United States Department of Agriculture

Soil Conservation Service

In cooperation with the University of Nebraska, Conservation and Survey Division

Soil Survey of Greeley County, Nebraska

How To Use This Soil Survey

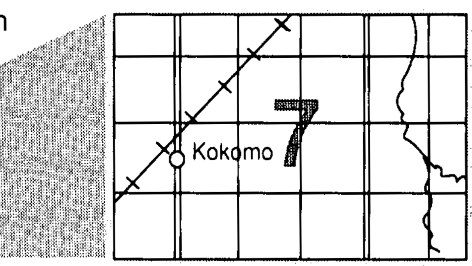
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

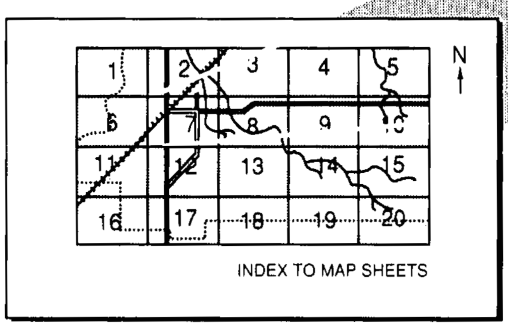
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

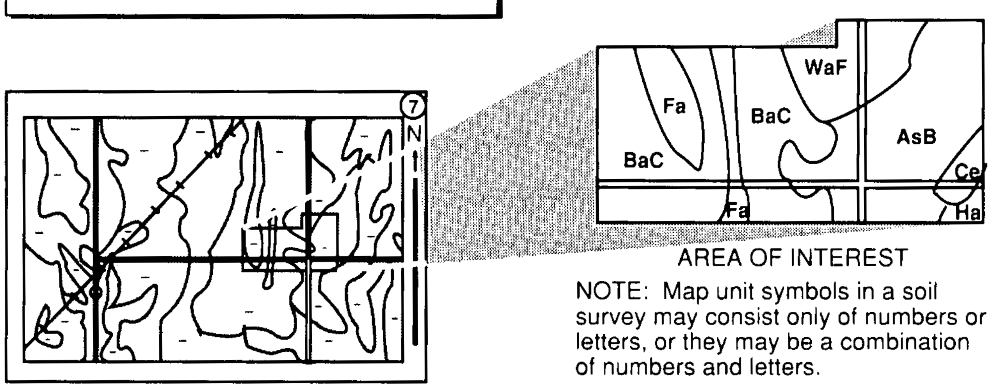


MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

MAP SHEET

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service and the University of Nebraska, Conservation and Survey Division. It is part of the technical assistance furnished to the Lower Loup Natural Resources District. The Greeley County Commissioners, the Lower Loup Natural Resources District, and the Old West Regional Commission provided financial assistance to purchase aerial photography used in field mapping. The Lower Loup Natural Resources District provided financial assistance to employ a soil scientist to accelerate the soil survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: The North Loup River Valley in Greeley County. The nearly level soils on bottom land and stream terraces are suited to cropland, and the strongly sloping to very steep soils on uplands are used mainly as pasture.

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Issued April 1993

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Foreword

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

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

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

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

Ronald E. Moreland
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Soil Survey of
Greeley County, Nebraska

By Jay R. Wilson, Soil Conservation Service, and Francis V. Belohlavy, John Beck, Robert S. Ohm, and William C. Markley, University of Nebraska, Conservation and Survey Division

United States Department of Agriculture, Soil Conservation Service,
in cooperation with the
University of Nebraska, Conservation and Survey Division

GREELEY COUNTY is in east-central Nebraska (fig. 1). The total area of the county is 365,063 acres, or about 570 square miles. The county is bordered on the north by Wheeler County, on the west by Valley County, on the south by Howard and Sherman Counties, and on the east by Boone and Nance Counties. The town of Greeley is the county seat. It is in the central part of the county. Other towns include Scotia in the southwestern part of the county, Wolbach in the southeast, and Spalding in the northeast.

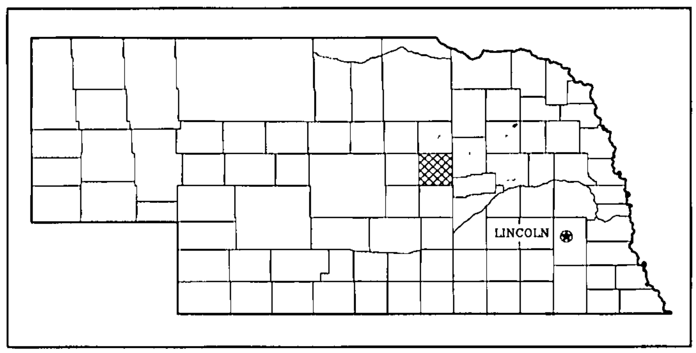

Figure 1.—Location of Greeley County in Nebraska.

The economy of the county is based mainly on a combination of grain and cattle production. While some grain is fed to cattle in the county, much of the grain is exported outside the county. Cattle production is supported by the abundant supply of grass produced on rangeland. Other businesses in the county are mainly agriculturally oriented service enterprises, such as seed, fertilizer, feed, fuel, and equipment supply companies.

About 48 percent of the acreage in the county is rangeland, and about 42 percent is cultivated cropland. The other 10 percent is used for pasture and hay, woodland, farmsteads, and urban areas.

The soils range widely in texture, drainage, and other characteristics. The soils in the northwestern part of the county are dominantly very sandy and formed in sandy windblown material. They are characterized by a rolling and hilly sandhills landscape. These soils are used mainly as rangeland. Most of the cultivated crops in this part of the county are grown on the nearly level, well drained, silty soils bordering the rivers and streams. These soils are used mainly for irrigated corn. The soils in the southern and eastern parts of the county, except for those in the river and stream valleys, are on rolling hills. They are well drained, silty soils that formed in loess. Much of this area is used for livestock grazing, although many areas are used for cultivated crops or alfalfa for hay. If the soils in the rolling loess hills are used for cultivated crops, water erosion is a severe hazard.

This soil survey updates the survey of Greeley County published in 1937 *(3)*. It provides additional information and has larger maps that show the soils in greater detail.

General Nature of the County

This section provides general information about Greeley County. It describes history; climate; geology and ground water; physiology, relief, and drainage; transportation facilities; and trends in farming and land use.

History

Nomadic Plains Indians originally inhabited the region that is now Greeley County. Large numbers of buffalo roamed the treeless plains and grazed the abundant grasses. The Indians hunted the buffalo, which provided their main source of food, hides for clothing and shelter covers, and bones for tools. Prairie fires and relatively dry summers prevented the establishment of trees other than a few species along the rivers. As much as 48 percent of Greeley County still supports the native grasses that were present when the Indians inhabited the area, although the makeup of the grass species may have changed somewhat because of the pressure of livestock grazing.

"Happy Jack" Swearington was most likely the first European settler to inhabit what is now Greeley County. He trapped along the Loup River Valley before 1869 and lived for a time on the peak that bears his name in the chalk hills near Scotia.

Greeley County was settled by soldiers who fought in the Civil War; immigrants from Ireland, Germany, Sweden, Denmark, and Austria; and many others from the eastern United States. The settlers came in covered wagons and with teams of oxen to settle and farm the new land. The Homestead Act, enacted by Congress in 1862, allowed many people to become landowners in the West. Under this act, any person in the United States who headed a family, was 21 years of age, and was a citizen or intended to become a citizen of the United States was entitled to a quarter section of land. In 1872, the act was extended and concessions were made to soldiers and their dependents to encourage the settlement of western land. Thereafter, land could be acquired under a preemption, the Homestead Act, a timber claim, or a Soldier's Homestead.

The first land claim was filed in 1871 in the southwestern part of the county. A group of Seventh-Day Baptists also settled near the present town of Scotia in the same year. Greeley County was established in 1872. By 1877, the southwestern part of the area along the North Loup River Valley was settled. Large numbers of Irish settlers homesteaded in the Spring Creek Valley and, a few years later, in the Cedar River Valley. Scotia was selected as the county seat in 1875, and 10 post offices were in the county by 1882. Five elections involving disputes among four communities over the location of the county seat took place over a period of 18 years. Because of its central location, the town of Greeley finally was designated as the county seat, first in 1888 and again in 1890 after the final election. The railroads played an important role in bringing settlers to Greeley County *(4)*.

The early homes were made mainly of sod. After transportation facilities were improved, lumber was brought in and wood frame homes were built. Sod houses, barns and other farm buildings, and granaries served as early schoolhouses. In the early years prairie fires were a constant threat to the settlers. Farm buildings and schoolhouses were often protected by plowing fire guards around them. Blizzards also were disastrous, causing the loss of livestock and human life.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

In Greeley County winters are cold because of incursions of cold, continental air that bring fairly frequent spells of low temperature. Summers are hot but are characterized by occasional interruptions of cooler air from the north. Snowfall is fairly frequent in winter, but the snow cover is usually not continuous. Rainfall is heaviest in late spring and early summer. The annual precipitation is normally adequate for wheat, sorghum, and range grasses.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Greeley, Nebraska, in the period 1951 to 1981. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 25 degrees F and the average daily minimum temperature is 13 degrees. The lowest temperature on record, which occurred at Greeley on January 12, 1974, is -31 degrees. In summer, the average temperature is 74 degrees and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred at Greeley on July 11, 1954, is 114 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 24 inches. Of this, 80 percent usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 14 inches. The heaviest 1-day rainfall during the period of record was 7.51 inches at Greeley on August 12, 1966. Thunderstorms occur on about 49 days each year.

The average seasonal snowfall is about 19 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 2 days of the year have at least 1 inch of snow on the ground.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 14 miles per hour, in spring.

Severe duststorms occur occasionally in the spring when strong, dry winds blow across unprotected soils. Tornadoes and severe thunderstorms, some of which are accompanied by hail, occur occasionally. These storms are local in extent and of short duration. The damage from these storms is in scattered, small areas.

Geology and Ground Water

Pierre Shale underlies most of the county. It consists of black and bluish gray marine shale deposited late in the Cretaceous period. Niobrara chalk underlies the Pierre Shale in the southeast corner of the county.

The Ogallala Group, which is Miocene in age, overlies the Pierre Shale and underlies the entire county. It is the oldest formation exposed in the county. It crops out in several small areas along the North Loup River in the southwestern part of the county. The Ogallala Group consists of beds of sand, sandstone cemented by lime, and sandy silt that has some lime. Unconsolidated sand and gravel deposits of Quaternary age overlie the Ogallala Group. Deposits of Wisconsin age overlie the older Quaternary deposits. They range from sandy to clayey. They are normally reddish brown and are often visible in road cuts and occasionally as small outcrops at the surface. No soils formed in this Wisconsin-age material in Greeley County because the exposures are not significant in size or extent.

Sandy eolian material covers the north-central and northwestern parts of the county. Dunes are 10 to 70 feet high. The present dune topography probably formed during arid intervals late in the Quaternary period and was stabilized by prairie grasses. The rest of the county, including the northeastern and southern parts, is capped with Peorian Loess that was deposited between 10,000 and 20,000 years ago. This loess is the most extensive parent material in the uplands and is on some of the higher stream terraces. It is silty, calcareous, wind-deposited material of local origin and ranges from a few feet to as much as 75 feet in thickness. It is generally silt loam. Small areas of the more recent, coarser textured Bignell Loess also are in the county. They are generally associated with the loess-sand transition areas adjacent to sandhills. The Bignell Loess is normally only a few feet thick and is very fine sandy loam.

Most of the silty soils on stream terraces and in narrow areas of bottom land in the loess-covered uplands formed in alluvium derived from eroded Peorian Loess. The Cedar River in the northwestern part of the county and the North Loup River in the southwestern part are the only permanent streams in the county. The bottom land along these rivers is recently deposited alluvium transported by water downstream from the sandhills or from the older formations exposed by the downcutting of river channels.

Pierre Shale has little significance as a potential source of ground water. Wells in both the Quaternary deposits and the Ogallala Group provide water for domestic livestock and for irrigation. The ground water throughout the county is of good quality, and the supply is adequate for all purposes. The depth to water ranges from a few feet to 250 feet and averages about 93 feet. The water from shallow wells in the sandhills is low in content of dissolved minerals, and the water from the deep wells is generally hard and contains calcium bicarbonate.

Ground water can be contaminated by drainage from feedlots and waste disposal facilities and by the leaching of chemicals applied on the soil surface. When a domestic well is installed, the water should be tested for contamination before the well is connected to the water system. Existing domestic wells should be tested for contamination occasionally. Shallow wells tend to have more problems with contamination than the deeper wells.

Physiography, Relief, and Drainage

The general physiography of Greeley County is that of deeply dissected uplands with a few higher remnants of nearly level and very gently sloping tableland. The dissected uplands are commonly strongly sloping to very steep and are traversed by several lower, long and narrow, nearly level and very gently sloping stream and river valleys. These valleys are commonly made up of low bottom land bordered by slightly higher stream terraces. The northwest fifth of the county consists of nearly level to very steep hummocks and sand dunes of the Nebraska Sandhills.

The relief of the dissected uplands commonly ranges from 70 to 150 feet between the hilltops and the bottom land. Stream terraces are commonly 10 to 25 feet higher than the bottom land that they border. The relief of dunes in the Sandhills is commonly 40 to 80 feet between hilltops and swales.

The surface drainage of the dissected uplands in the

Figure 2.—The Cedar River in northern Greeley County has a meandering channel, is spring fed, and has a very uniform flow of water. A center-pivot irrigated cornfield is on the left.

county is generally to the south and southeast and includes the North Loup River, Cedar River (fig. 2), Spring Creek, and their tributaries. Runoff is rapid on many of the soils in the uplands, and water erosion is a hazard. Most of the soils in the county are well drained. In the Sandhills the surface drainage is not well defined and is generally subterranean. Surface runoff is minor because of the rapid permeability in the coarse textured soils in the Sandhills. Most of the soils in the Sandhills are excessively drained. Water erosion is not generally a hazard, but soil blowing is a hazard.

Transportation Facilities

State highways and county roads are the main transportation routes in Greeley County. State Highway 11 follows the North Loup River across the southwest corner of the county. State Highway 22 passes through Scotia and connects State Highway 11 with U.S. Highway 281. State Highway 22 also extends east from U.S. Highway 281 through Wolbach. U.S. Highway 281 extends from north to south across the center of the county. State Highway 91 passes through Spalding and also connects to U.S. Highway 281. State Highway 56 extends from U.S. Highway 281 at Greeley east across the center of the county. Many county roads have gravel surfaces. The northwestern part of the county has few roads. The Union Pacific Railroad serves Greeley County at Spalding.

Trends in Farming and Land Use

Farming and ranching have been the most important enterprises in Greeley County since it was settled. In the early years, crops were produced mainly for local use. Once railroads and improved roads were built in the county, however, farmers and ranchers began to ship grain and livestock to other markets. Total production has improved over the years with the increased use of irrigation; use of more efficient, larger machinery; applications of fertilizer, herbicide, and pesticide; and incorporation of improved crop varieties. Farms have continued to decrease in number and increase in size. There were 500 farms in the county in 1972. The number declined to 455 in 1982 *(5)*. Most farms are a combination of cash-grain and livestock operations.

The acreage of irrigated crops is steadily increasing. In 1972, about 30,800 acres of land was irrigated. In 1982, this acreage had increased to 79,000 acres. Irrigation water is supplied from wells and canals. In 1982, the county had 237 center-pivot irrigation systems. The number of systems continues to increase. By 1983, the number of registered irrigation wells was 586. The North Loup Division of the Missouri Basin Irrigation Development provides irrigation water for 9,700 acres of land in Greeley County. Water for this irrigation project is stored at a reservoir on the Calamus River north of Burwell and in the Davis Creek Reservoir in the southeast corner of Valley County southwest of Scotia. Water is delivered by open canals.

Corn is the main cultivated crop in Greeley County. Other crops are alfalfa, grain sorghum, soybeans, wheat, oats, and barley. In 1972, corn was grown on 55,400 acres, of which 19,900 acres was irrigated. In 1982, corn was grown on 78,900 acres, of which 51,300 acres was irrigated. Grain sorghum was grown on 7,700 acres in 1972 and on 11,200 acres in 1982. Soybeans were grown on 1,500 acres, wheat on 3,000 acres, oats on 2,700 acres, barley on 100 acres, and alfalfa hay on 21,300 acres in 1982.

The raising of livestock is an important enterprise on most farms. The number of cattle raised in the county increased from 61,600 head in 1972 to 65,000 head in 1982. The number of dairy cattle decreased from 1,400 head in 1972 to 1,200 head in 1982. The number of hogs raised on farms totaled 27,000 in 1982.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; and the kinds of crops and native plants growing on the soils. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Some soil boundaries and soil names in this survey do not fully match those in the surveys of adjoining counties that were published at an earlier date. Differences are the result of changes and refinements in series concepts, variations in slope groupings, and application of the latest soil classification system.

Soil Descriptions

1. Valentine Association

Deep, nearly level to hilly, excessively drained, sandy soils; on uplands

This association consists of nearly level to hilly soils on sandhills in the uplands. Slopes range from 0 to 45 percent.

The total area of this association is about 80,955 acres, or about 22 percent of the county. The association is about 90 percent Valentine soils and 10 percent minor soils (fig. 3).

Valentine soils are nearly level to hilly and are on hummocks and dunes in the uplands. They are excessively drained. Typically, the surface layer is grayish brown, loose fine sand or loamy fine sand about 5 inches thick. Below this is a transition layer of light brownish gray, loose fine sand about 5 inches thick. The underlying material to a depth of 60 inches is light gray fine sand.

The minor soils in this association include Gates and Hersh soils. These soils are nearly level and very gently sloping and are in the lower areas on the landscape.

Most of the acreage in this association is used as range. Ranches are mainly limited to livestock production. Most of the association is poorly suited to dryland and irrigated crops because many of the soils are too steep, are easily eroded, and have a low available water capacity. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to maintain or improve the range condition and reduce the hazard of soil blowing. An abundant supply of good-quality ground water is available in this association.

Ranches in areas of this association average about 1,200 acres in size. Few improved roads cross the association. Livestock is marketed within the county or shipped to major markets outside the county.

2. Dunday-Anselmo-Valentine Association

Deep, nearly level to strongly sloping, well drained and excessively drained, sandy and loamy soils; on uplands

This association consists of nearly level to strongly sloping soils on uplands. Slopes range from 0 to 9 percent.

The total area of this association is about 13,607 acres, or about 4 percent of the county. The association is about 41 percent Dunday soils, 15 percent Anselmo soils, 13 percent Valentine soils, and 31 percent minor soils (fig. 4).

Dunday soils are nearly level to gently sloping and are on uplands. They are well drained. Typically, the surface layer is dark grayish brown, loose loamy fine sand about 13 inches thick. Below this is a transition layer of brown loamy fine sand about 11 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand.

Anselmo soils are very gently sloping and gently sloping and are on uplands. They are well drained. Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 6 inches thick. The

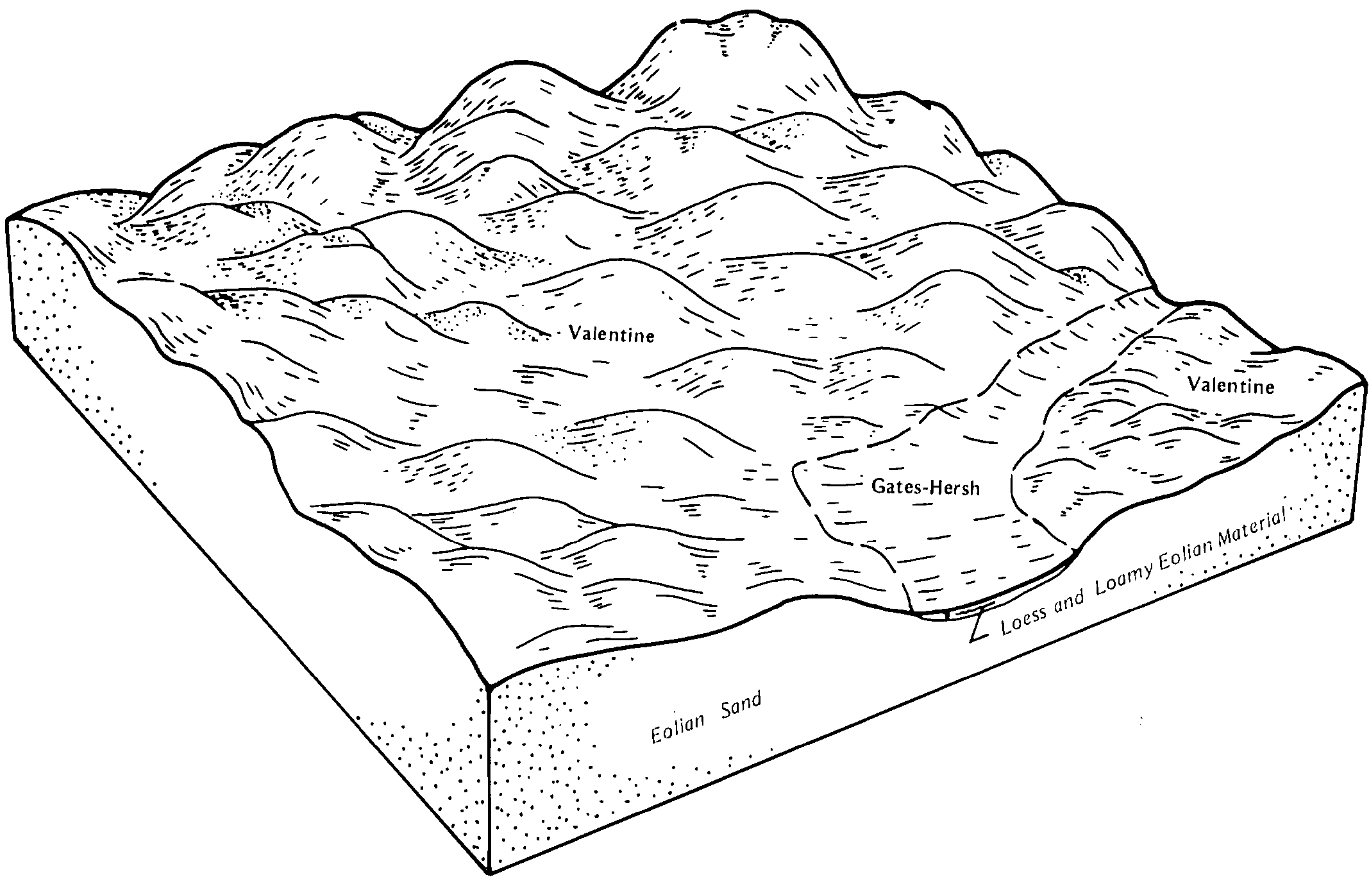

Figure 3.—Typical pattern of soils and parent material in the Valentine association.

subsurface layer is dark grayish brown, very friable fine sandy loam about 5 inches thick. The subsoil is very friable fine sandy loam about 13 inches thick. It is brown in the upper part and light yellowish brown in the lower part. The underlying material to a depth of 60 inches is very pale brown fine sandy loam.

Valentine soils are nearly level to strongly sloping and are on hummocks and dunes in the uplands. They are excessively drained. Typically, the surface layer is dark grayish brown, loose, very friable loamy fine sand about 6 inches thick. Below this is a transition layer of pale brown, very friable loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand.

The minor soils in this association include Gates, Hersh, and Ipage soils. Gates and Hersh soils are in landscape positions similar to those of the Anselmo and Dunday soils. Ipage soils are on stream terraces and in valleys in the sandhills.

Most of the acreage in this association is used for irrigated crops. Some areas are used as range. Farms are mainly a combination of cash-grain and livestock enterprises. An abundant supply of good-quality ground water is available in this association.

In the areas managed for dryland crops, an insufficient amount of rainfall and soil blowing are the main management concerns. Applying an adequate amount of irrigation water and controlling soil blowing are the chief concerns in managing irrigated areas. Soil blowing can be controlled by a system of conservation tillage that keeps crop residue on the surface. Maintaining productivity and controlling soil blowing are the main management concerns in the areas used as range.

Farms in areas of this association average about 640 acres in size. Gravel or improved dirt roads are the major kinds of roads. Grain is generally stored on the farm and fed to livestock or is marketed at local grain elevators. Livestock is marketed within the county or shipped to major markets outside the county.

3. Gates-Hersh Association

Deep, gently sloping to steep, well drained and somewhat excessively drained, silty and loamy soils; on uplands

This association consists of gently sloping to steep soils on ridgetops and side slopes in the uplands. Slopes range from 3 to 30 percent.

The total area of this association is about 16,450 acres, or about 4 percent of the county. The association is about 50 percent Gates soils, 32 percent Hersh soils, and 18 percent minor soils.

Gates soils are gently sloping to steep and are on ridgetops and side slopes in the uplands. They are well drained and somewhat excessively drained. Typically, the surface layer is brown, very friable silt loam about 4 inches thick. Below this is a transition layer of pale brown, very friable silt loam about 5 inches thick. The underlying material to a depth of 60 inches is white and light gray, calcareous silt loam.

Hersh soils are gently sloping to steep and are on uplands. They are well drained and somewhat excessively drained. Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 5 inches thick. Below this is a transition layer of grayish brown, very friable fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is very pale brown and light gray fine sandy loam.

The minor soils in this association include Hobbs, Hord, and Valentine soils. Hobbs soils are nearly level and are on bottom land. Hord soils are very gently sloping and are on stream terraces. Valentine soils are gently sloping, strongly sloping, and rolling and are on hummocks and dunes.

Most of the acreage in this association is used as range. Some areas are used for cultivated crops. Ranches are mainly cow-calf livestock enterprises.

Maintaining or improving the range condition is the main management concern. Proper grazing use, timely deferment of grazing or haying, and a grazing system in which two or more pastures are alternately grazed and rested and the order of the grazing and rest periods is changed each year help to maintain or improve the range condition. In areas used for cultivated crops,

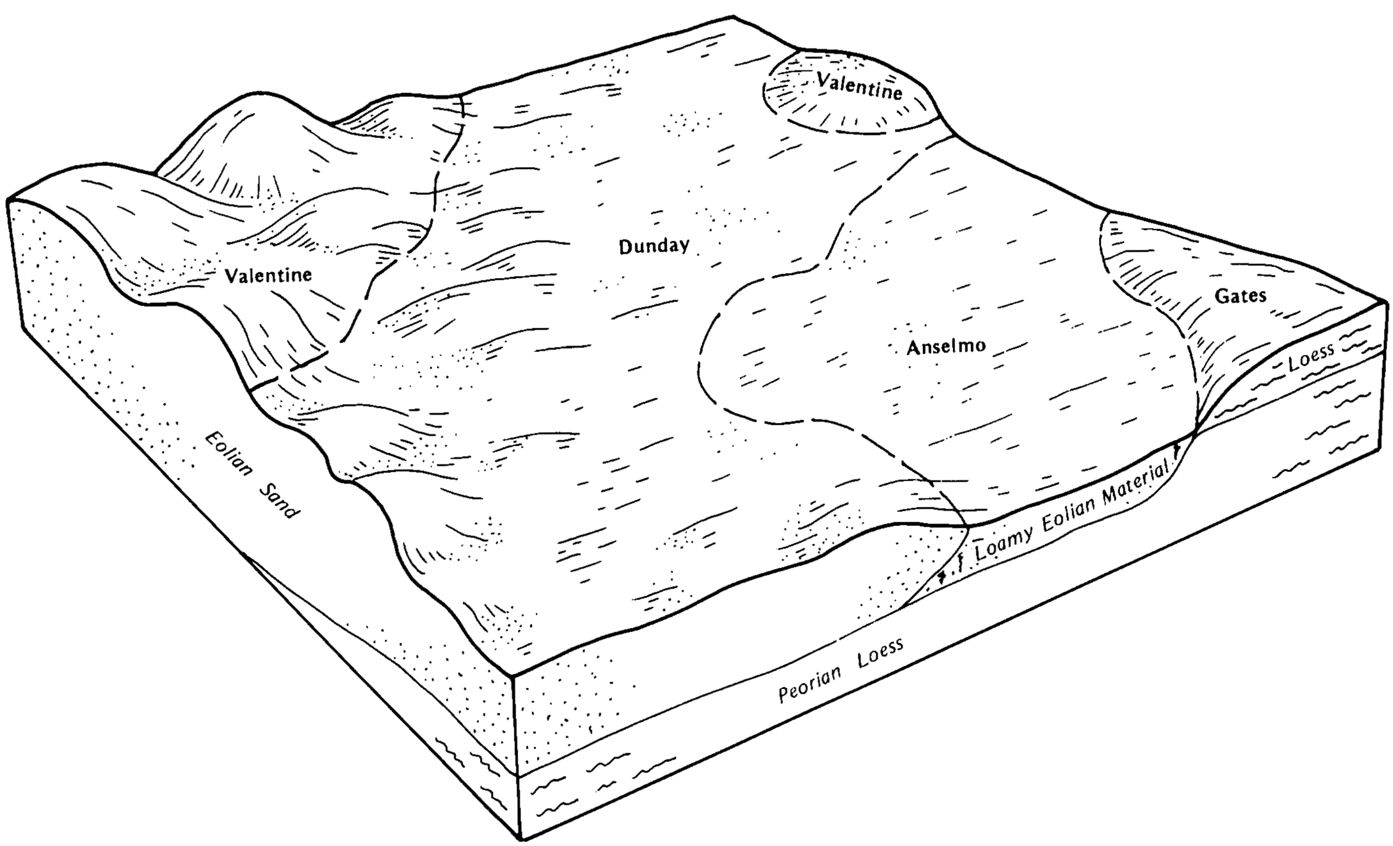

Figure 4.—Typical pattern of soils and parent material in the Dunday-Anselmo-Valentine association.

water erosion and soil blowing are the main management concerns. They can be controlled by terraces, contour farming, and a system of conservation tillage that keeps crop residue on the surface.

Ranches in areas of this association average about 1,200 acres in size. Roads are not on all section lines. Livestock is marketed within the county or shipped to major markets outside the county.

4. Anselmo-Gates-Kenesaw Association

Deep, nearly level to moderately steep, well drained and somewhat excessively drained, loamy and silty soils; on uplands

This association consists of nearly level to moderately steep soils on uplands. Slopes range from 0 to 17 percent.

The total area of this association is about 10,080 acres, or about 3 percent of the county. The association is about 32 percent Anselmo soils, 26 percent Gates soils, 17 percent Kenesaw soils, and 25 percent minor soils.

Anselmo soils are very gently sloping and gently sloping and are on uplands. They are well drained. Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 6 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 5 inches thick. The subsoil is very friable fine sandy loam about 13 inches thick. It is brown in the upper part and light yellowish brown in the lower part. The underlying material to a depth of 60 inches is very pale brown fine sandy loam.

Gates soils are nearly level to moderately steep and are on uplands. They are well drained and somewhat excessively drained. Typically, the surface layer is light brownish gray, very friable silt loam about 5 inches thick. Below this is a transition layer of pale brown, very friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam.

Kenesaw soils are nearly level and very gently sloping and are on uplands. They are well drained. Typically, the surface layer is grayish brown, very friable very fine sandy loam about 7 inches thick. The subsurface layer is dark grayish brown, very friable very fine sandy loam about 4 inches thick. The subsoil is very friable very fine sandy loam about 15 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material is very pale brown very fine sandy loam about 16 inches thick. A buried surface layer of dark grayish brown loam is between depths of 42 and 55 inches. Below this to a depth of 60 inches is brown very fine sandy loam.

The minor soils in this association include Hersh and Valentine soils. These soils are gently sloping and strongly sloping. Hersh soils are in landscape positions similar to those of the Gates soils. Valentine soils are on hummocks and dunes.

Most of the acreage in this association is used for cultivated crops. Some areas are used as range. Farms are mainly a combination of cash-grain and livestock enterprises.

In the areas managed for dryland crops, an insufficient amount of rainfall is the main limitation. Applying an adequate amount of irrigation water and controlling water erosion and soil blowing are the chief concerns in managing irrigated areas. Water erosion and soil blowing can be controlled by terraces, contour farming, and a system of conservation tillage that keeps crop residue on the surface.

Farms in areas of this association average about 640 acres in size. Gravel or improved dirt roads are the major kinds of roads. Grain is generally stored on the farm and fed to livestock or is marketed at local grain elevators. Livestock is marketed within the county or shipped to major markets outside the county.

5. Uly-Coly Association

Deep, strongly sloping to very steep, well drained to excessively drained, silty soils; on uplands

This association consists of strongly sloping to very steep soils on ridgetops and side slopes in the uplands. Slopes range from 6 to 60 percent.

The total area of this association is about 185,844 acres, or about 51 percent of the county. The association is about 45 percent Uly soils, 43 percent Coly soils, and 12 percent minor soils.

Uly soils are strongly sloping to steep and are on the lower part of side slopes and on ridgetops. They are well drained and somewhat excessively drained. Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is friable silt loam about 17 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Coly soils are strongly sloping to very steep and are on the upper part of side slopes and on ridgetops. They are well drained to excessively drained. Typically, the surface layer is grayish brown, very friable, calcareous silt loam about 4 inches thick. Below this is a transition layer of light brownish gray, very friable, calcareous silt loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

The minor soils in this association include Hobbs, Holdrege, and Hord soils. Hobbs soils are nearly level to gently sloping, are on narrow bottom land, and are occasionally flooded. Holdrege soils are gently sloping and are on ridgetops and side slopes. Hord soils are very gently sloping and gently sloping and are on foot slopes and stream terraces.

Most of the acreage in this association is used as range. Some areas are used for cultivated crops. Ranches are mainly cow-calf livestock enterprises. Farms are mainly a combination of livestock and cash-grain enterprises. Crops, such as corn, grain sorghum, wheat, and alfalfa, are grown on the less sloping soils in this association and in the adjacent associations.

Maintaining or improving the range condition is the main management concern in this association. Proper grazing use, timely deferment of grazing or haying, and a grazing system in which two or more pastures are alternately grazed and rested and the order of the grazing and rest periods is changed each year help to maintain or improve the range condition. Water erosion is the main hazard in cultivated areas. In the areas managed for dryland crops, an insufficient amount of rainfall also is a limitation. Applying an adequate amount of irrigation water and controlling water erosion are the chief concerns in managing irrigated areas.

Farms in areas of this association average about 640 acres in size. Roads are not on all section lines. A few paved roads and highways pass through the association. Livestock is marketed within the county or shipped to major markets outside the county. Grain is generally stored on the farm and fed to livestock or is marketed at local grain elevators.

6. Hall Association

Deep, nearly level and very gently sloping, well drained, silty soils; on uplands

This association consists of nearly level and very gently sloping soils on uplands. Slopes range from 0 to 3 percent.

The total area of this association is about 3,565 acres, or about 1 percent of the county. The association is about 93 percent Hall soils and 7 percent minor soils.

Hall soils are nearly level and very gently sloping and are on uplands. They are well drained. Typically, the surface layer is dark grayish brown, very friable silt loam about 6 inches thick. The subsurface layer also is dark grayish brown, very friable silt loam about 6 inches thick. The subsoil is firm silty clay loam about 22 inches thick. It is dark grayish brown in the upper part, brown in the next part, and pale brown in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam.

The minor soils in this association include Holdrege and Uly soils. Holdrege soils are gently sloping and are on ridgetops and side slopes. Uly soils are strongly sloping to steep and are on the lower part of side slopes and on ridgetops.

Most of the acreage in this association is used for cultivated crops. Farms are mainly a combination of cash-grain and livestock enterprises. Corn, grain sorghum, wheat, and alfalfa are the major crops. The soils are dry farmed or irrigated with sprinkler or gravity irrigation systems. Livestock are generally raised on range in the adjacent Uly-Coly association.

Water erosion is a slight hazard in the very gently sloping areas. In areas managed for dryland crops, an insufficient amount of rainfall is the main limitation. The hazard of erosion can be reduced by terraces, contour farming, and a system of conservation tillage that keeps crop residue on the surface. Applying an adequate amount of irrigation water and controlling water erosion are the main concerns in managing irrigated areas.

Farms in areas of this association average about 640 acres in size. Gravel or improved dirt roads are along some section lines. Livestock is marketed mainly within the county or shipped to major markets outside the county. Most grain is stored on the farm and fed to livestock or is marketed at local grain elevators.

7. Hord-Cozad Association

Deep, nearly level and very gently sloping, well drained, silty soils; on stream terraces

This association consists of nearly level and very gently sloping, well drained soils on stream terraces. Slopes range from 0 to 3 percent.

The total area of this association is about 15,415 acres, or about 4 percent of the county. The association is about 58 percent Hord soils, 15 percent Cozad soils, and 27 percent minor soils (fig. 5).

Hord soils are nearly level and very gently sloping and are on stream terraces. They are well drained. Typically, the surface layer is dark gray, very friable silt loam about 6 inches thick. The subsurface layer is very friable silt loam about 18 inches thick. It is dark grayish brown in the upper part and dark gray in the lower part. The subsoil is friable silty clay loam about 18 inches thick. It is dark gray in the upper part, brown in the next part, and pale brown in the lower part. The upper part of the underlying material is grayish brown, stratified silt loam and silty clay loam. The lower part to a depth of 60 inches is brown silt loam.

Cozad soils are nearly level and very gently sloping and are on stream terraces. They are well drained. Typically, the surface layer is grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 5 inches thick. The subsoil is grayish brown and light brownish gray, friable silt loam about 12 inches thick. The

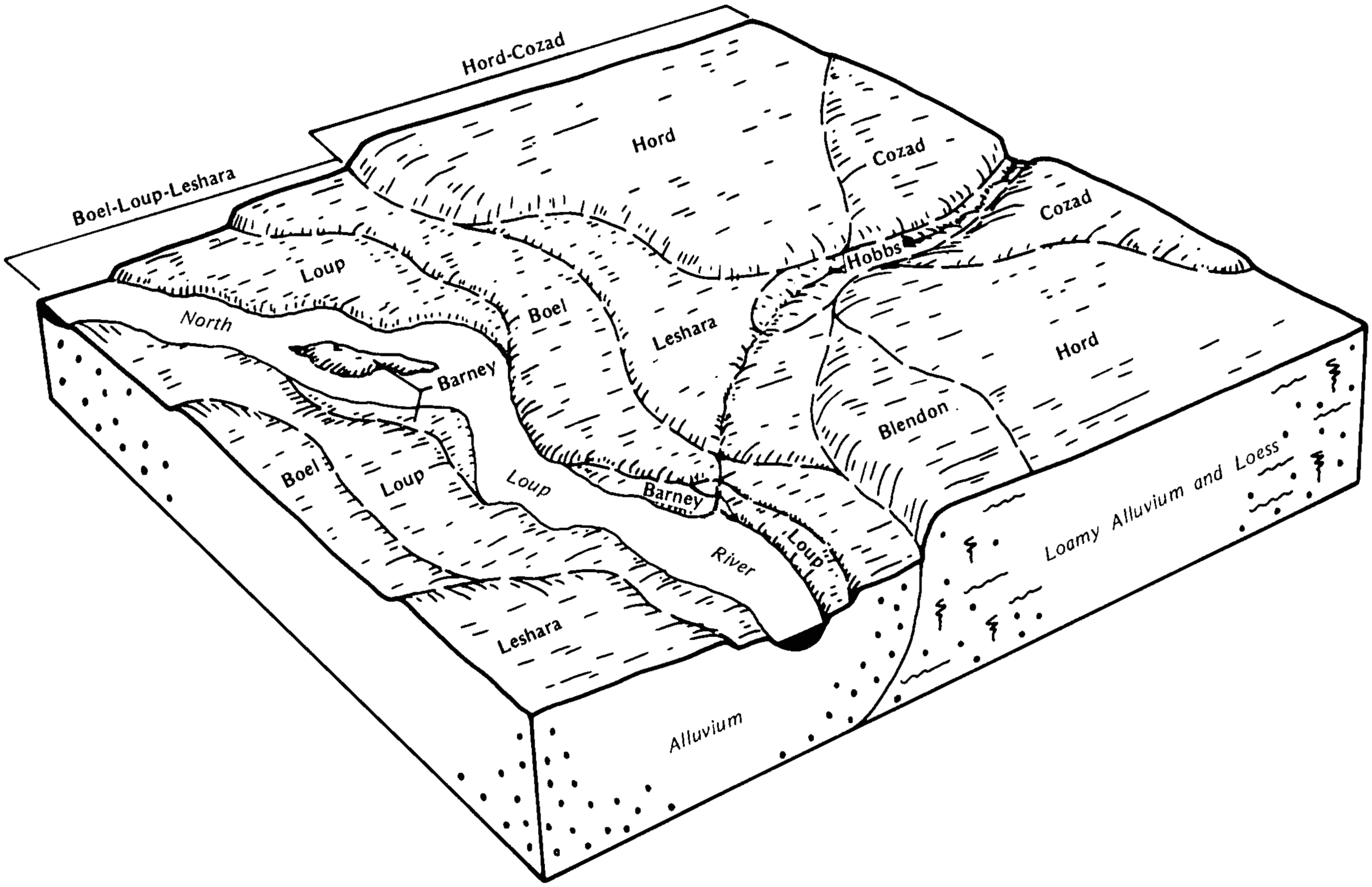

Figure 5.—Typical pattern of soils and parent material in the Hord-Cozad and the Boel-Loup-Leshara associations.

underlying material to a depth of 60 inches is light brownish gray and light gray very fine sandy loam.

The minor soils in this association include Blendon, Hobbs, Leshara, and Simeon soils. Blendon soils are nearly level and are on stream terraces. Hobbs soils are nearly level and very gently sloping and are on bottom land. Leshara soils are nearly level and are on bottom land. Simeon soils are nearly level and gently sloping and are on stream terraces.

Most of the acreage in this association is used for irrigated crops. Farms are mainly a combination of cash-grain and livestock enterprises. Corn and alfalfa are the main crops. These soils generally are irrigated by a gravity system. The efficient use of irrigation water is the main management concern. Wells in this association supply a high volume of water for irrigation. Livestock are raised on range in the adjacent associations.

Farms in areas of this association average about 640 acres in size. Gravel or improved dirt roads are along most section lines. A few paved highways pass through this association. Livestock is marketed mainly within the county or shipped to major markets outside the county. Grain is generally stored on the farm and fed to livestock or is marketed at local grain elevators.

8. Hord-Hobbs Association

Deep, nearly level to gently sloping, well drained, silty soils; on stream terraces and bottom land

This association consists of nearly level to gently sloping soils on stream terraces and bottom land. Slopes range from 0 to 6 percent.

The total area of this association is 31,812 acres, or about 9 percent of the county. The association is about 46 percent Hord soils, 33 percent Hobbs soils, and 21 percent minor soils.

Hord soils are nearly level to gently sloping and are on stream terraces. They are well drained. Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 17 inches thick. The subsoil is very friable silt loam about 25 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam.

Hobbs soils are nearly level and very gently sloping and are on bottom land. They are well drained and are occasionally flooded or frequently flooded. Typically, the surface layer is grayish brown, friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is stratified dark grayish brown, grayish brown, and light brownish gray, very friable silt loam.

The minor soils in this association include Holdrege soils. These soils are gently sloping and are on uplands.

Most of the acreage in this association is used for cultivated crops. Some areas are used as range. Farms are mainly a combination of cash-grain and livestock enterprises. Corn and alfalfa are the main crops. Many areas are irrigated. The efficient use of irrigation water is the main management concern in irrigated areas. In the areas used as range, proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve the range condition.

Farms in areas of this association average about 500 acres in size. Gravel or improved dirt roads are along some section lines. Few paved highways pass through this association. Livestock is marketed mainly within the county or shipped to major markets outside the county. Grain is generally stored on the farm and fed to livestock or is marketed at local grain elevators.

9. Boel-Loup-Leshara Association

Deep, nearly level, somewhat poorly drained and poorly drained, loamy and silty soils; on bottom land

This association consists of nearly level soils on bottom land along the channels of the Cedar and North Loup Rivers. Slopes range from 0 to 2 percent.

The total area of this association is about 7,335 acres, or about 2 percent of the county. The association is about 23 percent Boel soils, 21 percent Loup soils, 20 percent Leshara soils, and 36 percent minor soils (fig. 5).

Boel soils are nearly level and are on bottom land. They are in long, narrow areas adjacent to river channels. They are somewhat poorly drained and occasionally flooded. Typically, the surface layer is very friable loam about 10 inches thick. It is dark gray in the upper part and dark grayish brown in the lower part. Below this is a transition layer of light brownish gray and grayish brown, very friable loam about 4 inches thick. The underlying material to a depth of 60 inches is stratified very pale brown fine sand, white fine sand, and white sand and coarse sand.

Loup soils are nearly level and are on bottom land. They are parallel to river channels. They are slightly lower on the landscape than Boel and Leshara soils. They are poorly drained and occasionally flooded. Typically, the surface layer is very friable loam about 9 inches thick. It is dark grayish brown in the upper part and dark gray in the lower part. Below this is a transition layer of light brownish gray, very friable fine sandy loam about 6 inches thick. The upper part of the underlying material is light gray fine sand. The lower part to a depth of 60 inches is white sand.

Leshara soils are nearly level and are on bottom land. They are somewhat poorly drained and occasionally flooded. Typically, the surface layer is grayish brown, friable silt loam about 5 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 9 inches thick. The underlying material to a depth of 46 inches is calcareous silt loam. It is light brownish gray in the upper part and light gray in the lower part. Below this to a depth of 60 inches is white fine sand.

The minor soils in this association include Almeria and Barney soils and the sandy Fluvaquents. Almeria and Barney soils are poorly drained and are lower on the bottom land than the major soils. Fluvaquents are very poorly drained and are in the lowest areas on the bottom land.

Most of the acreage of Boel and Leshara soils is used for irrigated crops. Most of the acreage of Loup soils is used as range or hayland.

The farms and ranches in this association generally have their headquarters in adjacent associations. The efficient use of irrigation water is a management concern in irrigated areas. In the areas used as range, proper grazing use, timely deferment of grazing or haying, and restricted use during very wet periods help to maintain or improve the range condition.

Farms and ranches in areas of this association average about 640 acres in size. The few gravel or improved dirt roads generally run parallel to the major streams and cross the association in only a few locations. Livestock is marketed within the county or shipped to major markets outside the county. Grain is generally stored on the farm and fed to livestock or is marketed at local grain elevators.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Valentine fine sand, 0 to 3 percent slopes, is a phase of the Valentine series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Uly-Coly silt loams, 15 to 30 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Some soil boundaries and soil names in this survey do not fully match those in the surveys of adjoining counties that were published at an earlier date. Differences are the result of changes and refinements in series concepts, variations in slope groupings, and application of the latest classification system.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils.

Soil Descriptions

Ae—Almeria loamy fine sand, channeled. This deep, nearly level, poorly drained soil is on bottom land dissected by stream channels that meander across flood plains. It formed in stratified, sandy alluvium. It is frequently flooded, but the floodwater remains on the surface for only brief periods. Slopes range from 0 to 2 percent. Individual areas range from 5 to 50 acres in size and occur as long and narrow tracts that border stream channels.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 2 inches thick. The upper part of the underlying material is grayish brown loamy fine sand. The next part is stratified pale brown and light gray fine sand. The lower part to a depth of 60 inches is stratified grayish brown, dark gray, gray, and light gray loamy fine sand. A thin buried surface layer of dark, moderately coarse textured material is common. In some places the surface layer is thicker. In other places it is finer textured.

Included with this soil in mapping are small areas of Boel soils; small areas of Fluvaquents, sandy; and areas of soils on short, steep slopes. Boel soils are somewhat poorly drained and are slightly higher on the landscape than the Almeria soil. Fluvaquents are very poorly drained, are in the lower landscape positions, and have a seasonal high water table that is closer to the surface than that in the Almeria soil. The soils on short, steep slopes are on escarpments where stream channels cut into the adjacent landscape. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Almeria soil. Available water capacity is low. Runoff is very slow. The content of organic matter is moderately low. The seasonal high water table is at the surface in wet years and at a depth of 1.5 feet in dry years. The depth of the water flowing in the nearby stream channels directly affects depth to the water table.

Nearly all of the acreage is used as range. This soil is unsuited to cultivated crops, hay, and pasture because of the flooding, the wetness, and inaccessibility caused by the meandering stream channels and the escarpments.

In the areas used as range, the climax vegetation is dominantly big bluestem, reedgrass, prairie cordgrass, switchgrass, sedges, and rushes. These species make up 80 percent or more of the total annual forage. Bluegrass, slender wheatgrass, Canada wildrye, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, prairie cordgrass, switchgrass, and reedgrass decrease in abundance and are replaced by slender wheatgrass, western wheatgrass, plains muhly, and sedges. Timothy, redtop, and red clover increase in abundance if they have been overseeded. If overgrazing continues for many years, bluegrass, western wheatgrass, sedges, rushes, and forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 1.9 animal unit months per acre. A planned grazing system that includes proper grazing use, timely deferment of grazing, and restricted use during very wet periods helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is in a pasture that includes better drained, sandy soils. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. When the surface is wet, grazing causes surface compaction and the formation of small mounds, which make grazing difficult.

This soil is generally unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. Suitable trees and shrubs can be grown in some recreational or wildlife areas if they are planted by hand or if other special management is applied.

This soil is not suitable as a site for septic tank absorption fields because of the flooding, the wetness, and the seepage of effluent into the ground water. It is not suited to dwellings because of the flooding and the wetness. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored during dry periods. Constructing local roads on suitable, well compacted fill material, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by wetness and flooding.

The capability unit is VIw-7, dryland; Wet Subirrigated range site; windbreak suitability group 10.

AnB—Anselmo fine sandy loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on uplands. It formed in loamy eolian material. Individual areas range from 15 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 6 inches thick. The subsurface layer also is dark grayish brown, very friable fine sandy loam. It is about 5 inches thick. The subsoil is very friable fine sandy loam about 13 inches thick. It is brown in the upper part and light yellowish brown in the lower part. The underlying material to a depth of 60 inches is very pale brown fine sandy loam. In some areas the underlying material is loamy fine sand. In some places the surface layer is lighter colored. In other places it is thinner.

Included with this soil in mapping are small areas of Gates and Kenesaw soils. These soils have more silt and clay throughout than the Anselmo soil. They are in landscape positions similar to those of the Anselmo soil. They make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Anselmo soil. Available water capacity is moderate. Runoff is slow. The content of organic matter is moderately low. The rate of water intake is moderately high.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is suited to grain sorghum, wheat, and alfalfa. Soil blowing is a hazard where the surface is not adequately protected by crops or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. Stripcropping, stubble mulching, and field windbreaks also help to control soil blowing. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is well suited to sprinkler irrigation systems. Soil blowing is a hazard where the surface is not adequately protected by crops or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. Gravity irrigation systems may require a relatively short run because of the moderately high rate of water intake.

This soil is suited to pasture. Forage production can be maintained or increased and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Forage production also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

This soil is suited to range. A cover of native plants is effective in controlling soil blowing and water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in severe soil blowing. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil generally is suited to septic tank absorption fields and dwellings. The sides of shallow excavations can cave in unless they are shored. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIe-3, dryland, and IIe-8, irrigated; Sandy range site; windbreak suitability group 5.

AnC—Anselmo fine sandy loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on uplands. It formed in loamy eolian material. Individual areas range from 10 to 100 acres in size.

Typically, the surface layer is very friable fine sandy loam about 13 inches thick. It is dark grayish brown in the upper part and very dark grayish brown in the lower part. The subsoil is friable fine sandy loam about 17 inches thick. It is dark grayish brown in the upper part, brown in the next part, and yellowish brown in the lower part. The underlying material to a depth of 60 inches is pale brown fine sandy loam. In some places the underlying material is loamy fine sand. In other places the surface layer is lighter colored and is thinner.

Included with this soil in mapping are small areas of Dunday and Gates soils. These soils are in landscape positions similar to those of the Anselmo soil. Dunday soils have more sand throughout than the Anselmo soil, and Gates soils have less sand throughout. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Anselmo soil. Available water capacity is moderate. Runoff is medium. The content of organic matter is moderately low. The rate of water intake is moderately high.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, and wheat and to alfalfa and grasses for hay and pasture. Water erosion and soil blowing are the main hazards. Where slopes are suitable, terraces and contour farming help to control water erosion. Leaving crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter and the level of fertility.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and introduced grasses. The soil is too sloping for gravity systems. Leaving crop residue on the surface and planting close-growing crops help to control water erosion and soil blowing. Where slopes are suitable, terraces and contour farming also help to control water erosion. Returning crop residue to the soil maintains or increases the content of organic matter and the level of fertility. The efficient use of irrigation water and uniform application rates are important management considerations.

This soil is suited to pasture. Forage production can be increased or maintained and the hazards of water erosion and soil blowing reduced by proper stocking rates and rotation grazing. Applying fertilizer and seeding mixtures of grasses and legumes also increase forage production.

This soil is suited to range. A cover of native plants is effective in controlling soil blowing and water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in severe water erosion and soil blowing. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil generally is suited to septic tank absorption fields and dwellings. The sides of shallow excavations can cave in unless they are shored. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIIe-3, dryland, and IIIe-8, irrigated; Sandy range site; windbreak suitability group 5.

Ba—Barney loam, channeled. This nearly level, poorly drained soil is on bottom land. It is frequently flooded for long periods. It formed in alluvium. Slopes range from 0 to 2 percent. Individual areas are long and narrow and are adjacent to river channels. They range from 10 to 150 acres in size.

Typically, the surface layer is dark gray, friable loam about 8 inches thick. The underlying material to a depth of 60 inches is fine sand that has thin strata of finer and coarser textured material. It is light gray in the upper part and very pale brown in the lower part. In some areas the surface layer is fine sandy loam or loamy fine sand and is thinner and lighter in color.

Included with this soil in mapping are small areas of Boel and Loup soils and a few small areas of marsh. The somewhat poorly drained Boel soils are in the slightly higher positions on the landscape. Loup soils are occasionally flooded for brief periods and are in the slightly higher positions on the landscape. The areas of marsh have water above the surface during part of the year and are in depressions on the bottom land. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate in the surface layer of the Barney soil and rapid in the underlying material. Available water capacity is low. Runoff is very slow. The content of organic matter is moderately low. The seasonal high water table is near the surface in wet years and at a depth of 2 feet in dry years. The water table is highest in the spring, when the level of streamflow is highest.

Most of the acreage is used as range or supports trees and shrubs. It is used for livestock grazing or wildlife habitat. This soil is unsuited to dryland and irrigated crops, pasture, and hay because of the high water table, the flooding, and inaccessibility caused by the meandering stream channels.

In the areas used as range, the climax vegetation is dominated by prairie cordgrass, bluejoint reedgrass, northern reedgrass, and sedges. These species make up 70 percent or more of the total annual forage. Bluegrass, slender wheatgrass, green muhly, and some forbs make up the rest. If subject to continuous heavy grazing, prairie cordgrass, bluejoint reedgrass, and northern reedgrass decrease in abundance and are replaced by slender wheatgrass, bluegrass, green muhly, sedges, rushes, and forbs. If overgrazing continues for many years, bluegrass, foxtail barley, sedges, rushes, and forbs dominate the site. When the surface layer is wet, overgrazing can cause surface compaction and create small mounds, which make grazing difficult.

If the range is in excellent condition, the suggested initial stocking rate is 2.1 animal unit months per acre. This soil produces a high quantity of low-quality forage. A planned grazing system that includes proper grazing use, timely deferment of grazing, and restricted use during very wet periods helps to maintain or improve the range condition.

This soil is generally unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. Suitable trees and shrubs can be grown in some recreational or wildlife areas if they are planted by hand or if other special management is applied.

This soil is not suitable as a site for septic tank absorption fields because of the flooding, the wetness, and the seepage of effluent into the ground water. It is not suited to dwellings because of the flooding and the wetness. A suitable alternative site is needed. Constructing local roads on suitable, well compacted fill material, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by wetness and flooding.

The capability unit is VIw-7, dryland; Wetland range site; windbreak suitability group 10.

Be—Blendon fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces. It formed in loamy material. Individual areas range from 15 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, very friable fine sandy loam about 6 inches thick. The subsurface layer also is very dark grayish brown, very friable fine sandy loam. It is about 7 inches thick. The subsoil is dark grayish brown, very friable fine sandy loam about 14 inches thick. The underlying material to a depth of 60 inches is light gray fine sand. In some places the surface layer is loam. In other places the dark color extends to a depth of less than 20 inches. In some areas the underlying material is gravelly.

Included with this soil in mapping are small areas of Cozad, Hord, and Simeon soils. Cozad and Hord soils have more silt and clay throughout than the Blendon soil. Also, they are slightly lower on the landscape. Simeon soils have more sand and less silt and clay throughout than the Blendon soil. They are in landscape positions similar to those of the Blendon soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderately rapid in the upper part of the Blendon soil and rapid in the underlying material. Available water capacity is moderate. Surface runoff is slow. The content of organic matter is moderate. The rate of water intake is moderately high.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is suited to grain sorghum, wheat, and alfalfa. Soil blowing is a hazard where the surface is not adequately protected by crops or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. Stripcropping, stubble mulching, and field windbreaks also help to control soil blowing. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is well suited to most sprinkler systems. Soil blowing is a hazard where the surface is not adequately protected by crops or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. Gravity irrigation systems may require a relatively short run because of the moderately high rate of water intake.

This soil is suited to pasture. Forage production can be increased or maintained and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Forage production also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

This soil is suited to range. A cover of native plants is effective in controlling soil blowing. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIe-3, dryland, and IIe-8, irrigated; Sandy range site; windbreak suitability group 5.

Bf—Blendon loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on stream terraces. It formed in loamy material. Individual areas range from 15 to 750 acres in size.

Typically, the surface layer is dark gray, very friable loam about 6 inches thick. The subsurface layer is very dark grayish brown, very friable loam about 11 inches thick. The subsoil is about 25 inches thick. It is dark grayish brown and very friable. It is loam in the upper part and fine sandy loam in the lower part. The underlying material to a depth of 60 inches is light gray loamy fine sand and very pale brown fine sand. In some places the surface layer is silt loam or fine sandy loam. In other places the dark color extends to a depth of less than 20 inches.

Included with this soil in mapping are small areas of Cozad and Hord soils. These soils have more silt throughout than the Blendon soil. Also, they are slightly lower on the landscape. They make up 5 to 10 percent of the unit.

Permeability is moderate in the subsoil of the Blendon soil and rapid in the underlying material. Available water capacity is moderate. Runoff is slow. The content of organic matter is moderate. The rate of water intake is moderately high.

Most of the acreage of this soil is used for irrigated crops.

If used for dryland farming, this soil is suited to grain sorghum, wheat, and alfalfa. A scarcity of moisture limits crop production. Systems of conservation tillage that leave crop residue on the surface conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is well suited to most sprinkler irrigation systems. Gravity irrigation systems may require a relatively short run because of the moderately high rate of water intake.

This soil is suited to pasture. Forage production can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

This soil is suited to range. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIc-1, dryland, and I-8, irrigated; Sandy range site; windbreak suitability group 5.

Br—Boel loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom land. It formed in alluvium. It is occasionally flooded for brief periods. Individual areas are long and narrow and are adjacent to river channels. They range from 10 to 200 acres in size.

Typically, the surface layer is very friable loam about 10 inches thick. It is dark gray in the upper part and dark grayish brown in the lower part. Below this is a transition layer of light brownish gray and grayish brown, very friable loam about 4 inches thick. The upper part of the underlying material is very pale brown fine sand. The next part is white fine sand. The lower part to a depth of 60 inches is white sand and coarse sand. In some areas the surface layer is lighter colored. In other areas it is fine sandy loam, loamy fine sand, or very fine sandy loam.

Included with this soil in mapping are small areas of Barney and Loup soils. These soils are poorly drained and are in the slightly lower positions on the landscape. They make up 5 to 15 percent of the unit.

Permeability is moderate in the upper part of the Boel soil and rapid in the underlying material. Available water capacity is low. Runoff is very slow. The content of organic matter is moderately low. The seasonal high water table is at a depth of 1.5 feet in wet years and 3.5 feet in dry years. The rate of water intake is moderately high.

Most of the acreage of this soil is used as range. Some areas are used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Flooding may delay cultivation in the spring, but it rarely causes severe crop damage. The deposition of silt by floodwater can damage newly seeded crops.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Flooding is the principal hazard. If the soil is to be leveled for gravity irrigation systems, care must be taken not to remove all of the loamy upper part of the profile and expose the underlying sand. When the soil is leveled, surface soil should be removed, stockpiled, and replaced in cut areas. Gravity irrigation systems require a relatively short run because of the moderately high rate of water intake. Sprinkler irrigation systems allow for a uniform distribution of water and a controlled rate of water application. Flooding may delay cultivation in the spring, but it rarely causes severe crop damage. The deposition of silt by floodwater can damage newly seeded crops.

This soil is suited to pasture. Flooding is a hazard. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer.

In the areas used as range or hayland, the climax vegetation is dominantly big bluestem, little bluestem, indiangrass, switchgrass, sedges, and rushes. These species make up 80 percent or more of the total annual forage. Prairie cordgrass, bluegrass, and forbs make up the rest. If subject to continuous heavy grazing or improperly harvested for hay, big bluestem, little bluestem, indiangrass, switchgrass, and prairie cordgrass decrease in abundance and are replaced by western wheatgrass, bluegrass, slender wheatgrass, green muhly, sedges, and rushes. If overgrazing or improper haying methods continue for many years, bluegrass, sedges, rushes, and forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 1.7 animal unit months per acre. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during wet periods helps to maintain or improve the range condition. This soil is generally the first to be overgrazed in a pasture that includes better drained, sandy soils. Properly located fences, livestock water, and salting facilities result in a more uniform distribution of grazing.

If this soil is used as hayland, mowing should be regulated so that the grasses remain vigorous. The hay is of best quality when the grasses are cut early. After the ground is frozen, livestock can graze without damaging the meadows. They should be removed before the ground thaws in the spring.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The trees and shrubs that can withstand occasional wetness survive and grow well.

This soil is not suitable as a site for septic tank absorption fields or dwellings because of the flooding. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored during dry periods. Constructing local roads on suitable, well compacted fill material, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by wetness and flooding.

The capability units are IIIw-4, dryland, and IIIw-8, irrigated; Subirrigated range site; windbreak suitability group 2S.

Ca—Cass fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on high bottom land. It formed in loamy alluvium. It is subject to rare flooding. Individual areas range from 15 to 50 acres in size.

Typically, the surface layer is grayish brown, very friable fine sandy loam about 5 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 11 inches thick. Below this is a transition layer of light brownish gray, very friable fine sandy loam about 12 inches thick. The upper part of the underlying material is light gray fine sandy loam. The lower part to a depth of 60 inches is grayish brown, very pale brown, and light gray very fine sandy loam. In places the surface layer is loamy fine sand.

Included with this soil in mapping are small areas of Hobbs soils. These soils have less sand throughout than the Cass soil. They are on the lower bottom land. They make up 5 to 10 percent of the unit.

Permeability is moderately rapid in the Cass soil. Available water capacity is moderate. Runoff is slow. The content of organic matter is moderately low. The rate of water intake is moderately high.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range or pasture.

If used for dryland farming, this soil is suited to grain sorghum, wheat, and alfalfa. Soil blowing is a hazard where the surface is not adequately protected by crops or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. Stripcropping, stubble mulching, and field windbreaks help to control soil blowing. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is well suited to most sprinkler systems. Soil blowing is a hazard where the surface is not adequately protected by crops or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. Gravity irrigation systems may require a relatively short run because of the moderately high rate of water intake.

This soil is suited to pasture. Forage production can be maintained or increased and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Forage production also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

This soil is suited to range and native hay. A cover of native plants is effective in controlling soil blowing. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivating with conventional equipment between the tree rows and by hand hoeing, rototilling, and applying appropriate herbicides in the rows.

The rare flooding should be considered if this soil is used as a site for septic tank absorption fields. The sides of shallow excavations can cave in unless they are shored. Constructing dwellings on raised, well compacted fill material helps to prevent the damage caused by floodwater. Constructing local roads on suitable, well compacted fill material above flood levels, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by flooding. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIe-3, dryland, and IIe-8, irrigated; Sandy Lowland range site; windbreak suitability group 1.

CrG—Coly-Hobbs silt loams, 2 to 60 percent slopes. These soils are deep and very gently sloping to very steep. The excessively drained Coly soil is on very steep side slopes and narrow ridgetops on deeply dissected uplands. The side slopes commonly have catsteps. The well drained Hobbs soil is on foot slopes, alluvial fans, and bottom land. The Coly soil formed in loess. The Hobbs soil formed in alluvium and is occasionally flooded for brief periods. The dominant slopes of the Coly soil range from 30 to 60 percent. The slopes of the Hobbs soil range from 2 to 6 percent. Individual areas range from 20 to 500 acres in size. They are 70 to 85 percent Coly soil and 10 to 25 percent Hobbs soil. The two soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Coly soil is brown, friable, calcareous silt loam about 4 inches thick. Below this is a transition layer of pale brown, friable, calcareous silt loam about 3 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In places the soil formed in older geologic material, such as reddish brown loess, and is on the lower part of side slopes.

Typically, the surface layer of the Hobbs soil is grayish brown and dark brownish gray, friable silt loam about 10 inches thick. The underlying material to a depth of 60 inches is stratified grayish brown and light gray silt loam. In places the soil is calcareous in part or all of the profile.

Included with these soils in mapping are small areas of Uly soils. These included soils have a surface layer that is darker and thicker than that of the Coly soil and are deeper to carbonates. They are on ridgetops and the lower side slopes. They make up less than 15 percent of the unit.

Permeability is moderate in the Coly and Hobbs soils. Available water capacity is high. Runoff is very rapid on the Coly soil and medium on the Hobbs soil. The content of organic matter is moderately low in the Coly soil and moderate in the Hobbs soil.

Most of the acreage is used as range. These soils also provide habitat for many kinds of wildlife common in Greeley County. They are unsuited to dryland and irrigated crops, pasture, and hay because of the slope.

In the areas used as range, the climax vegetation on the Coly soil is dominantly big bluestem, little bluestem, plains muhly, and sideoats grama. These species make up 70 percent or more of the total annual forage. Tall dropseed, hairy grama, indiangrass, blue grama, prairie sandreed, needleandthread, switchgrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, sideoats grama, and switchgrass decrease in abundance and are replaced by blue grama, hairy grama, plains muhly, prairie sandreed, needleandthread, and forbs. If overgrazing continues for many years, the plants lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

The climax vegetation on the Hobbs soil is dominantly big bluestem, little bluestem, switchgrass, sideoats grama, and western wheatgrass. These species make up about 80 percent of the total annual forage. Prairie junegrass, green needlegrass, bluegrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and green needlegrass decrease in abundance and are replaced by western wheatgrass, bluegrass, and sedges. Floodwater deposits debris and weed seeds. Deferring grazing after periods of flooding or heavy rains helps to prevent compaction.

If the range is in excellent condition, the suggested initial stocking rate is 0.6 animal unit month per acre on the Coly soil and 1.0 animal unit month per acre on the Hobbs soil. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Livestock tend to overuse very gently sloping areas of the Hobbs soil and underuse rough and irregular areas of the Coly soil. The distribution of livestock in a pasture can be improved by properly locating fences, livestock water, and salting facilities. Livestock wells and salting facilities should be distributed in a manner that encourages livestock to graze a pasture uniformly. Locating the salting facilities away from the watering facilities and relocating them each time that salt is provided help to prevent excessive trampling and local overuse.

These soils generally are unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The slope prevents the use of conventional tree-planting and tillage equipment.

The Hobbs soil is well suited to the wild herbaceous plants and shrubs that provide food and cover for rangeland wildlife, but the Coly soil is poorly suited to these plants.

The Coly soil generally is not suitable as a site for septic tank absorption fields or dwellings because of the slope. A suitable alternative site is needed. Cutting and filling are needed to provide a suitable grade for roads. Roads constructed in areas of the Hobbs soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Constructing roads on suitable, well compacted fill material above flood levels, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by flooding on the Hobbs soil.

The capability unit is VIIe-9, dryland. The Coly soil is in the Thin Loess range site and windbreak suitability group 10. The Hobbs soil is in the Silty Overflow range site and windbreak suitability group 1.

CuE2—Coly-Uly silt loams, 11 to 17 percent slopes, eroded. These deep, moderately steep, well drained soils are on uplands. They formed in loess. The Coly soil is on convex, narrow ridgetops and the upper parts of side slopes. The Uly soil is on the less sloping, lower parts of the side slopes and in concave areas. Some or all of the original surface layer of both soils has been removed by erosion, and the present surface layer may be mixed with the subsoil or underlying material by cultivation. Individual areas range from 20 to 200 acres in size. They are 45 to 65 percent Coly soil and 20 to 45 percent Uly soil. The two soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the Coly soil has a surface layer of brown, friable, calcareous silt loam about 5 inches thick. This layer has accumulations of calcium carbonate. The underlying material to a depth of 60 inches is pale brown, friable, calcareous silt loam.

Typically, the Uly soil has a surface layer of brown, friable silt loam about 5 inches thick. The subsoil is friable silt loam about 13 inches thick. It is brown and pale brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Included with these soils in mapping are small areas of Hobbs, Holdrege, and Hord soils. Hobbs soils are subject to flooding, are stratified, and are in narrow areas on bottom land. Holdrege soils have more clay in the subsoil than the Coly and Uly soils. They are on smooth ridgetops. Hord soils have a dark surface soil that extends to a depth of 20 inches or more. They are on foot slopes. Included soils make up about 5 to 15 percent of the unit.

Permeability is moderate in the Coly and Uly soils. Available water capacity is high. Runoff is rapid. The content of organic matter is low in the Coly soil and moderately low in the Uly soil.

About half of the acreage of these soils is farmed. Some areas have been reseeded to grasses and are used as range or pasture.

These soils generally are poorly suited to dryland and irrigated crops, pasture, and hay because of a very severe hazard of water erosion. Reseeding to native grasses is a better alternative than farming.

In the areas used as range, the climax vegetation on the Coly soil is dominantly little bluestem, big bluestem, sideoats grama, western wheatgrass, indiangrass, and blue grama. These species make up 80 percent or more of the total annual forage. Plains muhly, buffalograss, needleandthread, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by hairy grama, prairie sandreed, tall dropseed, western wheatgrass, needleandthread, plains muhly, sedges, and forbs.

The climax vegetation on the Uly soil is dominantly big bluestem, blue grama, little bluestem, sideoats grama, and western wheatgrass. These species make up 80 percent or more of the total annual forage. Buffalograss, switchgrass, needleandthread, prairie junegrass, Scribner panicum, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and switchgrass decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre on the Coly soil and 0.9 animal unit month per acre on the Uly soil. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

These soils are suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds in the rows can be controlled by hand hoeing, rototilling, and applying appropriate herbicides. Planting on the contour and terracing help to control runoff and water erosion. Only the trees and shrubs that can tolerate a high content of calcium in the soil should be planted.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are needed to provide a suitable grade for roads. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability unit is VIe-8, dryland. The Coly soil is in the Limy Upland range site and windbreak suitability group 8. The Uly soil is in the Silty range site and windbreak suitability group 3.

Cy—Cozad silt loam, terrace, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on stream terraces. It formed in alluvium and is subject to rare flooding. Individual areas range from 10 to 500 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 5 inches thick. The subsoil is grayish brown and light brownish gray, friable silt loam about 12 inches thick. The underlying material to a depth of 60 inches is light brownish gray and light gray very fine sandy loam. In some areas the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Hobbs soils. These soils are stratified throughout, are occasionally flooded, and are on bottom land. They make up 5 to 10 percent of the unit.

Permeability is moderate in the Cozad soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderately low. The rate of water intake is moderate.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. A scarcity of moisture during dry periods is the principal management concern. Systems of conservation tillage that leave crop residue on the surface conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. Land leveling commonly establishes a suitable grade for gravity systems. The efficient use of irrigation water and control of runoff are important management considerations. Tailwater recovery pits improve the efficiency of the irrigation system and conserve water.

This soil is suited to pasture. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range and native hay. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivating with conventional equipment between the tree rows and by hand hoeing, rototilling, and applying appropriate herbicides in the rows.

Septic tank absorption fields function well in areas of the soil if they are protected from floodwater. Constructing dwellings on raised, well compacted fill material helps to prevent the damage caused by floodwater. Constructing local roads on suitable, well compacted fill material above flood levels, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by flooding. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIc-1, dryland, and I-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

CyB—Cozad silt loam, terrace, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on stream terraces. It formed in alluvium and is subject to rare flooding. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 6 inches thick. The subsurface layer also is dark grayish brown, very friable silt loam. It is about 7 inches thick. The subsoil is friable silt loam about 13 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material is very pale brown silt loam about 4 inches thick. Below this is a buried surface layer of grayish brown silt loam about 12 inches thick. This layer is underlain by light gray very fine sandy loam, which extends to a depth of 60 inches or more. In some areas the surface layer is thinner or has been altered by land leveling. In other areas the soil is dark to a depth of more than 20 inches. In places the soil does not have a buried surface layer.

Included with this soil in mapping are small areas of Hobbs soils. These soils are stratified throughout, are occasionally flooded, and are on bottom land. They make up 5 to 10 percent of the unit.

Permeability is moderate in the Cozad soil. Available water capacity is high. Runoff is medium. The content of organic matter is moderately low. The rate of water intake is moderate.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard if the surface is not protected by vegetation or crop residue. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface reduce the hazard of erosion and conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface help to control erosion and conserve moisture. Land leveling commonly establishes a suitable grade for gravity systems. The efficient use of irrigation water and control of runoff are important management considerations.

This soil is suited to pasture. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range and native hay. A cover of native plants is effective in controlling water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivating with conventional equipment between the tree rows and by hand hoeing, rototilling, and applying appropriate herbicides in the rows.

Septic tank absorption fields function well in areas of the soil if they are protected from floodwater. Constructing dwellings on raised, well compacted fill material helps to prevent the damage caused by floodwater. Constructing local roads on suitable, well compacted fill material above flood levels, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by flooding. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIe-1, dryland, and IIe-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

DuB—Dunday loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on uplands. It formed in sandy eolian material. Individual areas range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, loose loamy fine sand about 13 inches thick. Below this is a transition layer of brown loamy fine sand about 11 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand. In some places the surface layer is fine sand. In other places it is lighter in color and is thinner.

Included with this soil in mapping are small areas of Anselmo, Hersh, and Ipage soils. Anselmo and Hersh soils have less sand than the Dunday soil. They are in landscape positions similar to those of the Dunday soil. Ipage soils are moderately well drained and are in valleys in the sandhills and on stream terraces. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the Dunday soil. Available water capacity is low. Runoff is very slow. The content of organic matter is moderately low. The rate of water intake is very high.

Most of the acreage of this soil is used for irrigated crops. Some areas are used as range.

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, and wheat and to alfalfa and grasses for hay because of the hazard of soil blowing and a low moisture supply. Systems of conservation tillage that leave crop residue on the surface reduce the hazard of soil blowing and conserve moisture. A cropping sequence that includes a minimum of row crops and a maximum of close-growing crops helps to control soil blowing.

If irrigated by sprinklers, this soil is suited to corn, grain sorghum, and alfalfa. It is not suited to gravity systems because of the very high rate of water intake. Soil blowing is the principal management concern. It can be controlled by field windbreaks and conservation tillage. Center-pivot sprinkler systems are the most common irrigation methods because they allow for controlled application rates and a uniform distribution of water. Nutrients are easily leached below the root zone in this sandy soil. This leaching can be minimized if a small amount of fertilizer is periodically applied through the sprinkler system throughout the growing season.

Because of the low available water capacity, water should be applied in relatively small amounts at regular intervals.

This soil is suited to pasture. Soil blowing is a severe hazard unless a good plant cover is maintained. Forage production can be increased and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Grasses respond well to applications of fertilizer and to irrigation.

In the areas used as range or hayland, the climax vegetation is dominantly prairie sandreed, sand bluestem, needleandthread, little bluestem, switchgrass, and blue grama. These species make up 85 percent or more of the total annual forage. Sand dropseed, indiangrass, sand lovegrass, western wheatgrass, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, indiangrass, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is in a pasture that includes Sands or Choppy Sands range sites. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

If this soil is used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested for hay only every other year. During the following year, the hayland should be used only as fall or winter range.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings and local roads.

The capability units are IVe-5, dryland, and IIIe-11, irrigated; Sandy range site; windbreak suitability group 5.

DuC—Dunday loamy fine sand, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on uplands. It formed in sandy eolian material. Individual areas range from 10 to 50 acres in size.

Typically, the surface layer is very friable loamy fine sand about 13 inches thick. It is brown in the upper part and grayish brown in the lower part. Below this is a transition layer of brown loamy sand about 7 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand. In some places the surface layer is fine sand. In other places it is lighter in color and is thinner.

Included with this soil in mapping are small areas of Anselmo and Hersh soils. These soils have less sand than the Dunday soil. They are in landscape positions similar to those of the Dunday soil. They make up 5 to 15 percent of the unit.

Permeability is rapid in the Dunday soil. Available water capacity is low. Runoff is very slow. The content of organic matter is moderately low. The rate of water intake is very high.

Most of the acreage of this soil is used for irrigated crops. Some areas are used as range.

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, and wheat and to alfalfa and grasses for hay because of the hazard of soil blowing and a low moisture supply. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. A cropping sequence that includes a minimum of row crops and a maximum of close-growing crops helps to control soil blowing.

If irrigated, this soil is poorly suited to corn, grain sorghum, and alfalfa. Soil blowing is the principal management concern. It can be controlled by field windbreaks and systems of conservation tillage that leave crop residue on the surface. The soil is not suited to gravity systems because of the very high rate of water intake. Center-pivot sprinkler systems are the most common irrigation methods because they allow for controlled application rates and a uniform distribution of water. Nutrients are easily leached below the root zone in this sandy soil. This leaching can be minimized if a small amount of fertilizer is periodically applied through the sprinkler system throughout the growing season. Because of the low available water capacity, water should be applied in relatively small amounts at regular intervals.

This soil is poorly suited to pasture even if it is irrigated by sprinklers. Soil blowing is a severe hazard unless a good plant cover is maintained. Forage production can be increased and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Grasses respond well to fertilizer, which can be effectively applied through the sprinkler irrigation system.

In the areas used as range or hayland, the climax vegetation is dominantly prairie sandreed, sand bluestem, needleandthread, little bluestem, switchgrass, and blue grama. These species make up 85 percent or more of the total annual forage. Sand dropseed, indiangrass, sand lovegrass, western wheatgrass, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, indiangrass, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is in a pasture that includes Sands or Choppy Sands range sites. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

If this soil is used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested for hay only every other year. During the following year, the hayland should be used only as fall or winter range.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings and local roads.

The capability units are IVe-5, dryland, and IVe-11, irrigated; Sandy range site; windbreak suitability group 5.

Fu—Fluvaquents, sandy. These deep, nearly level, very poorly drained soils are on bottom land along the Cedar River. They formed in alluvium and are frequently flooded. Individual areas range from 5 to 25 acres in size.

Typically, the surface layer is gray, friable muck about 12 inches thick. The underlying material to a depth of 60 inches is stratified gray to white fine sand. It has yellowish brown to reddish brown mottles in the upper part. In places the underlying material has strata of fine sandy loam, loamy fine sand, very fine sandy loam, or loamy sand. The thickness of the muck ranges from 2 to 20 inches.

Included with these soils in mapping are small areas of Almeria soils. These included soils have a seasonal high water table that is farther from the surface than that in the Fluvaquents and are slightly higher on the bottom land. They make up less than 10 percent of the unit.

Permeability is rapid in the Fluvaquents. Available water capacity is moderate. The content of organic matter is high. The seasonal high water table is 1 foot above to 2 feet below the surface. The soils are saturated most of the year because of the high water table. Water ponds on the surface for long periods in most years.

All of the acreage supports native vegetation, which consists dominantly of sedges, reeds, cattails, arrowhead, and indigobush. These soils are occasionally grazed by livestock, but the vegetation is coarse and unpalatable and is of very little nutritional value to livestock.

These soils are unsuited to cultivated crops, windbreaks, pasture, and range because of the high water table and the flooding. They are suited to the plants that provide food and cover for wetland wildlife.

These soils are not suitable as sites for septic tank absorption fields because of the wetness and the flooding. Constructing local roads on suitable, well compacted fill material, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by wetness and flooding.

The capability unit is VIIIw-7, dryland; windbreak suitability group 10. No range site is assigned.

GfC2—Gates silt loam, 3 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on uplands. It formed in loess. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the underlying material. In unprotected areas rills and shallow gullies form after heavy rains. They are smoothed by cultivation. Individual areas range from 10 to 75 acres in size.

Typically, the surface layer is light brownish gray, very friable silt loam about 5 inches thick. Below this is a transition layer of pale brown, very friable silt loam about 7 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In places the surface layer is calcareous.

Included with this soil in mapping are a few small areas of Hersh and Kenesaw soils. Hersh soils have more sand throughout than the Gates soil. Also, they are higher on the landscape. Kenesaw soils have a surface layer that is darker than that of the Gates soil. Also, they are lower on the landscape and are very gently sloping. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Gates soil. Available water capacity is high. Runoff is medium. The content of organic matter is low. The rate of water intake is moderate.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion and soil blowing are hazards where the surface is not adequately protected by vegetation or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control erosion and conserve moisture. Also, terraces and contour farming can reduce the hazard of water erosion where the slopes are suitable. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter and the level of fertility.

If irrigated by sprinklers, this soil is suited to corn, grain sorghum, and alfalfa. It is not suited to gravity irrigation because of the slope. Systems of conservation tillage that leave crop residue on the surface help to control erosion and conserve moisture. Also, terraces and contour farming can reduce the hazard of water erosion where the slopes are suitable. The efficient use of irrigation water and control of runoff are important management considerations.

This soil is suited to pasture. Forage production can be increased or maintained by proper stocking rates and by a planned grazing system. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm.

In the areas used as range or hayland, the climax vegetation is dominantly big bluestem, blue grama, little bluestem, sideoats grama, switchgrass, needleandthread, and indiangrass. These species make up 80 percent or more of the total annual forage. Buffalograss, western wheatgrass, prairie junegrass, Scribner panicum, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and switchgrass decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range.

If this soil is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

This soil generally is suited to septic tank absorption fields and dwellings. The sides of shallow excavations can cave in unless they are shored. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIIe-8, dryland, and IIIe-6, irrigated; Silty range site; windbreak suitability group 3.

GfD2—Gates silt loam, 6 to 11 percent slopes, eroded. This deep, strongly sloping, well drained soil is on narrow ridgetops and side slopes in the uplands. It formed in loess. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the underlying material. In unprotected areas shallow gullies form after heavy rains. They are smoothed by cultivation. Individual areas range from 20 to 150 acres in size.

Typically, the surface layer is brown, very friable silt loam about 5 inches thick. Below this is a transition layer of pale brown, very friable silt loam about 5 inches thick. The underlying material to a depth of 60 inches is white and light gray, calcareous silt loam. In some places the surface layer is darker. In other places it is calcareous.

Included with this soil in mapping are small areas of Hersh soils. These soils have more sand throughout than the Gates soil. They are in landscape positions similar to those of the Gates soil. They make up 2 to 10 percent of the unit.

Permeability is moderate in the Gates soil. Available water capacity is high. Runoff is rapid. The content of organic matter is low. The rate of water intake is moderate.

Most of the acreage of this soil is used for cultivated crops. A few areas are used as range or pasture.

If used for dryland farming, this soil is poorly suited to grain sorghum, wheat, and alfalfa. Water erosion and soil blowing are the principal hazards. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface reduce the hazard of water erosion. Returning crop residue or green manure crops to the soil increases the content of organic matter and the level of fertility.

If irrigated by sprinklers, this soil is poorly suited to corn, alfalfa, and grasses. It is not suited to gravity systems because of the slope. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface help to control water erosion. A system of conservation tillage, such as stubble mulching in areas of small grain and no-till planting in areas of row crops, keeps crop residue on the surface and thus is effective in controlling water erosion and runoff. A cropping sequence that includes a maximum of close-growing crops, such as alfalfa and grasses, helps to control water erosion.

This soil is poorly suited to pasture. Water erosion is a hazard unless a good plant cover is maintained. Forage production can be increased or maintained by proper stocking rates and a planned grazing system. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to sprinkler irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

In the areas used as range or hayland, the climax vegetation is dominantly big bluestem, blue grama, little bluestem, sideoats grama, switchgrass, needleandthread, and indiangrass. These species make up 80 percent or more of the total annual forage. Buffalograss, western wheatgrass, prairie junegrass, Scribner panicum, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and switchgrass decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

If this soil is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. The sides of shallow excavations can cave in unless they are shored. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are needed to provide a suitable grade for roads. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IVe-8, dryland, and IVe-6, irrigated; Silty range site; windbreak suitability group 3.

GfE2—Gates silt loam, 11 to 17 percent slopes, eroded. This deep, moderately steep, somewhat excessively drained soil is on uplands. It formed in loess. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the underlying material. In unprotected areas rills and shallow gullies form after heavy rains. They are smoothed by cultivation. Individual areas range from 20 to 200 acres in size.

Typically, the surface layer is pale brown, very friable silt loam about 5 inches thick. Below this is a transition layer of very pale brown, very friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In places the surface layer is calcareous.

Included with this soil in mapping are small areas of Hersh soils. These soils have more sand throughout than the Gates soil. They are in landscape positions similar to those of the Gates soil. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Gates soil. Available water capacity is high. Runoff is rapid. The content of organic matter is low.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range or pasture.

This soil is not suited to dryland or irrigated crops, pasture, or hay because of a severe hazard of water erosion. Reseeding to native grasses is a better alternative than farming.

In the areas used as range, the climax vegetation is dominantly big bluestem, blue grama, little bluestem, sideoats grama, switchgrass, needleandthread, and indiangrass. These species make up 80 percent or more of the total annual forage. Buffalograss, western wheatgrass, prairie junegrass, Scribner panicum, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and switchgrass decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. The sides of shallow excavations can cave in unless they are shored. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are needed to provide a suitable grade for roads. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability unit is VIe-8, dryland; Silty range site; windbreak suitability group 3.

GhB—Gates-Hersh complex, 0 to 3 percent slopes. These deep, nearly level and very gently sloping, well drained soils are on uplands. The Gates soil formed in loess, and the Hersh soil formed in loamy eolian material. Individual areas range from 10 to 100 acres in size. They are 55 to 75 percent Gates soil and 20 to 40 percent Hersh soil. The two soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Gates soil is grayish brown, very friable loamy fine sand about 6 inches thick. The subsurface layer is light brownish gray, very friable fine sandy loam about 5 inches thick. Below this is a transition layer of light brownish gray silt loam about 6 inches thick. The upper part of the underlying material is very pale brown silt loam. The lower part to a depth of 60 inches is very pale brown very fine sandy loam. In places the surface layer is fine sandy loam or very fine sandy loam.

Typically, the surface layer of the Hersh soil is dark grayish brown, very friable fine sandy loam about 6 inches thick. Below this is a transition layer of light brownish gray, very friable fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray fine sandy loam. In places the surface layer or the underlying material is loamy fine sand or fine sand.

Included with these soils in mapping are small areas of Valentine soils. These included soils are excessively drained and are on hummocks and in the higher areas. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Gates soil and moderately rapid in the Hersh soil. Available water capacity is high in both soils. Runoff is medium on the Gates soil and slow on the Hersh soil. The content of organic matter is low in both soils. The rate of water intake is moderate in the Gates soil and moderately high in the Hersh soil.

Most of the acreage of these soils is used as range.

If used for dryland farming, these soils are suited to corn, grain sorghum, wheat, and alfalfa. Soil blowing is the major hazard where the surface is not protected by crop residue or vegetation. Systems of conservation tillage that leave crop residue on the surface and a cropping sequence that includes a maximum of close-growing crops help to control soil blowing and conserve moisture. Stripcropping and field windbreaks also help to control soil blowing. Returning crop residue to the soil helps to maintain or increase the content of organic matter and the level of fertility.

If irrigated, these soils are suited to corn, grain sorghum, and alfalfa. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. Sprinkler irrigation systems offer an efficient means of applying water uniformly at the desired rate. Gravity irrigation systems generally are not used on these soils. They may require a short run because of the moderately high rate of water intake in the Hersh soil.

These soils are suited to pasture. Forage production can be increased or maintained and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Forage production also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

In the areas used as range or hayland, the climax vegetation on the Gates soil is dominantly prairie sandreed, sand bluestem, needleandthread, switchgrass, and little bluestem. These species make up 80 percent or more of the total annual forage. Blue grama and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive.

The climax vegetation on the Hersh soil is dominantly prairie sandreed, sand bluestem, needleandthread, and little bluestem. These species make up 80 percent or more of the total annual forage. Blue grama, switchgrass, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre on both soils. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. These soils are generally the first to be overgrazed when they are in a pasture that includes Sands or Choppy Sands range sites. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range.

If these soils are used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested for hay only every other year. During the following year, the hayland should be used only as fall or winter range.

These soils are suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

These soils generally are suited to septic tank absorption fields and dwellings. The sides of shallow excavations can cave in unless they are shored. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIIe-3, dryland, and IIIe-8, irrigated; Sandy range site; windbreak suitability group 5.

Ha—Hall silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on uplands. It formed in loess. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 6 inches thick. The subsurface layer also is dark grayish brown, very friable silt loam about 6 inches thick. The subsoil is firm silty clay loam about 22 inches thick. It is dark grayish brown in the upper part, brown in the next part, and pale brown in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam. In some places the dark color extends to a depth of less than 20 inches. In other places the subsoil has less clay.

Included with this soil in mapping are small areas of Scott soils. These soils have more clay in the subsoil than the Hall soil. They are in small depressions below the Hall soil.

Permeability is moderate in the Hall soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The rate of water intake is moderately low.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. A scarcity of moisture limits crop yields during dry seasons. Systems of conservation tillage that leave crop residue on the surface conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Where the adjacent soils are more sloping, center-pivot sprinkler systems are commonly used. These systems allow for control of application rates and a uniform distribution of water. Gravity systems also can be used.

This soil is suited to range. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides.

This soil generally is suited to septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IIc-1, dryland, and I-4, irrigated; Silty range site; windbreak suitability group 3.

HaB—Hall silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on uplands. It formed in loess. Individual areas range from 10 to 300 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 6 inches thick. The subsurface layer also is dark grayish brown, very friable silt loam and is about 7 inches thick. The subsoil is silty clay loam about 26 inches thick. It is grayish brown and friable in the upper part, brown and firm in the next part, and pale brown and friable in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam. In some places the dark color extends to a depth of less than 20 inches. In other places the subsoil has less clay.

Included with this soil in mapping are Uly and Scott soils. Uly soils have less clay in the subsoil than the Hall soil. Also, they are lower on the landscape. Scott soils have more clay in the subsoil than the Hall soil. They are in small depressions below the Hall soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Hall soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The rate of water intake is moderately low.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is the main hazard. Systems of conservation tillage that leave crop residue on the surface help to control erosion and conserve moisture. Terraces and contour farming also help to control water erosion.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Systems of conservation tillage, terraces, and contour farming help to control erosion. Where the adjacent soils are more sloping, center-pivot sprinkler systems are commonly used. These systems allow for control of application rates and a uniform distribution of water. Gravity systems also can be used. A system of conservation tillage, such as no-till planting in areas of row crops, keeps crop residue on the surface and thus is effective in controlling erosion and runoff. Land leveling or contour bench leveling helps to establish nonerosive grades and allows for efficient use of irrigation water.

This soil is suited to pasture. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range. A cover of native plants is effective in controlling water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in soil losses by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides.

This soil generally is suited to septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IIe-1, dryland, and IIe-4, irrigated; Silty range site; windbreak suitability group 3.

HeB—Hersh fine sandy loam, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on uplands. It formed in loamy eolian material. Individual areas range from 10 to 100 acres in size.

Typically, the surface layer is dark brown, very friable fine sandy loam about 5 inches thick. Below this is a transition layer of brown, very friable fine sandy loam about 6 inches thick. The underlying material to a depth of 38 inches is pale brown fine sandy loam. Below this to a depth of 60 inches, the underlying material is very pale brown loamy fine sand. In some places the surface layer is loamy fine sand. In other places it is dark.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils have less sand throughout than the Hersh soil. They are in landscape positions similar to those of the Hersh soil. Valentine soils have less silt and clay throughout than the Hersh soil. They are on hummocks and in the higher areas. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Hersh soil. Available water capacity is high. Runoff is slow. The content of organic matter is low. The rate of water intake is moderately high.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, and wheat and to alfalfa and grasses for hay and pasture. Soil blowing is the main hazard. Normally the configuration of the slopes on this soil is not appropriate for terraces or contour farming to control erosion. Systems of conservation tillage that leave crop residue on the surface helps to prevent excessive erosion and conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. In most areas, the irregular slope pattern is not suitable for gravity irrigation systems, although some areas have been leveled to a suitable grade. The moderately high rate of water intake requires that rows be relatively short for gravity systems. Sprinkler irrigation systems are best suited to this soil. Nutrients can be leached from the soil by excessive amounts of irrigation water. Leaving crop residue on the surface and planting close-growing crops help to control water erosion and soil blowing. The efficient use of irrigation water and uniform application rates are important management considerations.

This soil is suited to pasture. Forage production can be maintained or increased and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Applying fertilizer and seeding mixtures of grasses and legumes also increase forage production.

This soil is suited to range. A cover of native plants is effective in controlling soil blowing. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil generally is suited to septic tank absorption fields and dwellings. The sides of shallow excavations can cave in unless they are shored. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIIe-3, dryland, and IIe-8, irrigated; Sandy range site; windbreak suitability group 5.

HeC—Hersh fine sandy loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on uplands. It formed in loamy eolian material. Individual areas range from 10 to 100 acres in size.

Typically, the surface layer is grayish brown, very friable fine sandy loam about 5 inches thick. Below this is a transition layer of brown, very friable fine sandy loam about 5 inches thick. The underlying material to a depth of 60 inches is very pale brown fine sandy loam. In places the underlying material is loamy fine sand.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils have more silt and clay throughout than the Hersh soil. They are in landscape positions similar to those of the Hersh soil. Valentine soils have more sand throughout than the Hersh soil. They are on hummocks and in the higher areas. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Hersh soil. Available water capacity is high. Runoff is medium. The content of organic matter is low. The rate of water intake is moderately high.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, and wheat and to alfalfa and grasses for hay and pasture. Water erosion and soil blowing are the main hazards. Where slopes are suitable, terraces and contour farming help to control water erosion. Leaving crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue or green manure crops to the soil help to maintain or increase the content of organic matter and the level of fertility.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and introduced grasses. The soil is too sloping for gravity systems. Leaving crop residue on the surface and planting close-growing crops help to control water erosion and soil blowing. Where slopes are suitable, terraces and contour farming also help to control water erosion. Returning crop residue to the soil maintains or increases the content of organic matter and the level of fertility. The efficient use of irrigation water and uniform application rates are important management considerations.

This soil is suited to pasture. Forage production can be increased or maintained and the hazards of soil blowing and water erosion reduced by proper stocking rates and rotation grazing. Applying fertilizer and seeding mixtures of grasses and legumes also increase forage production.

This soil is suited to range. A cover of native plants is effective in controlling soil blowing and water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in severe water erosion and soil blowing. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil generally is suited to septic tank absorption fields and dwellings. The sides of shallow excavations can cave in unless they are shored. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIIe-3, dryland, and IIIe-8, irrigated; Sandy range site; windbreak suitability group 5.

HeD—Hersh fine sandy loam, 6 to 11 percent slopes. This deep, strongly sloping, well drained soil is on uplands. It formed in loamy eolian material. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is brown, very friable fine sandy loam about 5 inches thick. Below this is a transition layer of pale brown, very friable fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is pale brown and very pale brown fine sandy loam. In some areas the lower part of the underlying material is loamy fine sand.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils have more silt and clay throughout than the Hersh soil. They are in landscape positions similar to those of the Hersh soil. Valentine soils have more sand throughout than the Hersh soil. They are on hummocks and in landscape positions similar to those of the Hersh soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Hersh soil. Available water capacity is high. Runoff is medium. The content of organic matter is low. The rate of water intake is moderately high.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, wheat, and alfalfa. Water erosion and soil blowing are the main hazards. Where slopes are suitable, terraces and contour farming help to control water erosion. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and water erosion and conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter and the level of fertility.

This soil is unsuited to gravity irrigation and poorly suited to sprinkler irrigation of corn and of alfalfa and grasses for hay or pasture. Where slopes are suitable, terraces and contour farming help to control water erosion. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and water erosion and conserve moisture. A cropping sequence that includes a minimum of row crops and a maximum of close-growing crops, such as alfalfa and grasses, helps to control water erosion. The efficient use of irrigation water is an important consideration when irrigating this soil.

This soil is suited to pasture. Water erosion is a hazard. It can be controlled by an adequate plant cover. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to sprinkler irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range. A cover of native plants is effective in controlling soil blowing and water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in severe water erosion and soil blowing. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. The sides of shallow excavations can cave in unless they are shored. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are needed to provide a suitable grade for roads. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IVe-3, dryland, and IVe-8, irrigated; Sandy range site; windbreak suitability group 5.

HeE—Hersh fine sandy loam, 11 to 17 percent slopes. This deep, moderately steep, somewhat excessively drained soil is on uplands. It formed in loamy eolian material. Individual areas range from 10 to 100 acres in size.

Typically, the surface layer is brown, very friable fine sandy loam about 4 inches thick. Below this is a transition layer of brown, very friable fine sandy loam about 5 inches thick. The underlying material to a depth of 60 inches is pale brown and very pale brown fine sandy loam. In some areas the lower part of the underlying material is loamy fine sand.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils have more silt and clay throughout than the Hersh soil. They are in landscape positions similar to those of the Hersh soil. Valentine soils have more sand throughout than the Hersh soil. They are on hummocks and in landscape positions similar to those of the Hersh soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Hersh soil. Available water capacity is high. Runoff is rapid. The content of organic matter is low.

Most of the acreage is used for cultivated crops. Some areas are used as range. This soil is not suited to dryland or irrigated crops, pasture, or hay because of a severe hazard of water erosion. A cover of native plants helps to control water erosion.

In the areas used as range, the climax vegetation is dominantly prairie sandreed, sand bluestem, needleandthread, and little bluestem. These species make up 80 percent or more of the total annual forage. Blue grama, switchgrass, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is in a pasture that includes Sands or Choppy Sands range sites. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. The sides of shallow excavations can cave in unless they are shored. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are needed to provide a suitable grade for roads. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability unit is VIe-3, dryland; Sandy range site; windbreak suitability group 5.

HgF—Hersh-Gates complex, 15 to 30 percent slopes. These deep, steep, somewhat excessively drained soils are on uplands. The Hersh soil formed in loamy eolian material, and the Gates soil formed in loess. Individual areas range from 20 to 200 acres in size. They are 40 to 60 percent Hersh soil and 30 to 50 percent Gates soil. The two soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the Hersh soil has a surface layer of dark grayish brown, very friable fine sandy loam about 5 inches thick. Below this is a transition layer of grayish brown, very friable fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is very pale brown and light gray fine sandy loam. In places the surface layer is loamy fine sand.

Typically, the Gates soil has a surface layer of grayish brown, very friable silt loam about 5 inches thick. Below this is a transition layer of pale brown, very friable very fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light gray silt loam. In some places the surface layer is fine sandy loam. In other places it is gray loamy fine sand.

Included with these soils in mapping are small areas of Valentine soils. These included soils have more sand and less silt and clay throughout than the Hersh and Gates soils. They make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Hersh soil and moderate in the Gates soil. Available water capacity is high in both soils. Runoff is rapid. The content of organic matter is low.

Most of the acreage is used as range. These soils are unsuited to dryland and irrigated crops, pasture, and hay because of the slope and a severe hazard of erosion.

In the areas used as range, the climax vegetation on the Hersh soil is dominantly prairie sandreed, sand bluestem, needleandthread, and little bluestem. These species make up 80 percent or more of the total annual forage. Blue grama, switchgrass, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

The climax vegetation on the Gates soil is dominantly big bluestem, little bluestem, sideoats grama, switchgrass, and indiangrass. These species make up 70 percent or more of the total annual forage. Blue grama, needleandthread, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre on both soils. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

These soils generally are unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The slope prevents the use of conventional tree-planting and tillage equipment.

These soils generally are not suitable as sites for septic tank absorption fields or dwellings because of the slope. A suitable alternative site is needed. Cutting and filling are needed to provide a suitable grade for roads. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability unit is VIe-3, dryland; windbreak suitability group 10. The Hersh soil is in the Sandy range site, and the Gates soil is in the Silty range site.

Hk—Hobbs silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on bottom land. It formed in alluvium. It is occasionally flooded for brief periods. Individual areas are long and narrow and range from 10 to 100 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is stratified dark grayish brown, grayish brown, and light brownish gray, very friable silt loam. In areas not disturbed by cultivation, the surface layer is stratified.

Included with this soil in mapping are small areas of Cozad and Hord soils. These soils are not stratified in the upper part. They are higher on the landscape than the Hobbs soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the Hobbs soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The rate of water intake also is moderate.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Flooding may delay cultivation in the spring, but it rarely causes severe crop damage. The deposition of silt by floodwater can damage newly seeded crops. Diversions and drainage ditches can intercept and divert runoff from adjacent soils. Also, good conservation practices on adjacent soils reduce runoff and thus reduce flooding on the Hobbs soil.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Sprinkler or gravity irrigation systems may be used. In areas where the adjacent soils are gently sloping, center-pivot sprinkler systems commonly have been used as a practical method of irrigation. Diversions, drainage ditches, and good conservation practices on the adjacent soils reduce the hazards of flooding and crop damage on this soil.

This soil is suited to range and native hay. Continuous heavy grazing by livestock or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivating with conventional equipment between the tree rows and by hand hoeing, rototilling, and applying appropriate herbicides in the rows.

This soil is not suited to septic tank absorption fields or dwellings because of the flooding. A suitable alternative site is needed. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Constructing local roads on suitable, well compacted fill material above flood levels, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by flooding.

The capability units are IIw-3, dryland, and IIw-6, irrigated; Silty Overflow range site; windbreak suitability group 1.

Hm—Hobbs silt loam, channeled. This deep, nearly level and very gently sloping, well drained soil is on bottom land that is entrenched by meandering stream channels. It formed in alluvium. It is frequently flooded for brief periods. Individual areas are long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is stratified, dark grayish brown and grayish brown, very friable silt loam about 12 inches thick. The underlying material to a depth of 60 inches is stratified, grayish brown and light gray, very friable silt loam. In some places the underlying material has strata of sandy and loamy material. In other places the surface layer is calcareous.

Included with this soil in mapping are areas of Cozad and Hord soils and areas of very steep soils. Cozad and Hord soils are not stratified in the upper part. They are higher on the landscape than the Hobbs soil. The very steep soils are on escarpments and side slopes near the stream channels. Also included, mainly on flood plains along Spring Creek in the southeastern part of the county, are areas of somewhat poorly drained and poorly drained soils that have a seasonal high water table. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Hobbs soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate.

Most of the acreage of this soil is in native grasses, trees, and shrubs. It is used for grazing and as habitat for many types of wildlife. Some small areas are used for cultivated crops.

This soil is unsuited to dryland and irrigated crops and pasture because of the entrenched, meandering stream channels, inaccessibility, and frequent flooding.

In the areas used as range, the climax vegetation is dominantly big bluestem, little bluestem, switchgrass, sideoats grama, and western wheatgrass. These species make up about 80 percent of the total annual forage. Prairie junegrass, green needlegrass, bluegrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and green needlegrass decrease in abundance and are replaced by western wheatgrass, bluegrass, and sedges. Floodwater deposits debris and weed seeds. Deferring grazing after periods of flooding or heavy rains helps to prevent compaction.

If the range is in excellent condition, the suggested initial stocking rate is 1.0 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

This soil is generally unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. Suitable trees and shrubs can be grown in some recreational or wildlife areas if they are planted by hand or if other special management is applied.

This soil is well suited to introduced grasses and legumes, wild herbaceous plants, and hardwoods that provide food and cover for woodland wildlife.

This soil is not suited to septic tank absorption fields or dwellings because of the flooding. A suitable alternative site is needed. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Constructing local roads on suitable, well compacted fill material above flood levels, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by flooding.

The capability unit is VIw-7, dryland; Silty Overflow range site; windbreak suitability group 10.

HoC—Holdrege silt loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on uplands. It formed in loess. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is 31 inches thick. It is grayish brown, friable silty clay loam in the upper part; brown and yellowish brown, friable silty clay loam in the next part; and light yellowish brown, friable silt loam in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam. In places the dark color extends to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Hord and Uly soils. These soils have less clay in the subsoil than the Holdrege soil. Hord soils are on foot slopes, and Uly soils are on the steeper slopes. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Holdrege soil. Available water capacity is high. Runoff is medium. The content of organic matter is moderate. The rate of water intake is moderately low.

Most of the acreage of this soil is used for cultivated crops. Some areas are used as range or pasture.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard where the surface is not adequately protected by vegetation or crop residue. A system of conservation tillage, such as stubble mulching in areas of small grain and no-till planting in areas of row crops, keeps crop residue on the surface and thus is effective in controlling water erosion and runoff. Terraces, contour farming, and conservation tillage help to control water erosion and conserve moisture.

If irrigated by sprinklers, this soil is suited to corn and grain sorghum and to alfalfa and grasses for hay or pasture. It is not suited to gravity systems unless the slope can be reduced to nonerosive grades by contour bench leveling. The hazard of erosion can be reduced by terraces, contour farming, conservation tillage, and a cropping sequence that includes a maximum of close-growing crops, such as alfalfa and grasses for hay or pasture. The efficient use of irrigation water and control of runoff are important management considerations. Returning crop residue to the soil helps to maintain or increase the content of organic matter and the level of fertility.

This soil is suited to pasture. Water erosion is the major hazard. It can be controlled by terraces and an adequate plant cover. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer. Grazing should be delayed in the spring until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range. A cover of native plants is effective in controlling water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in soil losses by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

This soil generally is suited to septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IIIe-1, dryland, and IIIe-4, irrigated; Silty range site; windbreak suitability group 3.

HpC2—Holdrege silty clay loam, 3 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on uplands. It formed in loess. Some or all of the original surface layer has been removed by erosion, and the present surface layer may be mixed with the subsoil by cultivation. Individual areas range from 10 to several hundred acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 4 inches thick. The subsoil is about 24 inches thick. It is brown, firm silty clay loam in the upper part; pale brown, firm silt loam in the next part; and pale brown, friable silt loam in the lower part. The underlying material to a depth of 60 inches is light gray silt loam. In places the surface layer is thicker.

Included with this soil in mapping are small areas of Coly, Hord, and Uly soils. Coly soils are calcareous at or near the surface. They are on the steeper slopes. Hord soils have a dark color that extends to a depth of more than 20 inches. They are on foot slopes. Uly soils have less clay in the subsoil than the Holdrege soil. They are on the steeper slopes. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the Holdrege soil. Available water capacity is high. Runoff is medium. The content of organic matter is moderately low. The rate of water intake is low.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard where the surface is not adequately protected by vegetation or crop residue. Terraces, contour farming, and conservation tillage help to prevent excessive erosion and conserve moisture. A system of conservation tillage, such as stubble mulching in areas of small grain and no-till planting in areas of row crops, keeps crop residue on the surface and thus is effective in controlling water erosion and runoff. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter and the level of fertility.

If irrigated by sprinklers, this soil is suited to corn and grain sorghum and to alfalfa and grasses for hay or pasture. It is not suited to gravity systems unless the slope can be reduced to nonerosive grades by contour bench leveling. The hazard of erosion can be reduced by terraces, contour farming, conservation tillage, and a cropping sequence that includes a maximum of close-growing crops, such as alfalfa and grasses for hay or pasture. The efficient use of irrigation water and control of runoff are important management considerations. Returning crop residue to the soil helps to maintain or increase the content of organic matter and the level of fertility.

This soil is suited to pasture. Water erosion is the major hazard and can be controlled by conservation practices, such as terracing and maintaining adequate cover on the surface. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range. A cover of native plants is effective in controlling water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in soil losses by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

This soil generally is suited to septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IIIe-8, dryland, and IIIe-3, irrigated; Silty range site; windbreak suitability group 3.

HtC—Hord silt loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on foot slopes. It formed in loess and alluvium. Individual areas range from 10 to 80 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 7 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 17 inches thick. The subsoil is friable silt loam about 20 inches thick. It is grayish brown in the upper part and brown in the lower part. The underlying material to a depth of 60 inches is light brownish gray silt loam. In some areas the dark color extends to a depth of less than 20 inches.

Included with this soil in mapping are small areas of Holdrege soils. These soils are higher on the landscape than the Hord soil. Also, they have a thinner dark surface layer. They make up 2 to 10 percent of the unit.

Permeability is moderate in the Hord soil. Available water capacity is high. Runoff is medium. The content of organic matter is moderate. The rate of water intake also is moderate.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard if the soil is cultivated. Terraces, contour farming, stubble mulching, and minimum tillage can reduce the hazard of erosion.

If irrigated by sprinklers, this soil is suited to corn and grain sorghum and to alfalfa and grasses for hay or pasture. It is not suited to gravity systems unless the slope can be reduced to nonerosive grades by land leveling or contour bench leveling. Under sprinkler irrigation, terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface reduce the hazard of erosion and conserve moisture. The efficient use of irrigation water and control of runoff are important management considerations.

This soil is suited to pasture. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range. A cover of native plants is effective in controlling water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in soil losses by water erosion and soil blowing. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

This soil generally is suited to septic tank absorption fields and dwellings. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IIIe-1, dryland, and IIIe-6, irrigated; Silty range site; windbreak suitability group 3.

Hy—Hord silt loam, terrace, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on stream terraces. It formed in loess and alluvium. It is subject to rare flooding. Individual areas range from 10 to 300 acres in size.

Typically, the surface layer is dark gray, very friable silt loam about 6 inches thick. The subsurface layer is very friable silt loam about 18 inches thick. It is dark grayish brown in the upper part and dark gray in the lower part. The subsoil is friable silty clay loam about 18 inches thick. It is dark gray in the upper part, brown in the next part, and pale brown in the lower part. The underlying material extends to a depth of 60 inches. It is grayish brown, stratified silt loam and silty clay loam in the upper part and brown silt loam in the lower part. In some places the surface layer is thinner. In other places the subsoil is silt loam.

Included with this soil in mapping are small areas of Hobbs soils. These soils are stratified throughout and are on bottom land below the Hord soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the Hord soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The rate of water intake also is moderate.

Nearly all of the acreage of this soil is used for irrigated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. It produces some of the highest yields of crops in Greeley County. A scarcity of moisture during dry periods is a management concern. Systems of conservation tillage that leave crop residue on the surface conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Gravity or sprinkler irrigation systems can be used effectively. The efficient use of irrigation water is a management concern. Land leveling commonly establishes a suitable grade for gravity systems. Irrigation water should be applied in sufficient amounts to meet the needs of the crops and at a rate that permits maximum absorption and minimum runoff.

This soil is suited to pasture. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivating with conventional equipment between the tree rows and by hand hoeing, rototilling, and applying appropriate herbicides in the rows.

The rare flooding should be considered if this soil is used as a site for septic tank absorption fields. Constructing dwellings on raised, well compacted fill material helps to prevent the damage caused by floodwater. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IIc-1, dryland, and I-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

HyB—Hord silt loam, terrace, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on stream terraces. It formed in loess and alluvium. It is subject to rare flooding. Individual areas range from 10 to 300 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 17 inches thick. The subsoil is very friable silt loam about 25 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam. In some places the subsoil is silty clay loam. In other places the dark color extends to a depth of less than 20 inches.

Included with this soil in mapping are small areas of Hobbs soils. These soils are stratified throughout and are on bottom land below the Hord soil. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Hord soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The rate of water intake also is moderate.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard if the surface is not protected by vegetation or crop residue. Systems of conservation tillage help to control water erosion and conserve moisture. Also, terraces and contour farming can reduce the hazard of water erosion.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. Gravity or sprinkler irrigation systems may be used. A principal concern is efficient water management. Land leveling or contour bench leveling can be used to establish a suitable grade for gravity systems. The efficient use of irrigation water and control of runoff are important management considerations. Under sprinkler irrigation, terraces, contour farming, and conservation tillage can help to control water erosion. Leaving crop residue on the surface also reduces the hazard of water erosion.

This soil is suited to pasture. Forage production can be increased by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after periods of irrigation until the surface is firm and the grasses have reached a minimum height.

This soil is suited to range. Overgrazing or improper haying methods reduce the protective cover and cause the native plants to deteriorate. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivating with conventional equipment between the tree rows and by hand hoeing, rototilling, and applying appropriate herbicides in the rows.

The rare flooding should be considered if this soil is used as a site for septic tank absorption fields. Constructing dwellings on raised, well compacted fill material helps to prevent the damage caused by floodwater. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IIe-1, dryland, and IIe-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

IpB—Ipage loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, moderately well drained soil is on stream terraces. It formed in sandy eolian and alluvial material. Individual areas are generally irregular in shape and range from 20 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 6 inches thick. Below this is a transition layer of pale brown, very friable loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is fine sand. It is pale brown in the upper part and very pale brown and white in the lower part. In some places the surface layer is fine sand. In other places loamy layers are below a depth of 40 inches.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils have more silt and clay throughout than the Ipage soil. They are well drained and are in positions on the landscape similar to those of the Ipage soil. Valentine soils are excessively drained and are on hummocks and uplands. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Ipage soil. Available water capacity is low. Runoff is very slow. The content of organic matter is low. The seasonal high water table is at a depth of 3 feet in most wet years and 6 feet in most dry years. The rate of water intake is very high.

Most of the acreage of this soil is used as range. Some areas are used for irrigated crops.

If used for dryland farming, this soil is poorly suited to grain sorghum, wheat, and alfalfa. After alfalfa is established, it can obtain moisture from the seasonal high water table. Soil blowing and droughtiness are the main hazards for cultivated crops. Stripcropping, field windbreaks, and systems of conservation tillage that leave crop residue on the surface help to maintain or increase the content of organic matter and the level of fertility. A cropping sequence that includes a minimum of row crops and a maximum of close-growing crops helps to control soil blowing. Burning crop residue is not recommended.

If irrigated by sprinklers, this soil is poorly suited to corn and grain sorghum and to alfalfa and grasses and legumes for hay or pasture. The very high rate of water intake, the low available water capacity, and soil blowing are the main limitations for irrigated crops. Careful application rates and timely application of irrigation water by sprinkler systems help to overcome the very high rate of water intake and the low available water capacity. Systems of conservation tillage that leave crop residue on the surface reduce the hazard of soil blowing and conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter and the level of fertility.

This soil is poorly suited to pasture. Forage production can be increased or maintained and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Forage production also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

In the areas used as range or hayland, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, needleandthread, and switchgrass. These species make up 55 percent or more of the total annual forage. Blue grama, prairie junegrass, bluegrass, indiangrass, Scribner panicum, sedges, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, indiangrass, little bluestem, and switchgrass decrease in abundance and are replaced by prairie sandreed, needleandthread, sand dropseed, blue grama, Scribner panicum, sedges, and forbs. If overgrazing continues for many years, blue grama, sand dropseed, needleandthread, Scribner panicum, sedges, and forbs dominate the site. Under these conditions the native plants lose vigor and are unable to stabilize the site.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

If this soil is used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Weeds and undesirable grasses in the tree rows can be controlled by cultivation with conventional equipment and timely applications of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or other vegetation between the tree rows.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil is generally suited to dwellings. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IVe-5, dryland, and IVe-11, irrigated; Sandy Lowland range site; windbreak suitability group 5.

ItB—Ipage fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, moderately well drained soil is on stream terraces and in valleys in the sandhills. It formed in sandy eolian and alluvial material. Individual areas are generally irregular in shape and range from 20 to 300 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sand about 8 inches thick. Below this is a transition layer of light brownish gray, loose fine sand about 5 inches thick. The underlying material to a depth of 60 inches is fine sand. It is light gray in the upper part and very pale brown in the lower part.

Included with this soil in mapping are small areas of Hersh and Valentine soils. Hersh soils have more silt and clay throughout than the Ipage soil. They are well drained and are on uplands. Valentine soils are excessively drained and are on hummocks and uplands. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Ipage soil. Available water capacity is low. Runoff is very slow. The content of organic matter is low. The seasonal high water table is at a depth of 3 feet in most wet years and 6 feet in most dry years. The rate of water intake is very high.

Most of the acreage of this soil is used as range. A few areas are used for irrigated cultivated crops.

Because of droughtiness and the hazard of soil blowing, this soil is not suited to dryland crops. If irrigated by sprinklers, it is poorly suited to corn and grain sorghum and to alfalfa and grasses and legumes for hay or pasture. The very high rate of water intake, the low available water capacity, and soil blowing are the main limitations for irrigated crops. Careful application rates and timely application of irrigation water by sprinkler systems help to overcome the very high rate of water intake and the low available water capacity. Systems of conservation tillage that leave crop residue on the surface reduce the hazard of soil blowing and conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter and the level of fertility.

This soil is poorly suited to pasture. Forage production can be increased or maintained and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Forage production also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

In the areas used as range or hayland, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, needleandthread, and switchgrass. These species make up 55 percent or more of the total annual forage. Blue grama, prairie junegrass, bluegrass, indiangrass, Scribner panicum, sedges, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, indiangrass, little bluestem, and switchgrass decrease in abundance and are replaced by prairie sandreed, needleandthread, sand dropseed, blue grama, Scribner panicum, sedges, and forbs. If overgrazing continues for many years, blue grama, sand dropseed, needleandthread, Scribner panicum, sedges, and forbs dominate the site. Under these conditions the native plants lose vigor and are unable to stabilize the site.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

If this soil is used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Maintaining sod between the tree rows and in the rows helps to prevent competition from weeds and undesirable grasses and reduces the hazard of soil blowing. Supplemental water is needed during dry periods. The trees should be planted in shallow furrows with as little disturbance of the soil as possible.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are VIe-5, dryland, and IVe-12, irrigated; Sandy Lowland range site; windbreak suitability group 7.

Ka—Kenesaw very fine sandy loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on uplands. It formed in recent loess. Individual areas range from 10 to 50 acres in size.

Typically, the surface layer is grayish brown, very friable very fine sandy loam about 7 inches thick. The subsurface layer is dark grayish brown, very friable very fine sandy loam about 4 inches thick. The subsoil is very friable very fine sandy loam about 15 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material is very pale brown very fine sandy loam about 16 inches thick. A buried surface layer of dark grayish brown loam is between depths of 42 and 55 inches. Below this to a depth of 60 inches is brown very fine sandy loam. In some places the soil does not have a buried surface layer. In other places the surface layer and subsoil are silt loam.

Included with this soil in mapping are areas of Anselmo soils. These soils have more sand throughout than the Kenesaw soil. Also, they are slightly higher on the landscape. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Kenesaw soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The rate of water intake also is moderate.

Most of the acreage of this soil is used for irrigated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. A scarcity of moisture limits crop yields during dry seasons. Systems of conservation tillage that leave crop residue on the surface conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Gravity or sprinkler irrigation systems may be used. Irrigation water should be applied at rates not to exceed the moderate rate of water intake.

This soil is suited to range. Overgrazing or improper haying methods deplete the protective cover of native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides.

This soil generally is suited to septic tank absorption fields, dwellings, and roads. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIc-1, dryland, and I-6, irrigated; Silty range site; windbreak suitability group 3.

KaB—Kenesaw very fine sandy loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on uplands. It formed in recent loess. Individual areas range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, very friable very fine sandy loam about 6 inches thick. The subsurface layer also is dark grayish brown, very friable very fine sandy loam about 8 inches thick. The subsoil is very friable very fine sandy loam about 12 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is very pale brown very fine sandy loam. In places a buried soil is below a depth of 40 inches.

Included with this soil in mapping are areas of Anselmo soils. These soils have more sand throughout than the Kenesaw soil. Also, they are slightly higher on the landscape. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Kenesaw soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The rate of water intake also is moderate.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion and soil blowing are hazards if the surface is not protected by crops or crop residue. Systems of conservation tillage that leave crop residue on the surface help to control water erosion and soil blowing and conserve moisture. Terraces and contour farming can reduce the hazard of water erosion.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Systems of conservation tillage, terraces, and contour farming help to control water erosion. Where the adjacent soils are more sloping, center-pivot sprinkler systems are commonly used. These systems allow for control of application rates and a uniform distribution of water. Gravity systems also can be used. Systems of conservation tillage that leave crop residue on the surface are effective in controlling water erosion, soil blowing, and runoff. Land leveling or contour bench leveling helps to establish nonerosive grades and allows for efficient use of irrigation water.

This soil is suited to range. A cover of native plants is effective in controlling water erosion. Overgrazing or improper haying methods deplete the protective cover of native plants. Overgrazing also can result in soil losses by water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides.

This soil generally is suited to septic tank absorption fields, dwellings, and roads. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIe-1, dryland, and IIe-6, irrigated; Silty range site; windbreak suitability group 3.

Le—Leshara silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom land. It formed in alluvium. It is occasionally flooded for very brief periods. Individual areas are 10 to 80 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 5 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 9 inches thick. The upper part of the underlying material is light brownish gray and light gray, calcareous silt loam. The lower part to a depth of 60 inches is white fine sand. In some places the surface layer is silty clay loam. In other places free carbonates are at the surface. In some areas the soil is stratified throughout.

Included with this soil in mapping are small areas of Loup soils. These soils are poorly drained and are slightly lower on the landscape than the Leshara soil. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Leshara soil. Available water capacity is high. Runoff is slow. The content of organic matter is moderate. The seasonal high water table is at a depth of 1.5 feet in most wet years and about 3.0 feet in most dry years. The rate of water intake is moderate. Tilth is good, although wetness may delay tillage in the spring.

Most of the acreage of this soil is used for cultivated crops.

If used for dryland farming, this soil is suited to corn, wheat, grain sorghum, and alfalfa. Fieldwork may be delayed in the spring by the flooding. The soil may warm up slowly in the spring because of the wetness.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Gravity or sprinkler systems can be used. Land leveling can be used to establish suitable grades for gravity irrigation systems.

This soil is suited to pasture. Forage production can be maintained or increased by proper stocking rates and rotation grazing. It also can be increased by applying fertilizer and by seeding mixtures of grasses and legumes.

This soil is suited to range and native hay. Continuous heavy grazing by livestock or improper haying methods deplete the protective cover of native plants. If the surface layer is wet, overgrazing can cause surface compaction and the formation of small mounds, which make grazing or harvesting for hay difficult. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The trees and shrubs that can withstand occasional wetness survive and grow well.

This soil is not suitable as a site for septic tank absorption fields or dwellings because of the flooding. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored during dry periods. Constructing local roads on suitable, well compacted fill material above flood levels, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by flooding and

Figure 6.—Bales of native hay in an area of Loup loam, 0 to 2 percent slopes.

wetness. The damage to local roads caused by frost action can be minimized by a good surface drainage system and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IIw-4, dryland, and IIw-6, irrigated; Subirrigated range site; windbreak suitability group 2S.

Lo—Loup loam, 0 to 2 percent slopes. This deep, nearly level, poorly drained soil is on bottom land. It formed in alluvium. It is occasionally flooded for brief periods. Individual areas are parallel to river channels. They range from 20 to 300 acres in size.

Typically, the surface layer is very friable loam about 9 inches thick. It is dark grayish brown in the upper part and dark gray in the lower part. Below this is a transition layer of light brownish gray, very friable fine sandy loam about 6 inches thick. The upper part of the underlying material is light gray fine sand. The lower part to a depth of 60 inches is white sand. In places the surface layer is clay loam, silt loam, or fine sandy loam.

Included with this soil in mapping are small areas of Barney and Boel soils. Barney soils are frequently flooded and are slightly lower on the landscape than the Loup soil. Boel soils are somewhat poorly drained and are slightly higher on the landscape than the Loup soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Loup soil. Available water capacity is low; however, the seasonal high water table provides additional water during the growing season. Runoff is slow. The content of organic matter is high. The seasonal high water table is at the surface in most wet years and at a depth of 1.5 feet in most dry years.

Most of the acreage is used as range or hayland. This soil is generally not suited to cultivated crops because of the excessive wetness.

In the areas used as range or hayland, the climax vegetation is dominantly big bluestem, indiangrass, prairie cordgrass, and switchgrass (fig. 6). These species make up 70 percent or more of the total annual forage. Plains bluegrass, northern reedgrass, and forbs make up the rest. If subject to continuous heavy grazing or improperly harvested for hay, big bluestem, prairie cordgrass, switchgrass, and indiangrass decrease in abundance and are replaced by slender wheatgrass, western wheatgrass, plains muhly, and sedges. Timothy, redtop, and red clover increase in abundance if they have been overseeded. If overgrazing or improper haying continues for many years, bluegrass, western wheatgrass, sedges, rushes, and forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 1.9 animal unit months per acre. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during very wet periods helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is in a pasture that includes better drained, sandy soils. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. When the surface is wet, grazing and heavy machinery traffic cause surface compaction and the formation of small mounds and ruts, which make grazing or harvesting for hay difficult.

If this soil is used as hayland, mowing should be regulated so that the grasses remain vigorous. Large meadows can be divided into three sections and the sections mowed in rotation. The order in which the sections are mowed should be changed in successive years. After the ground is frozen, livestock can graze without damaging the meadows. They should be removed before the ground thaws and the water table reaches a high level in the spring.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. Species that can withstand the excessive wetness survive and grow well. Tilling and planting may not be possible until the water table drops and the soil begins to dry out in the spring.

This soil is not suitable as a site for septic tank absorption fields and dwellings because of the flooding and the wetness. A suitable alternative site is needed. Constructing local roads on suitable, well compacted fill material, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by wetness and flooding.

The capability unit is Vw-7, dryland; Wet Subirrigated range site; windbreak suitability group 2D.

Sc—Scott silty clay loam, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil is in depressions on uplands. It is commonly ponded. In some small areas a drainage system has been installed. The soil formed in loess. Individual areas range from 5 to 35 acres in size.

Typically, the surface layer is dark gray, friable silty clay loam about 6 inches thick. The subsoil is about 30 inches thick. In sequence downward, it is grayish brown, firm silty clay loam; grayish brown, firm silty clay; very dark grayish brown, firm silty clay loam; dark grayish brown, firm silty clay loam; and grayish brown, friable silty clay loam. The underlying material to a depth of 60 inches is grayish brown and dark grayish brown silt loam. In places the surface layer is silt loam.

Permeability is very slow in the Scott soil. Available water capacity is high. Runoff is ponded in the spring and fall after rainy periods. The content of organic matter is moderate. A perched seasonal high water table is as much as 0.5 foot above the surface in wet years and is at a depth of about 1.0 foot in dry years, mainly during the period March through June. The shrink-swell potential is high in the subsoil.

Most of the acreage of this soil is not cultivated or grazed. The vegetation generally is sedges and other annual weeds and grasses. A few small areas have been drained and are used for cultivated crops.

If this soil is used for dryland farming, it is poorly suited to cultivated crops. Seedbed preparation is often delayed or cannot be performed because of the ponding. Because of the very slow permeability, most of the surface water is lost through evaporation. Wheat is often destroyed by ponding in the fall and spring. Corn and grain sorghum also can be damaged or destroyed by ponding. Good seedbeds are difficult to establish because the soil is slow to dry and becomes hard and crusted when it dries.

Unless drained, this soil is generally not suited to irrigated crops, hay, pasture, range, or windbreaks.

This soil is not suitable as a site for septic tank absorption fields because of the ponding and the very slow permeability. It is not suited to dwellings because of the ponding and shrinking and swelling of the subsoil. A suitable alternative site is needed. Constructing local roads on suitable, well compacted fill material above the level of ponding, providing adequate roadside ditches, and installing culverts help to prevent the road damage caused by ponding and wetness. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability unit is IVw-2, dryland; windbreak suitability group 10. No range site is assigned.

SmB—Simeon loamy sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on stream terraces. It formed in sandy alluvium. Individual areas are 20 to 150 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy sand about 7 inches thick. Below this is a transition layer of grayish brown, loose loamy sand about 3 inches thick. The underlying material to a depth of 60 inches is sand containing 5 to 15 percent gravel. It is light gray in the upper part and white in the lower part. In places the surface layer is loamy fine sand or sand.

Included with this soil in mapping are small areas of Blendon and Ipage soils. Blendon soils have less sand in the upper part than the Simeon soil. Also, they are slightly lower on the landscape. Ipage soils are moderately well drained and are lower on the landscape than the Simeon soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Simeon soil. Available water capacity is low. Runoff is very slow. The content of organic matter is low. The rate of water intake is very high.

Most of the acreage of this soil is used as range. Some areas are used for irrigated crops.

This soil is generally not suited to dryland crops, pasture, or hay because of a scarcity of available moisture and the hazard of soil blowing.

This soil is poorly suited to corn and alfalfa under sprinkler irrigation and not suited to gravity irrigation because of the high rate of water intake and the low available water capacity. Soil blowing also is a hazard if the surface is not adequately protected by growing crops or crop residue. Systems of conservation tillage that leave crop residue on the surface reduce the hazard of soil blowing and conserve moisture. Careful application rates and timely application of irrigation water by sprinkler systems are necessary to maintain yields. Fertilizers may be applied through the sprinkler system as the crop requires to help eliminate possible leaching losses from a larger, single application. After several years of irrigation and fertilization, the surface may become acidic and require addition of lime to neutralize the acidity.

In the areas used as range, the climax vegetation is dominantly blue grama, needleandthread, prairie sandreed, and clubmoss. These species make up 60 percent or more of the total annual forage. Sand dropseed, little bluestem, hairy grama, sand bluestem, and fringed sagebrush make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and prairie sandreed decrease in abundance and are replaced by hairy grama, blue grama, buffalograss, sand dropseed, needleandthread, sedges, and forbs. If overgrazing continues for many years, hairy grama, blue grama, sedges, common pricklypear, brittle pricklypear, fringed sagewort, and other forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 0.4 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Planned, short periods of heavy grazing during the grazing season or deferment of grazing in 2 years out of 3 helps to retain little bluestem and prairie sandreed in the plant community. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Because of the low available water capacity and droughtiness, the amount of forage produced depends on the frequency and amount of seasonal rainfall. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range.

This soil is generally unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. Suitable trees and shrubs can be grown in some recreational or wildlife areas if they are planted by hand or if other special management is applied.

This soil generally is suited to dwellings and roads. It readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored.

The capability units are VIs-4, dryland, and IVs-11, irrigated; Shallow to Gravel range site; windbreak suitability group 10.

UbD—Uly silt loam, 6 to 11 percent slopes. This deep, strongly sloping, well drained soil is on side slopes and ridgetops on uplands. It formed in loess. Individual areas range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is friable silt loam about 18 inches thick. It is grayish brown in the upper part, brown in the next part, and pale brown and calcareous in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Included with this soil in mapping are areas of Coly and Holdrege soils. Coly soils are calcareous at or near the surface. They are on the steeper slopes. Holdrege soils have more clay in the subsoil than the Uly soil. They are gently sloping and are in landscape positions similar to those of the Uly soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Uly soil. Available water capacity is high. Runoff is rapid. The content of organic matter is moderate. The rate of water intake also is moderate. Tilth is good.

Most of the acreage of this soil is used as range.

Some areas are used for cultivated crops.

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a severe hazard if the surface is not adequately protected by vegetation or crop residue. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface help to control water erosion and conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or increase the content of organic matter and the level of fertility.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is not suited to gravity systems, but sprinkler systems can be used if careful management is applied. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface reduce the hazard of water erosion and conserve moisture. Center-pivot sprinkler systems are the most commonly used systems on this soil. Erosion can occur in the wheel tracks. Adjusting the rate of water application to the moderate rate of water intake reduces the runoff rate and the hazard of water erosion. A cropping sequence that includes a minimum of row crops and a maximum of close-growing crops, such as alfalfa and grasses, also reduces the runoff rate and the hazard of water erosion.

This soil is suited to pasture. Overgrazing increases the susceptibility to water erosion. Forage production can be increased and erosion reduced by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer. Grazing should be delayed in the spring until the surface is firm and the grasses have reached a minimum height.

In the areas used as range or hayland, the climax vegetation is dominantly big bluestem, blue grama, little bluestem, sideoats grama, and western wheatgrass. These species make up 80 percent or more of the total annual forage. Buffalograss, needleandthread, prairie junegrass, Scribner panicum, switchgrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and switchgrass decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

If this soil is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability units are IVe-1, dryland, and IVe-6, irrigated; Silty range site; windbreak suitability group 3.

UbE—Uly silt loam, 11 to 17 percent slopes. This deep, moderately steep, well drained soil is on uplands. It formed in loess. Individual areas range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 12 inches thick. The subsoil is friable silt loam about 19 inches thick. It is brown in the upper part and pale brown and calcareous in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Included with this soil in mapping are small areas of Coly and Holdrege soils. Coly soils have carbonates at or near the surface and are in landscape positions similar to those of the Uly soil. Holdrege soils have more clay in the subsoil than the Uly soil. They are gently sloping and are in landscape positions similar to those of the Uly soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Uly soil. Available water capacity is high. Runoff is rapid. The content of organic matter is moderate.

Most of the acreage of this soil is used as range. Some areas are used for cultivated crops.

This soil is generally unsuited to dryland and irrigated crops, pasture, and hay because of the slope and the hazard of water erosion.

In the areas used as range, the climax vegetation is dominantly big bluestem, blue grama, little bluestem, sideoats grama, and western wheatgrass. These species make up 80 percent or more of the total annual forage. Buffalograss, needleandthread, prairie junegrass, Scribner panicum, switchgrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem, little bluestem, prairie junegrass, and switchgrass decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability unit is VIe-1, dryland; Silty range site; windbreak suitability group 3.

UcD2—Uly-Coly silt loams, 6 to 11 percent slopes, eroded. These deep, strongly sloping, well drained soils are on side slopes and ridgetops in the uplands. They formed in loess. Some or all of the original surface layer of both soils has been removed by erosion, and the present surface layer may be mixed with the subsoil or underlying material by cultivation. The Coly soil has accumulations of calcium carbonate at the surface. Individual areas range from 10 to 200 acres in size. They commonly are 45 to 65 percent Uly soil and 25 to 45 percent Coly soil. The two soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Uly soil is brown, friable silt loam about 6 inches thick. The subsoil is friable silt loam about 19 inches thick. It is pale brown in the upper part and very pale brown in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Typically, the surface layer of the Coly soil is light brownish gray, very friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Included with these soils in mapping are small areas of Hobbs and Holdrege soils. Hobbs soils are stratified throughout and are in narrow areas on bottom land. Holdrege soils have more clay in the subsoil than the Uly and Coly soils. They are on gently sloping ridgetops. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Uly and Coly soils. Available water capacity is high. Runoff is rapid. The content of organic matter is moderately low in the Uly soil and low in the Coly soil. The rate of water intake is moderate in both soils.

Most of the acreage of these soils is used for cultivated crops (fig. 7). Some areas have been reseeded to grasses and are used as range or pasture.

If used for dryland farming, these soils are poorly suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is the principal hazard. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface reduce the hazard of water erosion. Returning crop residue or green manure crops to the soil helps to increase the content of organic matter and the level of fertility.

These soils are suited to sprinkler irrigation but are not suited to gravity irrigation. Terraces, contour farming, and systems of conservation tillage that leave crop residue on the surface reduce the hazard of water

Figure 7.—Grain sorghum and alfalfa are common crops in areas of Uly-Coly silt loams, 6 to 11 percent slopes, eroded, used for dryland farming.

erosion. A cropping sequence that includes a maximum of close-growing crops, such as alfalfa and grasses, helps to control runoff and water erosion. Returning crop residue to the soil helps to increase the content of organic matter and the level of fertility. Where center-pivot irrigation systems are used, erosion and the formation of small gullies can occur in the wheel tracks. Adjusting the application rate to the moderate rate of water intake permits most of the water to be absorbed and helps to control runoff.

These soils are suited to pasture and hay. Water erosion is a hazard. It can be controlled by terraces and an adequate plant cover. Forage production can be increased or maintained by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Introduced grasses respond well to applications of fertilizer. Grazing should be delayed in the spring until the surface is firm and the grasses have reached a minimum height.

In the areas used as range or hayland, the climax vegetation on the Uly soil is dominantly big bluestem, blue grama, little bluestem, sideoats grama, and western wheatgrass. These species make up 80 percent or more of the total annual forage. Sedges and forbs make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

The climax vegetation on the Coly soil is dominantly little bluestem, big bluestem, sideoats grama, and western wheatgrass. These species make up 70 percent or more of the total annual forage. Blue grama, indiangrass, and sedges make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by hairy grama, prairie sandreed, tall dropseed, western wheatgrass, needleandthread, plains muhly, sedges, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre on the Uly soil and 0.7 animal unit month per acre on the Coly soil. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

If these soils are used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

These soils are suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are good. Weeds and undesirable grasses can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides. Planting on the contour and terracing help to control water erosion.

The slope is a limitation on sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Roads constructed in areas of these soils should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soils. Providing coarser grained base material helps to ensure better performance. Cutting and filling are needed to provide a suitable grade for roads. The damage to local roads caused by frost action can be minimized by a good surface drainage system. Crowning the road by grading and constructing adequate roadside ditches help to provide the needed surface drainage.

The capability units are IVe-8, dryland, and IVe-6, irrigated. The Uly soil is in the Silty range site and windbreak suitability group 3. The Coly soil is in the Limy Upland range site and windbreak suitability group 8.

UcF—Uly-Coly silt loams, 15 to 30 percent slopes. These deep, steep, somewhat excessively drained soils are on uplands. The Uly soil is on ridgetops and the lower side slopes, and the Coly soil is on the upper side slopes. Both soils formed in loess. Individual areas range from 20 to 1,000 acres in size. They are 35 to 60 percent Uly soil and 30 to 50 percent Coly soil. The two soils occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer of the Uly soil is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is friable silt loam about 17 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Typically, the surface layer of the Coly soil is grayish brown, very friable, calcareous silt loam about 4 inches thick. Below this is a transition layer of light brownish gray, very friable, calcareous silt loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Included with these soils in mapping are small areas of Hobbs soils. These included soils are stratified, are occasionally flooded, and are in narrow areas on bottom land. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Uly and Coly soils. Available water capacity is high. Runoff is very rapid. The content of organic matter is moderate in the Uly soil and moderately low in the Coly soil.

Most of the acreage is used as range. These soils are not suited to dryland or irrigated crops, pasture, hay, or windbreaks because of the slope and the hazard of water erosion.

In the areas used as range, the climax vegetation on the Uly soil is dominantly big bluestem, blue grama, little bluestem, sideoats grama, and western wheatgrass. These species make up 80 percent or more of the total annual forage. Sedges and forbs make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by blue grama, buffalograss, needleandthread, plains muhly, sand dropseed, tall dropseed, western wheatgrass, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion and soil blowing are excessive.

The climax vegetation on the Coly soil is dominantly little bluestem, big bluestem, sideoats grama, and blue grama. These species make up 70 percent or more of the total annual forage. Western wheatgrass and sedges make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by hairy grama, prairie sandreed, tall dropseed, western wheatgrass, needleandthread, plains muhly, sedges, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre on the Uly soil and 0.7 animal unit month per acre on the Coly soil. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

These soils generally are unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The slope prevents the use of conventional tree-planting and tillage equipment.

These soils generally are not suitable as sites for sanitary facilities because of the slope. A suitable alternative site is needed. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are needed to provide a suitable grade for roads. Roads constructed in areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The capability unit is VIe-1, dryland; windbreak suitability group 10. The Uly soil is in the Silty range site. The Coly soil is in the Limy Upland range site.

VaB—Valentine fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on uplands. It formed in sandy eolian material. Individual areas range from 30 to 400 acres in size.

Typically, the surface layer is grayish brown, loose fine sand about 5 inches thick. Below this is a transition layer of pale brown, loose fine sand about 6 inches thick. The underlying material to a depth of 60 inches is very pale brown fine sand. In places the surface layer is loamy fine sand.

Included with this soil in mapping are small areas of Hersh and Ipage soils. Hersh soils have less sand than the Valentine soil. They are in landscape positions similar to those of the Valentine soil. Ipage soils are moderately well drained and are on the slightly lower parts of valleys in the sandhills. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is very slow. The content of organic matter is low. The rate of water intake is very high.

Most of the acreage is used as range.

Because of the low available water capacity and a severe hazard of soil blowing, this soil is not suited to dryland crops. If irrigated, it is poorly suited to cultivated crops. It is best suited to sprinkler systems and is not suited to gravity systems because of the very high rate of water intake. The soil is best suited to alfalfa and introduced grasses. Soil blowing is the principal management concern. It can be controlled by field windbreaks and conservation tillage. Center-pivot sprinkler systems are the most common irrigation methods because they allow for controlled application rates and a uniform distribution of water. Nutrients are easily leached below the root zone in this sandy soil. This leaching can be minimized if a small amount of fertilizer is periodically applied through the sprinkler system throughout the growing season. Because of the low available water capacity, water should be applied in relatively small amounts at regular intervals.

In the areas used as range or hayland, the climax vegetation is dominantly prairie sandreed, sand bluestem, needleandthread, blue grama, and little bluestem. These species make up 75 percent or more of the total annual forage. Switchgrass, sand dropseed, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is in a pasture that includes Sands or Choppy Sands range sites. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

If this soil is used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested for hay only every other year. During the following year, the hayland should be used only as fall or winter range.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Maintaining sod between the tree rows and in the rows helps to prevent competition from weeds and undesirable grasses and reduces the hazard of soil blowing. Supplemental water is needed during dry periods. The trees should be planted in shallow furrows with as little disturbance of the soil as possible.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings and local roads.

The capability units are VIe-5, dryland, and IVe-12, irrigated; Sandy range site; windbreak suitability group 7.

VaD—Valentine fine sand, 3 to 9 percent slopes. This deep, gently sloping and strongly sloping, excessively drained soil is on hummocks and dunes on uplands. It formed in sandy eolian material. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, loose fine sand about 5 inches thick. Below this is a transition layer of pale brown, loose fine sand about 5 inches thick. The underlying material to a depth of 60 inches is pale brown and very pale brown fine sand. In places the surface layer is loamy fine sand.

Included with this soil in mapping are small areas of Hersh and Ipage soils. Hersh soils are fine sandy loam throughout. They are on the smoother parts of the landscape. Ipage soils are moderately well drained and are on the lower parts of valleys in the sandhills. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is slow. The content of organic matter is low. The rate of water intake is very high.

Most of the acreage of this soil is used as range. A few areas are used for crops irrigated by center-pivot systems.

This soil is generally not suited to dryland crops, pasture, or hay because of the low available water capacity and a severe hazard of soil blowing.

If irrigated by sprinklers, this soil is poorly suited to corn and grain sorghum. It is best suited to alfalfa and introduced grasses for hay or pasture. It is not suited to gravity irrigation because of the slope and the very high rate of water intake. Systems of conservation tillage that leave crop residue on the surface help to prevent soil blowing. The efficient use of irrigation water and controlled application rates are important management considerations. Small amounts of plant nutrients can be applied through the sprinkler systems to eliminate larger applications that may be partially lost through leaching. Returning crop residue to the soil helps to maintain or increase the content of organic matter and the level of fertility.

In the areas used as range or hayland, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, and needleandthread. These species make up 70 percent or more of the total annual forage. Blue grama, switchgrass, sand lovegrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, blue grama, sand dropseed, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range.

If this soil is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Maintaining sod between the tree rows and in the rows helps to prevent competition from weeds and undesirable grasses and reduces the hazard of soil blowing. Supplemental water is needed during dry periods. The trees should be planted in shallow furrows with as little disturbance of the surface as possible.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. Land shaping and installing the absorption field on the contour help to ensure that the system operates properly. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings and local roads and streets.

The capability units are VIe-5, dryland, and IVe-12, irrigated; Sands range site; windbreak suitability group 7.

VaE—Valentine fine sand, rolling. This deep, excessively drained soil is on uplands. It is on dunes in the sandhills. It formed in sandy eolian material. Slopes range from 9 to 24 percent. Individual areas range from 40 to 2,000 acres in size.

Typically, the surface layer is grayish brown, loose fine sand about 5 inches thick. Below this is a transition layer of light brownish gray, loose fine sand about 5 inches thick. The underlying material to a depth of 60 inches is light gray fine sand.

Included with this soil in mapping are small areas of Hersh and Ipage soils. Hersh soils are finer textured than the Valentine soil. Also, they are lower on the landscape. Ipage soils are moderately well drained, are nearly level, and are on the lower parts of valleys in the sandhills. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is slow. The content of organic matter is low.

Nearly all of the acreage is used as range. This soil is not suited to dryland or irrigated crops, pasture, or hay because of the slope, droughtiness, and a severe hazard of soil blowing.

In the areas used as range, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, and needleandthread. These species make up 70 percent or more of the total annual forage. Blue grama, switchgrass, sand lovegrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, blue grama, sand dropseed, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Maintaining sod between the tree rows and in the rows helps to prevent competition from weeds and undesirable grasses and reduces the hazard of soil blowing. Supplemental water is needed during dry periods. The trees should be planted in shallow furrows with as little disturbance of the surface as possible.

This soil generally is not suited to septic tank absorption fields or dwellings because of the slope. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored. Cutting and filling are needed to provide a suitable grade for roads.

The capability unit is VIe-5, dryland; Sands range site; windbreak suitability group 7.

VaF—Valentine fine sand, rolling and hilly. This deep, excessively drained soil is on uplands. It formed in sandy eolian material. The rolling part is on the smooth ridgetops and the lower side slopes. The hilly part is on side slopes and commonly has catsteps. Slopes in the rolling part range from 17 to 24 percent, and those in the hilly part range from 24 to 45 percent. Individual areas range from 20 to 200 acres in size. They are 40 to 60 percent Valentine fine sand, rolling, and 35 to 55 percent Valentine fine sand, hilly. The rolling and hilly areas are so intricately mixed or so small that separating them in mapping is not practical.

Typically, the surface layer is grayish brown, loose fine sand about 4 inches thick. Below this is a transition layer of light brownish gray, loose fine sand about 3 inches thick. The underlying material to a depth of 60 inches is very pale brown fine sand. In places the surface layer is thinner because of loss by soil blowing.

Included with this soil in mapping are small areas of Ipage soils. These soils are moderately well drained and are in swales in valleys in the sandhills. They make up 2 to 5 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is slow. The content of organic matter is low.

Most of the acreage is used as range. This soil is not suited to dryland or irrigated crops, pasture, hay, or windbreaks because of the very steep, irregular slopes, droughtiness, and a very severe hazard of soil blowing.

In the areas used as range, the climax vegetation on the rolling part is dominantly sand bluestem, little bluestem, prairie sandreed, and needleandthread. These species make up 70 percent or more of the total annual forage. Blue grama, switchgrass, and sand lovegrass make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, blue grama, sand dropseed, sedges, and forbs.

The climax vegetation on the hilly part is dominantly sand bluestem, little bluestem, switchgrass, prairie sandreed, and needleandthread. These species make up 70 percent or more of the total annual forage. Sand lovegrass, blue grama, and sandhill muhly make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, hairy grama, sand dropseed, sandhill muhly, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is possible and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre on the rolling part and 0.6 animal unit month per acre on the hilly part. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing.

This soil is generally unsuited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The slope prevents the use of conventional tree-planting and tillage equipment.

This soil generally is not suitable as a site for septic tank absorption fields or dwellings because of the slope. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored. Cutting and filling are needed to provide a suitable grade for roads.

The capability unit is VIIe-5, dryland. The rolling part is in the Sands range site and windbreak suitability group 7. The hilly part is in the Choppy Sands range site and windbreak suitability group 10.

VeB—Valentine loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on uplands. It formed in sandy eolian material. Individual areas range from 20 to 100 acres in size.

Typically, the surface layer is brown, loose loamy fine sand about 6 inches thick. Below this is a transition layer of pale brown, loose loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is very pale brown fine sand. In some places the surface layer is fine sand. In other places it is thicker.

Included with this soil in mapping are small areas of Hersh and Ipage soils. Hersh soils have less sand than the Valentine soil. They are in landscape positions similar to those of the Valentine soil. Ipage soils are moderately well drained and are on the slightly lower parts of valleys in the sandhills. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is very slow. The content of organic matter is low. The rate of water intake is very high.

Most of the acreage of this soil is used as range. Some areas are used for cultivated crops.

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, and wheat and to alfalfa and grasses for hay because of the hazard of soil blowing and a low moisture supply. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing and conserve moisture. A cropping sequence that includes a minimum of row crops and a maximum of close-growing crops helps to control soil blowing.

If irrigated, this soil is poorly suited to corn and grain sorghum. It is not suited to gravity systems because of the very high rate of water intake. Center-pivot sprinkler systems are the most common irrigation methods because they allow for controlled application rates and a uniform distribution of water. Soil blowing is the principal management concern. It can be controlled by field windbreaks and conservation tillage. Nutrients are easily leached below the root zone in this sandy soil. This leaching can be minimized if a small amount of fertilizer is periodically applied through the sprinkler system throughout the growing season. Because of the low available water capacity, water should be applied in relatively small amounts at regular intervals.

If irrigated by sprinklers, this soil is poorly suited to pasture. Soil blowing is a severe hazard unless a good plant cover is maintained. Forage production can be increased and the hazard of soil blowing reduced by proper stocking rates and rotation grazing. Seeding mixtures of grasses and legumes also increases forage production. Grasses respond well to fertilizer, which can be effectively applied through the sprinkler irrigation system.

In the areas used as range or hayland, the climax vegetation is dominantly prairie sandreed, sand bluestem, needleandthread, blue grama, and little bluestem. These species make up 75 percent or more of the total annual forage. Sand dropseed, switchgrass, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is in a pasture that includes Sands or Choppy Sands range sites. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range.

If this soil is used as hayland, mowing should be regulated so that the grasses remain healthy and vigorous. The forage should be harvested for hay only every other year. During the following year, the hayland should be used only as fall or winter range.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Maintaining sod between the tree rows and in the rows helps to prevent competition from weeds and undesirable grasses and reduces the hazard of soil blowing. Supplemental water is needed during dry periods. The trees should be planted in shallow furrows with as little disturbance of the surface as possible.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings and local roads and streets.

The capability units are IVe-5, dryland, and IVe-11, irrigated; Sandy range site; windbreak suitability group 5.

VeD—Valentine loamy fine sand, 3 to 9 percent slopes. This deep, gently sloping and strongly sloping, excessively drained soil is on hummocks and dunes on uplands. It formed in sandy eolian material. Individual areas range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, loose, very friable loamy fine sand about 6 inches thick. Below this is a transition layer of pale brown, very friable loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand. In places the surface layer is fine sand.

Included with this soil in mapping are small areas of Dunday and Hersh soils. Hersh soils are fine sandy loam throughout. They are in landscape positions similar to those of the Valentine soil. Dunday soils have a thick surface layer. They are in swales in valleys in the sandhills. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is slow. The content of organic matter is low. The rate of water intake is very high.

Most of the acreage of this soil supports native grasses and is used for grazing or hay. A few areas are used for crops irrigated by center-pivot systems.

This soil is generally not suited to dryland crops, pasture, or hay because of the low available water capacity and a severe hazard of soil blowing.

If irrigated by sprinklers, this soil is poorly suited to corn and grain sorghum. It is best suited to alfalfa and introduced grasses for hay or pasture if it is irrigated. It is not suited to gravity irrigation because of the slope. Systems of conservation tillage that leave crop residue on the surface help to control soil blowing. The efficient use of irrigation water and controlled application rates are very important management considerations. Small amounts of plant nutrients can be applied through the sprinkler systems to eliminate larger applications that may be partially lost through leaching if gravity irrigation systems are used. Returning crop residue to the soil helps to maintain or increase the content of organic matter and the level of fertility.

In the areas used as range or hayland, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, and needleandthread. These species make up 70 percent or more of the total annual forage. Blue grama, switchgrass, and sand lovegrass make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, blue grama, sand dropseed, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences, livestock water, and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable mixture of grasses if they are used as range.

If this soil is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Mowing should be regulated so that the grasses remain vigorous and healthy.

This soil is suited to the trees and shrubs grown as windbreaks and to plantings that enhance recreational areas and wildlife habitat. The survival and growth rates of adapted species are fair. Maintaining sod between the tree rows and in the rows helps to prevent competition from weeds and undesirable grasses and reduces the hazard of soil blowing. Supplemental water is needed during dry periods. The trees should be planted in shallow furrows with as little disturbance of the surface as possible.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. The sides of shallow excavations can cave in unless they are shored. The soil generally is suited to dwellings and local roads.

The capability units are VIe-5, dryland, and IVe-11, irrigated; Sands range site; windbreak suitability group 7.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 82,610 acres in the survey area, or nearly 23 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county, but most are in the Hord-Hobbs, Hall, Hord-Cozad, and Anselmo-Gates-Kenesaw associations, which are described under the heading "General Soil Map Units." The crops grown on this land include corn and alfalfa hay. Much of the prime farmland is irrigated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table qualify as prime farmland only in areas where this limitation has been overcome by drainage measures. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where wetness or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the county are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops and Pasture

William E. Reinsch, conservation agronomist, Soil Conservation Service, Lincoln, Nebraska, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified, the system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Most of the acreage in Greeley County is farmland. About 42 percent of the farmland is used for cultivated crops. Nearly 47 percent of the cultivated cropland is irrigated. Corn and alfalfa are the most important crops.

Dryland Farm Management

Good management of areas used for dryland crops reduces the runoff rate and the hazards of soil blowing and water erosion, conserves moisture, and improves tilth (fig. 8). Insufficient rainfall commonly is a limiting factor affecting crop production in Greeley County. Water erosion and soil blowing should be controlled if crop production is to be maximized.

Soil blowing is a hazard on many of the soils in Greeley County. It can be controlled by conservation tillage practices that leave crop residue on the surface throughout the winter.

Water erosion is the major problem on nearly all of the sloping soils used as cropland and on overgrazed pasture. All of the soils that have slopes of more than 4 percent are susceptible to damage by water erosion.

Loss of the surface layer by water erosion is damaging for two reasons. The surface layer provides much of the natural fertility reserve, and productivity is reduced as the surface layer is lost. Also, water erosion on farmland results in the pollution and sedimentation of

Figure 8.—An area of Coly-Uly silt loams, 11 to 17 percent slopes, eroded, left unprotected by vegetation or crop residue. Water erosion has caused severe damage.

streams, lakes, and ponds. Controlling water erosion minimizes this pollution and prolongs the useful life of ponds and lakes. It also improves the quality of water for municipal use, for recreation, and for fish and wildlife.

The cropping system and management practices that help to control water erosion should be planned so that they are effective on the soil in each field. This planned management is known as a resource management system. Resource management systems in areas of dryland crops help to preserve soil tilth and fertility, maintain a surface cover that protects the soil from water erosion, and control weeds, insects, and diseases.

Terraces, contour farming, contour stripcropping, and conservation tillage systems that keep crop residue on the surface help to control water erosion. Keeping crop residue on the surface or establishing a protective plant cover helps to prevent crusting after heavy rains. In winter, crop residue holds snow on the field and conserves the moisture supply. Mechanical practices, such as terraces, reduce the length of the slope and help to control runoff and water erosion. Conventional terraces are most practical on gently sloping soils on uplands and on long, smooth slopes. Push-up terraces are best suited to strongly sloping soils since these terraces do not increase the steepness of the slope.

Contour stripcropping helps to control water erosion by maintaining contoured strips of meadow or small grain crops in a short-term rotation. The areas between the strips are cultivated, and row crops are planted on the contour. The grass or grass-legume strips generally are used for hay. Soils with short, steep slopes are best suited to contour stripcropping.

The overall hazard of erosion can be reduced by using areas of the more productive soils for row crops and areas of the steeper, more erodible soils for close-growing crops, such as small grain, or for hay and pasture.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. Regular additions of crop residue, manure, and other organic material improve soil structure and tilth. Growing legumes, such as clover and alfalfa, also improves tilth by adding nitrogen to the soil.

Tillage is sometimes needed to prepare a seedbed and control weeds. Excessive tillage, however, reduces the extent of the protective plant cover and increases the hazard of water erosion. Steps in the tillage process should be limited to those that are essential. Various conservation tillage practices can be used in Greeley County. No-till planting, till-plant, disk-plant, and chisel-plant are well suited to soils used for row crops. Grasses can be planted by drilling into a cover of stubble without further seedbed preparation.

Soil fertility is naturally lower in most eroded soils than in uneroded soils. All soils, however, require additional plant nutrients for optimum production. The kind and amount of fertilizer to be applied should be based on the results of soil tests. Nitrogen and phosphorus are the elements added to most cultivated areas. In some areas trace elements are needed.

Irrigation Management

About 35 percent of the cropland in Greeley County is irrigated. Corn is grown on 65 percent of the irrigated cropland. A smaller acreage is used for alfalfa hay or soybeans. Irrigation water is obtained mainly from wells, but some is diverted from rivers or streams. Gravity or sprinkler irrigation systems are suited to the areas used for corn, grain sorghum, and soybeans. Alfalfa is generally irrigated by sprinkler systems.

A cropping sequence on soils that are well suited to irrigation consists mainly of row crops. If it includes different crops, such as soybeans, corn, and sorghum, the common diseases and insects are better controlled than if the same crop is grown year after year.

Gently sloping soils, such as Holdrege silt loam, 3 to 6 percent slopes, are subject to water erosion if they are furrow irrigated up and down the slope. If furrow irrigated, these soils should be contour bench leveled or contour furrows and a ridge-till conservation system should be used in combination with parallel terraces. Land leveling increases the efficiency of irrigation by providing an even distribution of water. The efficiency of a furrow irrigation system can be improved by installing a tailwater recovery system.

Terraces, contour farming, and conservation tillage practices that keep crop residue on the surface help to control water erosion on soils irrigated by a sprinkler system. When water is applied by the sprinklers at a controlled rate, it is absorbed by the soil and does not run off the surface. Sprinklers can be used on the more sloping soils and on the nearly level ones. Some soils, such as Valentine loamy fine sand, 3 to 9 percent slopes, are suited to sprinkler irrigation only if water erosion is controlled. Because the application of water can be carefully controlled, sprinklers can be used for special purposes, such as establishing a new pasture on moderately steep soils. The most common types of sprinkler irrigation in Greeley County are the center-pivot and towline systems.

Furrow irrigation is most efficient if it is started after the plants have used about half of the available water in the soil. Thus, if a soil holds 8 inches of available water, irrigation should be started when about 4 inches has been removed by the crop.

A recovery pit can be installed to trap excess irrigation tailwater. This water can be pumped back onto the field and used again. This practice increases the efficiency of the irrigation system and conserves the supply of underground water.

All of the soils in Greeley County that are suited to irrigation are assigned to irrigation design groups. These groups are described in an irrigation guide that is part of the technical specifications for conservation in Nebraska *(8)*. If applicable, an irrigation capability unit is specified at the end of the map unit descriptions under the heading "Detailed Soil Map Units." The Arabic number at the end of the irrigation capability unit indicates the irrigation design group to which the soil is assigned.

Assistance in planning and designing an irrigation system can be obtained from the local office of the Soil Conservation Service. Estimates of the cost of irrigation equipment can be obtained from local dealers and manufacturers.

Weed Control

A suitable cropping sequence or herbicides can control weeds. Rotating different crops in a planned sequence not only helps to control weeds but also increases the productivity of the soil and the content of organic matter. The kind and amount of herbicide applied to the soil should be carefully controlled. The colloidal clay and humus fractions of the soil are responsible for most of the chemical activity in the soil. Applications of some herbicides can damage crops on sandy soils that have a low content of colloidal clay, such as Dunday loamy fine sand, 0 to 3 percent slopes. They can also damage soils that are moderately low or low in content of organic matter, such as Uly-Coly silt loams, 6 to 11 percent slopes, eroded.

Management of Pasture and Hayland

Hayland and pasture should be managed for maximum forage production. After a pasture is established, the grasses should be kept productive. In Greeley County pastures of introduced grasses consist mainly of cool-season grasses, which start to grow early in spring and reach their peak growth in May or June (fig. 9). These grasses are dormant during July and August unless the pasture is irrigated and start to grow again in the fall. For this reason, additional pastures of warm-season grasses or temporary pastures of sudangrass, which attains its peak growth during July and August, are desirable. A combination of cool-season and warm-season grasses provides forage during the entire growing season.

Grasses and legumes used for pasture should be grazed in a rotation that allows for plant regrowth. A planned grazing system in which pastures of cool-season grasses are grazed in rotation extends the grazing season and increases forage production. The most commonly grown introduced grasses in cool-season pastures are smooth brome and intermediate wheatgrass. Other suitable cool-season grasses and legumes in Greeley County are orchardgrass, creeping foxtail, meadow brome, reed canarygrass, alfalfa, birdsfoot trefoil, and cicer milkvetch. If planted as a single species on nonirrigated land, some native warm-season grasses can be grown along with cool-season grasses. Switchgrass, indiangrass, and big bluestem are native, warm-season grasses that can be used in a planned system of grazing to provide high-quality forage during the summer.

Introduced pasture grasses can be grazed in the spring and fall after they reach a height of 5 or 6 inches. Until they reach this height, they grow on food reserves stored in their roots and rhizomes. Grazing too early in spring or too late in fall weakens the plants.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded.

Figure 9.—A pastured area of Coly-Uly silt loams, 11 to 17 percent slopes, eroded. Many cultivated areas of this soil have been reseeded to cool-season grasses, such as bromegrass.

The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, alkaline, or droughty; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 and IIIe-3.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units," in the yields table, and in the section "Interpretive Groups," which follows the tables at the back of this survey.

Rangeland

Kenneth L. Hladek, range conservationist, Soil Conservation Service, helped prepare this section.

Rangeland makes up about 48 percent of the agricultural land in Greeley County. It is in scattered areas throughout the county. The largest acreages, however, are in the Valentine and Uly-Coly associations. The Valentine association, which makes up most of the north-central and northwestern parts of the county, is dominantly used for large ranching enterprises. The Uly-Coly association, which is throughout most of the county, has an extensive area of rangeland. The farms in areas of this association typically are smaller livestock and cash-grain enterprises. The rangeland throughout the county is mainly used for grazing by livestock, but a limited acreage is used for native hay.

The raising of livestock, mainly cow-calf herds, is one of the most important agricultural enterprises in the county. The calves are sold in the fall as feeders. The range is generally grazed from late in spring to early in fall. Livestock graze the corn residue on irrigated cropland and the regrowth on native meadows in the fall. Many producers, particularly those in the Uly-Coly association, keep livestock on winter pastures near their headquarters until the end of the year. The livestock are fed alfalfa or native hay, or both, during the winter and early in spring. The forage produced on rangeland is often supplemented with protein in fall and winter.

Much of the rangeland in Greeley County is producing well below its potential because of continuous overgrazing, particularly in the Uly-Coly association, where stocking rates are often related to the amount of crop residue available for grazing in the fall. Many formerly terraced fields of cropland in this association were reseeded to smooth brome. These fields generally are intermingled and grazed with the rangeland. For best production these areas should be managed separately as pasture or reseeded to a native grass mixture compatible with the surrounding rangeland. Poor grazing distribution, brush invasion on uplands, and musk thistles also reduce forage production.

The main goal of range management is excellent range condition. Proper management of rangeland is one of the most important factors affecting the conservation of soil, water, and plant resources in Greeley County. Proper range management and improvement practices, such as proper grazing use, planned grazing systems, range seeding, and brush control, increase the productivity of the range. Besides improving the yields of desirable forage plants, they reduce soil losses and increase the potential for producing livestock.

This section can help ranchers and conservationists to plan range management in Greeley County. It describes range condition, planned grazing systems, and other management practices that help to achieve sustained forage production.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for nearly all soils, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. An explanation of the column headings in table 8 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Proper Grazing Use

Proper grazing use is grazing at an intensity that maintains enough plant cover to protect the soil and that maintains or improves the quantity and quality of desirable vegetation. It is the first and most important step in successful range management. It increases the vigor and reproductive capacity of desirable plants, leaves enough accumulated litter and mulch on the surface to control erosion, and increases forage production. The proper intensity of grazing on rangeland used during the entire growing season removes no more than half of the current year's growth, by weight.

Proper grazing use is determined by the degree to which desirable species are grazed in key areas. It is affected by stocking rates, the distribution of livestock, the kinds and classes of livestock, and the length of the grazing season.

The stocking rate is the number of grazing animals in a particular pasture. It is based on animal units and animal unit months. An animal unit is generally considered to be one mature cow of about 1,000 pounds and a calf as much as 4 months old, or their equivalent. An animal unit month is the amount of forage or feed necessary to sustain an animal unit for 1 month. The range site and range condition are used to determine animal unit months for each pasture. Suggested initial stocking rates can then be calculated. The proper stocking rates for range sites in excellent condition are given for each soil under the heading "Detailed Soil Map Units." The rates are lower for range sites in less than excellent condition.

The suggested initial stocking rate is easy to calculate for any given soil or range site. For example, in an area of Valentine fine sand, rolling, which is in the Sands range site, the suggested initial stocking rate is about 0.9 animal unit month per acre if the range is in excellent condition. Thus, a 640-acre pasture in excellent condition can carry 576 animal units for 1 month. If the pasture is to be grazed for 5 months, the suggested initial stocking rate would be 576 divided by 5, or 115 animal units. The rate is based on the existing plant community and the average annual forage

Figure 10.—Overgrazing by cattle on Valentine fine sand, rolling, has caused deterioration and loss of the protective cover, resulting in severe damage from soil blowing.

production of each site. Because of weather conditions, forage production varies. The suggested rate is intended as an initial stocking rate and should be adjusted to changes in forage production or the management system.

The proper distribution of livestock throughout a pasture requires planning. Livestock tend to graze in areas near water, roads, and trails and in the more gently sloping areas. Distant corners of the pasture and steep areas are often undergrazed.

Poor grazing distribution can result from too few watering sites, from excessively large pastures, or from poorly distributed salt, shade, supplemental feed, and water. A continued concentration of livestock causes severe overuse in local parts of a pasture, leaving other parts underused, and often creates an erosion hazard (fig. 10). Carefully locating fences and salting and watering facilities and using a planned grazing system help to achieve a uniform distribution of grazing.

Fences help to distribute grazing in a more uniform pattern. Also, they can divide pastures into sections used in a planned grazing system and can isolate blowouts and reseeded areas. Cross fences should be located so that they follow natural land features and range site boundaries as much as possible. The potential stocking rate should be similar throughout a given pasture, although this similarity is not essential. Generally, the smaller pastures are grazed more efficiently than the larger ones. This efficiency should be considered along with convenience when pasture size is determined.

Properly locating salt and minerals is one of the easiest and most economical methods of achieving a more uniform distribution of grazing in a pasture. Salt and minerals should be located away from watering facilities. Cattle do not need to drink immediately after consuming salt or minerals. The salt and mineral stations can be easily moved to areas that are undergrazed and can be relocated periodically during the grazing season. On Valentine soils relocating these stations each time that salt and minerals are provided lessens the hazard of soil blowing.

Properly locating watering facilities also can improve the distribution of grazing. In Greeley County most livestock water is obtained from perennial streams and from wells that are pumped by windmills, particularly in areas of the Valentine association. Stock water dams in areas of the Uly-Coly association also provide water for livestock. Regardless of the source, watering facilities should be spaced at varying distances, depending on topography. In rough or hilly areas, the distance between facilities should not be more than half a mile. In the more nearly level areas, it should be about a mile. If the distance between watering facilities is too far, the cattle tend to graze close to the water sources rather than throughout the pasture.

Range management is dependent on the kinds and classes of livestock grazing the pasture. Cattle, sheep, and horses have different grazing habits and nutritional needs that affect how the range can best be managed. Cattle are the principal kinds of livestock raised in Greeley County and are well suited to grazing its range sites. Horses and sheep are also raised in Greeley County but are few in number. The general management techniques outlined in this section and "Detailed Soil Map Units" apply principally to cattle production. Where different kinds of livestock are raised, adjustments in management may be needed.

Grazing habits differ among classes of cattle. Yearlings tend to travel farther within a pasture than cow-calf pairs. They also tend to graze the steeper areas and use a pasture more uniformly. Their tendency to trail along fence lines, however, can result in erosion. Cow-calf pairs graze for longer periods on the gentler slopes and stay close to watering facilities. As a result, poor grazing distribution may be more of a problem in pastures stocked with cow-calf pairs than in those stocked with yearlings.

Range Condition

The range condition for any range site is the existing state of vegetation compared to its potential, or climax, vegetation. Climax vegetation is a stable plant community that represents the furthest point of plant succession. It is the most productive combination of forage plants and represents the highest potential in kind and amount of vegetation for a given range site. It reproduces itself and changes little as long as the climate and soil remain stable.

Determining the range condition provides an approximate measure of the overall health of the plant community. More importantly, it provides a basis for predicting the degree of improvement possible under different kinds of management. Four range condition classes express the degree to which the composition of the present plant community differs from that of the climax vegetation. These classes are excellent, good, fair, and poor.

All food that green plants use for growth, maintenance, and reproduction is manufactured in their leaves. The excessive removal of leaves during the growing season drastically affects the growth of both roots and shoots. Livestock graze selectively, removing more leaves from some plants than from others. This selective grazing varies according to the season and the degree of use. Various plants respond to continuous heavy grazing in different ways. Some plants decrease in abundance, some increase, and others invade. These plant responses are used to classify range condition.

The *decreaser species* on a site are those in the original plant community that decrease in abundance when grazed closely and continuously during the growing season. The *increaser species* are those in the original community that normally increase in abundance under continuous heavy grazing. They decrease in abundance if the pasture is severely overgrazed. *Invader species* are not part of the original plant community. They begin growing in an area after the decreasers and increasers have been weakened or eliminated.

Once range condition has been determined, it is important to know whether the range is improving or deteriorating in order to plan adjustments in grazing use and management. Important factors affecting trends in the plant community are the vigor and reproductive capacities of both the desirable and undesirable species.

The goal of range management should be an excellent range condition. The greatest forage yields may be obtained on a sustained basis when the range is in excellent condition and is not deteriorating. Under these circumstances, soil blowing and water erosion are naturally reduced to an acceptable level and plants can make optimum use of precipitation.

The range sites given in table 8 and at the end of each map unit description are determined according to the kinds and amounts of vegetation that can be expected when the sites are in excellent condition.

Deferred Grazing

Deferred grazing gives plants a rest period during critical times in their growth stages. This period allows grasses to become vigorous, to replace food reserves, and to produce a mulch at the surface, thus increasing the rate of water infiltration. The mulch also reduces the susceptibility to erosion. Deferred grazing also allows the desirable grasses to mature, flower, and seed naturally.

The need for deferment is based on the range condition and range trend. To be beneficial, deferment should be for a minimum of 3 consecutive months and should coincide with the food storage period of the key forage plants. This period varies, depending on the grass species. The food storage period of native, warm-season grasses occurs from late July to early October. On some sites a short deferment of 3 months is all that is needed, while on other sites a deferment of two complete growing seasons may be needed. Generally, however, some grazing during the year is more beneficial than a year-long deferment. Pastured areas where grazing has been deferred may be grazed after heavy frost in the fall or before the warm-season grasses begin to grow in the spring. If pastures are grazed in the winter, protein supplements are needed to meet the nutritional needs of the cattle.

Where overgrazing has eliminated the native grasses, reseeding the range to adapted native grasses is the best method of restoration. Native range should be reseeded only after the kinds and amounts of existing grasses are carefully evaluated.

Planned Grazing Systems

Planned grazing systems are effective in achieving higher forage production and livestock quality while controlling erosion and improving wildlife habitat. In a planned grazing system, two or more pastures are alternately rested and grazed in a planned, but flexible, sequence over a period of years. The rest periods are planned for sometime during the growing season. All livestock should be removed from the pastures being rested. The same pasture is not grazed during the same period 2 years in a row. Therefore, the plants are not close-cropped by livestock at the same stage of development every year. This grazing system improves plant vigor, forage production, and the plant community and thus results in a better range condition and a higher stocking rate. Planned grazing systems permit maximum and uniform use of forage, while maintaining rangeland productivity over a period of years.

Planned grazing systems can help to maintain or improve the plant cover and increase grazing efficiency by uniformly using all parts of a pasture. They also reduce the adverse effects of drought and other climatic conditions, help to control blowouts, and help to control parasites and disease among cattle.

To be effective, planned grazing systems must be flexible and adapted to the needs of an individual rancher. Fences, watering facilities, range condition, range sites, kinds and classes of grazing animals, and economic factors are all important considerations in determining the best system for a particular ranch. Grazing systems should be modified over a period of time because of improved plant vigor, increased forage production, or changes in management needs.

Range Seeding

In some areas range management alone cannot restore a satisfactory cover of native vegetation. Some of these areas are formerly cultivated fields, "go-back" areas, and abandoned farmsteads. Range seeding, rather than range management, may be needed in these areas and in severely overgrazed areas where the native vegetation does not respond to management practices.

Good stands of native grasses can be reestablished if the seedbed is properly prepared, adapted species of native grasses are planted, the correct seeding practices are employed, and careful management is applied after seeding.

Range seeding is most successful when the seedbed is firm and has a cover of mulch. A firm seedbed helps to ensure good soil-seed contact, which is essential for seedling development. The cover of mulch helps to keep the soil moist, lowers the surface soil temperature, and reduces the hazard of erosion. It can be provided by planting a temporary crop, such as sudangrass or grain sorghum. Tillage should be avoided because of the need for a firm seedbed. The grass should be seeded directly into the stubble the following fall, winter, or spring. On soils that have a coarse textured surface layer and are subject to soil blowing, seedbed preparation and seeding should be done in narrow strips over a period of several years.

Seeding mixtures should include adapted native grasses that are present on the range site when it is in excellent condition. Consequently, the appropriate mixtures vary according to range sites and range sites vary according to the soils. Use of a grassland drill with depth bands ensures proper placement of seeds at a uniform depth. On soils in the Sands and Choppy Sands range sites and on other soils in areas where tillage during seedbed preparation causes a severe hazard of soil blowing, a low-till drill capable of seeding native grasses should be used. This drill places seeds in the center of a shallow furrow without disturbing the vegetation between the furrows. As a result, seeding with this kind of drill greatly reduces the hazard of erosion.

Newly seeded areas should not be fully grazed until after the grass is well established. Establishment may take from 2 to 3 years, depending on the grass species, the range site, the method of planting, and the weather. Initial grazing in these areas should be light. Limited grazing in spring or in late fall and winter is desirable until the grass is established. Proper grazing use and a planned grazing system can help to keep the range productive after the grass is established.

Additional information about grass mixtures, grassland drills, and range seeding dates can be obtained from the local office of the Soil Conservation Service.

Control of Blowouts

Blowouts form on sandy soils, mainly in areas of the Valentine association where the vegetation has been removed. Many blowouts form in areas of the sandhills that have been subject to continuous heavy grazing. Formation of the larger blowouts generally begins in areas near wells, where livestock tend to concentrate. The smaller blowouts commonly form along trails or fence lines. Drought increases the likelihood that blowouts will form.

Unless stabilized, blowouts are likely to enlarge. Windblown sand covers the bordering areas and smothers the vegetation. The result is an expanding area that is subject to severe soil blowing.

A planned grazing system is the most effective way to control and stabilize blowouts. It can stabilize many blowouts in 4 to 5 years. Locating salt and mineral stations away from the blowouts helps to prevent the concentration of livestock near the blowouts. Feeding livestock native hay with seed over winter in areas of blowouts has also proven to be effective in stabilizing the blowouts. This method should be tried before a full-fledged reseeding program is undertaken.

If a planned grazing system or feeding hay in winter is not feasible, reseeding may be necessary. If blowouts are reseeded, steep banks around the blowouts should be reshaped into a stable slope. If a fast-growing summer cover crop is planted in the spring, an adapted native grass mixture can be drilled into the stubble left from the crop. The cover crop helps to protect the surface from soil blowing, lowers the soil temperature, and creates a firm seedbed. If a cover crop is not practical, a mulch of native hay can be spread over the surface and worked into the sand after seeding. Mulching helps to prevent the damage caused by windblown sand while the grasses become established. Fencing blowout areas helps to keep out livestock until a desirable stand is established. Proper grazing use and a planned grazing system help to prevent the reactivation of stabilized blowouts after the grasses are established.

Brush Control

Small soapweed, western snowberry, eastern redcedar, and smooth sumac are the main brush species in Greeley County. Although these plants are not a major range problem, they are invading and increasing in abundance on range that is subject to continuous heavy grazing. The result is reduced forage production and a reduced carrying capacity.

Small soapweed, or yucca, is a problem mainly in areas of the Valentine association. The largest concentration is in the northwestern part of the county. Using cottonseed cake as a protein supplement increases the amount of small soapweed that cattle consume. If grazed during winter, the plants lose vigor and may be broken off below the root crown. Approved herbicides are not effective in controlling small soapweed.

Western snowberry, smooth sumac, and eastern redcedar are a problem in areas of the Uly-Coly and Gates-Hersh associations. They are invading prairie uplands adjacent to steep canyon areas in fairly large numbers, particularly in the Uly-Coly association.

Western snowberry and smooth sumac are best controlled by applications of approved herbicides. Repeated applications for several consecutive years may be needed to control western snowberry.

Eastern redcedar is best controlled by cutting the trees at ground level. The trees can be cut by hand or by earthmoving equipment where the slopes and topography are suitable. Followup treatment is not necessary if no green branches remain. Approved herbicides can be effective in controlling eastern redcedar. Deferment of grazing after treatment helps to restore plant vigor and forage quality.

Herbicide recommendations can be obtained from the local office of the Soil Conservation Service or from the county extension agent.

Figure 11.—Native hay in an area of the Uly-Coly association.

Managing Native Hayland

A limited acreage of rangeland in Greeley County is used for the production of native hay. A considerable amount of hay is cut in areas of the soils that have a seasonal high water table and are in the Wet Subirrigated and Subirrigated range sites. These soils are in the Boel-Loup-Leshara association.

Wet meadows can be maintained or improved by proper hayland management. Timely mowing is needed to maintain strong plant vigor and a high quality and quantity of forage. Mowing the grasses between the boot stage and the emergence of the seed heads allows for adequate regrowth and carbohydrate storage in the plant before the first frost. A mowing height of 3 inches or more helps to maintain plant vigor and promotes rapid regrowth. Large meadows can be divided into three sections and mowed in rotation. One third of the meadow should be mowed about 2 weeks before plants reach the boot stage, one third at the boot stage, and one third in the early flowering period. The order in which the sections are mowed should be rotated in succeeding years.

Meadows should not be grazed or harvested for hay when the surface is wet or the water table is within a depth of 6 inches. Grazing or using machinery at these times results in the formation of small depressions, ruts, and mounds, which can hinder mowing in later years. After the soil is frozen, meadows can be moderately grazed without damage.

The Valentine and Uly-Coly associations are also used for native hay on upland sites (fig. 11). The range sites in areas of these associations are generally the Sandy Lowland, Sands, Sandy Silty, and Limy Upland.

Hay grown in these areas should be harvested only every other year. During the following year, grazing only in fall, winter, or early in spring allows the warm-season grasses to gain vigor and decreases the abundance of cool-season grasses and weeds. As on wet sites, the best time for mowing is between the boot stage and the emergence of seed heads. Regulating mowing allows the desirable grasses to remain vigorous and healthy. Early mowing and cutting at the proper height allow for adequate plant regrowth. The regrowth helps to hold snow on the surface and increases the supply of soil moisture.

Technical assistance in managing range and hayland can be obtained from the local office of the Soil Conservation Service.

Native Woodland

Keith A. Ticknor, forester, Soil Conservation Service, helped prepare this section.

Native woodland in Greeley County occurs along the major streams and rivers in areas of the Hord-Hobbs and Boel-Loup-Leshara associations and along drainageways in areas of the Uly-Coly association near the North Loup River. The acreage of woodland is small and scattered. As a result, the woodland is not managed for commercial purposes, although it is an important resource for local use.

Woody cover along drainageways in the uplands west of the North Loup River is unique because it is representative of eastern hardwood forests. Bur oak and green ash are the dominant species. Other species include hackberry, American basswood, eastern redcedar, boxelder, American elm, smooth sumac, American plum, eastern cottonwood, gooseberry, greenbrier, western snowberry, bittersweet, gray dogwood, and common pricklyash.

Other areas along drainageways in the uplands have a few scattered trees and shrubs. These trees and shrubs are more common along the drainageways in areas of ungrazed rangeland or permanent hay meadows than in other areas. Clumps of western sandcherry, western snowberry, leadplant, American plum, and common chokecherry are common in the sandhills.

Areas in the Hord-Hobbs association along Spring Creek are heavily wooded at the lower reaches and sparsely wooded at the upper reaches. Green ash, American elm, and boxelder are the dominant species. Bur oak is abundant on the face of steep streambanks. Other species include willow, eastern cottonwood, mulberry, smooth sumac, wahoo, common chokecherry, American plum, and elderberry.

Areas along the North Loup River are much more heavily wooded than those along the Cedar River. Eastern cottonwood, black willow, peachleaf willow, sandbar willow, and indigobush are the dominant species along these two rivers. Other species include green ash, American elm, mulberry, gray dogwood, redosier dogwood, boxelder, wahoo, greenbrier, riverbank grape, eastern redcedar, and Russian olive. Bur oak is limited to the areas along the North Loup River. It is on the face of banks cut into the bottom land alluvium by the river channel.

The county has a few areas of woodland remaining from the Timber Claim Act. These areas generally support pure stands of eastern cottonwood or black locust.

Windbreaks and Environmental Plantings

Keith A. Ticknor, forester, Soil Conservation Service, helped prepare this section.

Windbreaks and environmental plantings have been established at various times on most ranch headquarters and farmsteads in Greeley County. Also, numerous windbreaks have been established to protect livestock and fields and to function as living snow fences in the county.

Siberian elm and eastern redcedar are predominant species in windbreaks around the ranch headquarters. Other species include bur oak, eastern cottonwood, ponderosa pine, Austrian pine, Rocky Mountain juniper, Russian mulberry, boxelder, and lilac.

Tree planting around the range headquarters is a continual need because old trees, such as Siberian elm, pass maturity and deteriorate; some trees are destroyed by insects or disease or by storms; and new plantings are needed on expanding ranches or farms. Windbreak renovation practices, such as removal and replacement or supplemental plantings, are needed to maintain the effectiveness of the windbreaks, especially where old Siberian elm trees are the predominant species.

Field windbreaks and shelterbelts are common in the county. Most of them are in areas of the Boel-Loup-Leshara and Dunday-Anselmo-Valentine associations and along the edge of the sandhills. Shelterbelts were planted during the Prairie States Forestry Project from 1935 to 1942. They generally have 8 to 10 rows of trees and shrubs. The rows consist of green ash, Siberian elm, eastern cottonwood, honeylocust, American elm, hackberry, ponderosa pine, Russian olive, Russian mulberry, eastern redcedar, northern catalpa, black locust, or American plum. Numerous large cottonwood shelterbelts are in the northern part of the county in areas of the Dunday-Anselmo-Valentine association. They generally are flanked by two or three rows of eastern redcedar, Russian mulberry, hackberry, or American plum.

The species of trees and shrubs grown as windbreaks should be adapted to the soil on the selected site. Permeability, available water capacity, fertility, depth to the seasonal high water table, and soil texture greatly affect the growth rate.

Trees are difficult to establish in Greeley County because of a low moisture supply during the growing season and hot, drying winds. Dry conditions and competition from weeds and grasses cause most of the failures of windbreaks or environmental plantings. Proper site preparation before planting and control of vegetation after planting are important in establishing and maintaining windbreaks. Supplemental watering is needed during dry periods, and cover crops may be needed to provide protection from windblown soil particles.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

At the end of each description under the heading "Detailed Soil Map Units," the soil has been assigned to a windbreak suitability group. These groups are based primarily on the suitability of the soil for the locally adapted species, as is indicated by their growth and vigor. Detailed interpretations for each windbreak suitability group in the county are provided in the "Technical Guide," which is available in the local office of the Soil Conservation Service.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Recreational opportunities in Greeley County are limited to hunting for upland game birds, such as pheasant, bobwhite quail, and prairie grouse, and big game, primarily for whitetail deer but also for mule deer. Mourning doves are common throughout the county and also can be hunted during regular seasons. Because the county is served by only about 65 miles of all-weather roads, access to recreational areas is somewhat limited, especially in the northwest quarter of the county.

Greeley County is in the Loup River Basin. The major streams include the Cedar River, North Loup River, Spring Creek, and Davis Creek.

The main fish include carp, minnows, carpsucker, whitesucker, redhorse sucker, channel catfish, flathead catfish, black bullhead, largemouth bass, crappie, bluegill, and green sunfish. The county has 51 miles of productive streams, many of which provide opportunities for canoeing.

About 800 private farm ponds are in Greeley County. They contain largemouth bass, bluegill, and catfish when they are stocked. Permission of the landowner is required for fishing.

The main tourist and recreational attraction in the county is the Chalk Mine State Wayside Area along State Highway 11 near Scotia. At this area a trail leads to a scenic overlook of the Loup River from "Happy Jack Peak."

The rolling hills, valleys, streams, and wooded areas provide opportunities for bird watching, photography, and scenic drives in Greeley County.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface absorbs rainfall readily but remains firm and is not dusty when dry. Strong slopes can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is firm after rains and is not dusty when dry. If grading is needed, the depth of the soil over sand or the depth to a high water table should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes.

Wildlife Habitat

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in 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* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, and the hazard of flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, the hazard of flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, Kentucky bluegrass, smooth brome, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and the hazard of flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are big bluestem, little bluestem, goldenrod, western wheatgrass, and blue grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are green ash, honeylocust, willow, hackberry, dogwood, and eastern cottonwood. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian olive, common chokecherry, and American plum.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, eastern redcedar, and Rocky Mountain juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are honeysuckle, western snowberry, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, and slope. Examples of wetland plants are smartweed, prairie cordgrass, rushes, sedges, and reedgrass.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are wetness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife 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. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, coyote, and cottontail.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, thrushes, woodpeckers, squirrels, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, great blue heron, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include deer, prairie grouse, meadowlark, and lark bunting.

In the following paragraphs, the potential for wildlife habitat of the soil associations in Greeley County is described.

The Valentine association, which is in the northwestern part of the county and makes up 22 percent of the county, is predominantly rangeland, but some areas are planted to corn and irrigated by center pivots. The drainage pattern is undefined in this association. Some wetlands are in the low areas where the soils have a high water table or a perched water table. These wetlands provide habitat for waterfowl and shore birds. They also provide water for deer, prairie grouse, and other birds and mammals. Whitetail deer is the dominant big game animal in this association.

The Uly-Coly association, which is the largest soil association in the county, makes up about 51 percent of the county. Typically, this association consists of strongly sloping to very steep soils on dissected uplands. Scattered areas of trees in fence lines and right-of-ways along roads and thickets of plum and chokecherry at the head of drainageways provide excellent habitat for whitetail deer and mule deer, as well as for prairie grouse, pheasants, and bobwhite quail.

The Hall, Dunday-Anselmo-Valentine, Anselmo-Gates-Kenesaw, and Hord-Cozad associations make up about 12 percent of the county. These associations provide habitat for openland wildlife. They are adjacent to the rangeland of the Valentine association and the rangeland and openland of the Uly-Coly association. Wildlife species, such as whitetail deer, mule deer, prairie grouse, and upland game birds, find food in the openland and a cover of grass and woody vegetation in the Valentine and Uly-Coly associations.

The minor stream systems in the Hord-Hobbs association flow southeast across the county and are tributaries of the North Loup and Cedar Rivers. The major drainageways in the Boel-Loup-Leshara association include the Cedar River, which cuts across the northeast corner of the county, and the North Loup River, which cuts across the southwest corner. These associations along rivers and streams provide the greatest diversity of cover types, and all species of wildlife in the county frequent them periodically. Wildlife attracted to these associations include whitetail deer, mule deer, wild turkey, pheasant, bobwhite quail, eagle, hawk, owl, cottontail rabbit, opossum, skunk, mink, weasel, beaver, muskrat, songbirds, and many rodents. The streams and the adjacent onshore woody and herbaceous vegetation provide travel lanes. Food is available in adjacent areas in the uplands. Cover is available in the woody and herbaceous vegetation along the streams. The streams and the wetlands in the lowlands adjacent to the streams are sources of water.

Diversity of plant species is the key to good wildlife habitat. Greeley County has this diversity and, in general, has a wide variety of wildlife species. Population control of game species is practiced by the Nebraska Game and Parks Commission.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by gravel content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, the available water capacity in the upper 40 inches, and the content of salts and sodium affect plant growth. Flooding, wetness, slope, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent. Areas of sandy soils interfere with installation because of the hazard of cutbanks caving.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the 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.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope can cause construction problems, and gravel can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils.

Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by a high water table and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential or slopes of 15 to 25 percent. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), and the thickness of suitable material. Acidity and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that has no more than 12 percent fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of organic matter or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, subsidence of organic layers, and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by slope and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts or sodium. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, and gravel content affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Wetness and slope affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

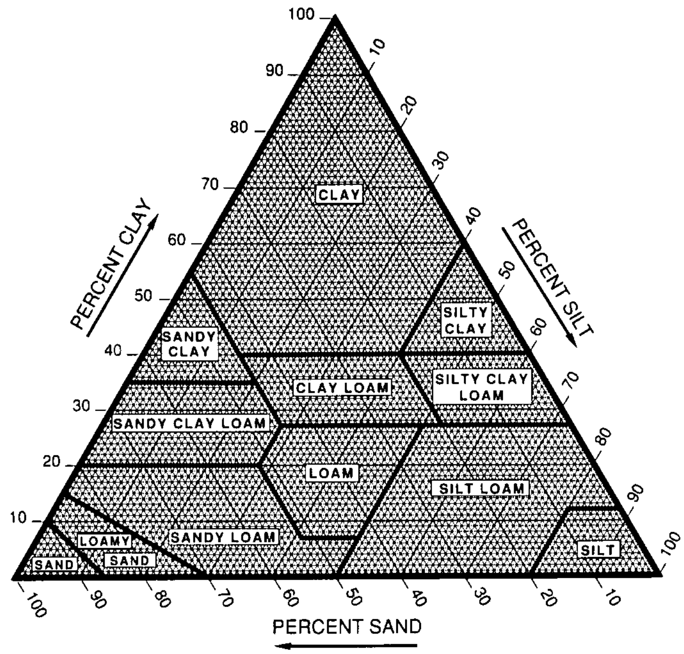

Figure 12.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 12). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(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 and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. In Nebraska, group index numbers range from -4 for the best subgrade material to 32 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams and by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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 the average, once or less in 2 years; and *frequent* that it occurs, on the average, 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.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM); and Specific gravity T—100 (AASHTO). The group index number that is part of the AASHTO classification is computed by the Nebraska modified system.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(7)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

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

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, mesic Typic Haplaquolls.

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

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(6)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(7)*. Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Almeria Series

The Almeria series consists of deep, poorly drained, rapidly permeable soils on bottom land. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Almeria soils are commonly adjacent to Boel soils and to Fluvaquents, sandy. Boel soils have a mollic epipedon. They are better drained than the Almeria soils and are higher on the landscape. Fluvaquents are very poorly drained and are slightly lower on the landscape than the Almeria soils.

Typical pedon of Almeria loamy fine sand, channeled, 800 feet west and 100 feet north of the southeast corner of sec. 10, T. 20 N., R. 10 W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C1—2 to 5 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; few medium faint dark brown (10YR 4/3) mottles; single grain; soft, very friable; mildly alkaline; abrupt smooth boundary.

C2—5 to 29 inches; stratified pale brown (10YR 6/3) and light gray (10YR 7/2) fine sand, brown (10YR 5/3) and light brownish gray (10YR 6/2) moist; common medium and coarse distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; single grain; loose; few thin strata of finer textured material; neutral; clear smooth boundary.

C3—29 to 35 inches; stratified grayish brown (10YR 5/2) and dark gray (10YR 4/1) loamy fine sand, dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) moist; few fine faint dark yellowish brown (10YR 4/4) mottles; single grain; soft, very friable; slightly acid; abrupt smooth boundary.

C4—35 to 60 inches; stratified gray (10YR 5/1) and light gray (10YR 7/2) loamy fine sand, dark gray (10YR 4/1) and light brownish gray (10YR 6/2) moist; single grain; loose; slightly acid.

The thickness of the solum ranges from 2 to 9 inches. The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. The C horizon has hue of 2.5Y or 10YR and value of 5 to 8. It is typically fine sand and loamy fine sand, but in some pedons it has strata of loamy sand, fine sandy loam, very fine sandy loam, or loam.

Anselmo Series

The Anselmo series consists of deep, well drained, moderately rapidly permeable soils on uplands. These soils formed in loamy eolian material. Slopes range from 1 to 6 percent.

Anselmo soils are commonly adjacent to Gates, Kenesaw, and Valentine soils. Gates and Kenesaw soils contain less sand and more silt than the Anselmo soils. Also, they are in slightly lower positions on the landscape. Valentine soils contain more sand throughout than the Anselmo soils. Also, they are higher on the landscape.

Typical pedon of Anselmo fine sandy loam, 1 to 3 percent slopes, 1,250 feet south and 200 feet east of the northwest corner of sec. 16, T. 20 N., R. 10 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; abrupt smooth boundary.

A—6 to 11 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

Bw—11 to 19 inches; brown (10YR 5/3) fine sandy loam, brown and dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

BC—19 to 24 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, very friable; neutral; gradual smooth boundary.

C—24 to 60 inches; very pale brown (10YR 7/4) fine sandy loam, light yellowish brown (10YR 6/4) moist; massive; soft, very friable; neutral.

The thickness of the solum ranges from 11 to 30 inches. The mollic epipedon ranges from 7 to 15 inches in thickness and includes the upper part of the B horizon in some pedons.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. The B horizon has value of 4 to 6 and chroma of 2 to 4. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is typically fine sandy loam but is loamy fine sand or fine sand in the lower part in some pedons.

Barney Series

The Barney series consists of deep, poorly drained soils on bottom land. These soils formed in alluvium. Permeability is moderate in the upper part of the profile and rapid in the sandy underlying material. Slopes range from 0 to 2 percent.

Barney soils are commonly adjacent to Boel and Loup soils. The adjacent soils are slightly higher on the landscape than the Barney soils. Boel soils are somewhat poorly drained. Loup soils have a mollic epipedon.

Typical pedon of Barney loam, channeled, 1,700 feet north and 900 feet west of the southeast corner of sec. 8, T. 17 N., R. 12 W.

A—0 to 8 inches; dark gray (10YR 4/1) loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable; few thin strata of finer textured and coarser textured material; slight effervescence; neutral; abrupt smooth boundary.

C1—8 to 12 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; many coarse prominent brown (7.5YR 5/4 moist) mottles; single grain; loose; few thin strata of finer textured material; mildly alkaline; clear smooth boundary.

C2—12 to 60 inches; very pale brown (10YR 7/3) fine sand, light brownish gray (10YR 6/2) moist; few medium prominent brown (7.5YR 5/4 moist) mottles; single grain; loose; few thin strata of loamy fine sand; mildly alkaline.

The thickness of the solum ranges from 7 to 10 inches. The A horizon has value of 3 to 5 (2 or 3 moist). The C horizon has hue of 2.5Y or 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 3. It is typically fine sand, but the range includes loamy fine sand, sand, coarse sand, and gravelly coarse sand.

Blendon Series

The Blendon series consists of deep, well drained soils on stream terraces. These soils formed in loamy material. Permeability is moderate or moderately rapid in the solum and rapid in the underlying material. Slopes range from 0 to 2 percent.

Blendon soils are commonly adjacent to Cozad and Hord soils. The adjacent soils contain less sand and more silt in the subsoil and underlying material than the Blendon soils. Also, they are slightly lower on the landscape.

Typical pedon of Blendon loam, 0 to 1 percent slopes, 2,575 feet west and 1,200 feet north of the southeast corner of sec. 26, T. 17 N., R. 12 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A—6 to 17 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, very friable; neutral; gradual smooth boundary.

Bw—17 to 33 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; neutral; gradual smooth boundary.

BC—33 to 42 inches; dark grayish brown (10YR 4/2) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

C1—42 to 54 inches; light gray (10YR 7/2) loamy fine sand, pale brown (10YR 6/3) moist; single grain; loose; neutral; gradual smooth boundary.

C2—54 to 60 inches; very pale brown (10YR 7/4) fine sand, pale brown (10YR 6/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 24 to 50 inches. The thickness of the mollic epipedon ranges from 20 to 50 inches. The depth to fine sand is more than 40 inches.

The A horizon is typically loam, but the range includes fine sandy loam. The Bw horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is typically loam and fine sandy loam, but the range includes sandy loam. The C horizon has value of 5 to 7 (5 or 6 moist). It is typically loamy fine sand and fine sand, but the range includes loamy sand and sand, mainly in the lower part of the horizon.

Boel Series

The Boel series consists of deep, somewhat poorly drained soils on bottom land. These soils formed in alluvium. Permeability is moderate in the solum and rapid in the underlying material. Slopes range from 0 to 2 percent.

Boel soils are commonly adjacent to Barney and Loup soils. The adjacent soils are poorly drained and are in the lower positions on the landscape.

Typical pedon of Boel loam, 0 to 2 percent slopes, 900 feet west and 400 feet south of the northeast corner of sec. 21, T. 17 N., R. 12 W.

A1—0 to 5 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak medium granular structure parting to weak fine granular; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

A2—5 to 10 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; mildly alkaline; clear smooth boundary.

AC—10 to 14 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) moist; few fine faint yellowish brown

(10YR 5/6) mottles; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; moderately alkaline; clear smooth boundary.

C1—14 to 34 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; few fine and medium faint yellowish brown (10YR 5/6) mottles; single grain; loose; few thin strata of finer textured material; moderately alkaline; gradual smooth boundary.

C2—34 to 48 inches; white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; few medium faint yellowish brown (10YR 5/6) mottles; single grain; loose; few thin strata of finer textured material; moderately alkaline; gradual smooth boundary.

C3—48 to 60 inches; white (10YR 8/2) sand and coarse sand, light gray (10YR 7/2) moist; few medium distinct yellowish brown (10YR 5/4) mottles; single grain; loose; few thin strata of finer textured material; moderately alkaline.

The thickness of the solum ranges from 10 to 16 inches. The A horizon has value of 3 to 5 (2 or 3 moist). The C horizon has value of 6 to 8 (5 to 7 moist).

Cass Series

The Cass series consists of deep, well drained, moderately rapidly permeable soils on high bottom land. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Cass soils are commonly adjacent to Hobbs and Hord soils. Hobbs soils are stratified near the surface. They are on the slightly lower bottom land. Hord soils have less sand throughout than the Cass soils. They are on stream terraces.

Typical pedon of Cass fine sandy loam, 0 to 2 percent slopes, 300 feet south and 1,050 feet east of the northwest corner of sec. 14, T. 18 N., R. 10 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; medium acid; abrupt smooth boundary.

A1—5 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

A2—10 to 16 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable; neutral; clear smooth boundary.

AC—16 to 28 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

C1—28 to 50 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; neutral; abrupt smooth boundary.

C2—50 to 56 inches; grayish brown (10YR 5/2) and very pale brown (10YR 7/3) very fine sandy loam, dark grayish brown (10YR 4/2) and pale brown (10YR 6/3) moist; massive; soft, very friable; neutral; clear smooth boundary.

C3—56 to 60 inches; light gray (10YR 7/2) very fine sandy loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable; mildly alkaline.

The thickness of the mollic epipedon ranges from 10 to 20 inches. The A horizon has chroma of 1 or 2. The C horizon has hue of 10YR or 2.5Y and value of 5 to 7. In some pedons it is loamy fine sand in the lower part.

Coly Series

The Coly series consists of deep, well drained to excessively drained, moderately permeable soils on side slopes and narrow ridgetops in the uplands. These soils formed in loess. Slopes range from 6 to 60 percent (fig. 13).

Coly soils are commonly adjacent to Hobbs, Holdrege, Hord, and Uly soils. Hobbs soils are nearly level and are on bottom land along intermittent drainageways. Holdrege soils have more clay in the subsoil than the Coly soils and have a mollic epipedon. They are gently sloping. Hord soils have a surface soil that is thicker and darker than that of the Coly soils. They are on stream terraces. Uly soils have a mollic epipedon. They are on side slopes below the Coly soils and on ridgetops above the Coly soils.

Typical pedon of Coly silt loam, in an area of Uly-Coly silt loams, 15 to 30 percent slopes, 1,800 feet north and 300 feet west of the southeast corner of sec. 1, T. 17 N., R. 12 W.

A—0 to 4 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

AC—4 to 8 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

C—8 to 60 inches; light gray (10YR 7/2) silt loam, light

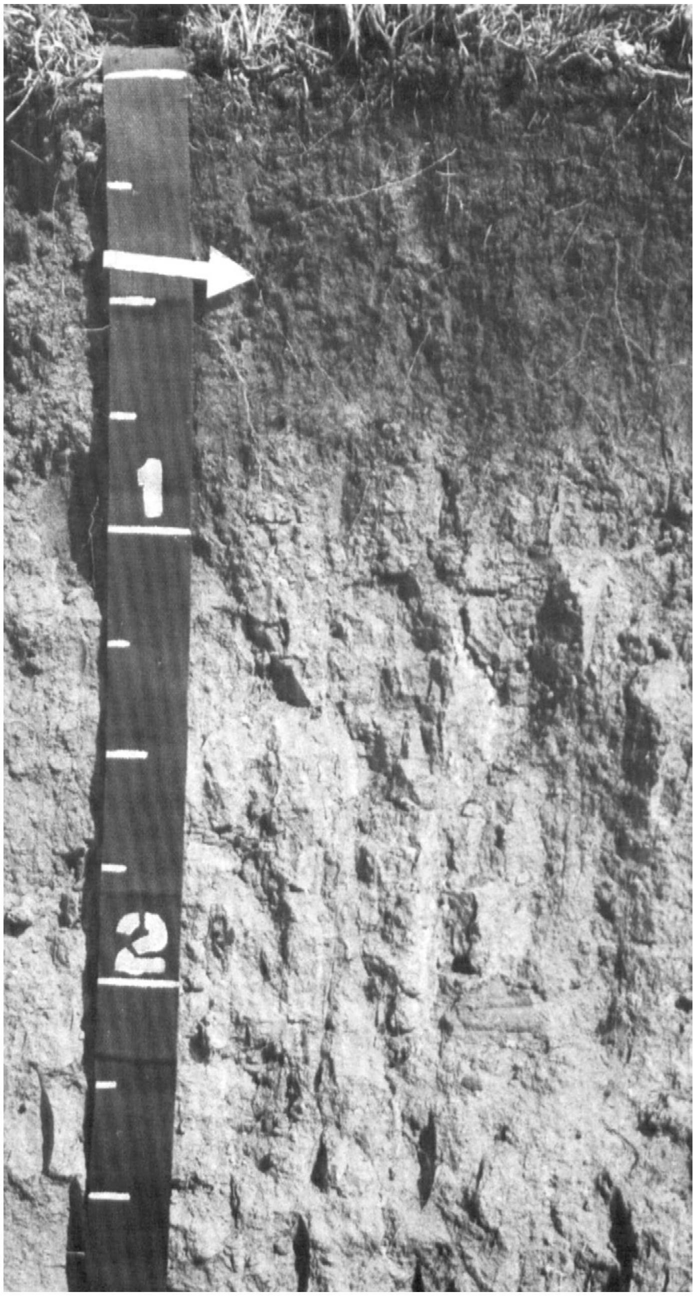

Figure 13.—Profile of a Coly soil. The arrow indicates the depth of the surface layer. Depth is marked in feet.

brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; few accumulations of calcium carbonate; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 3 to 14 inches. The A horizon has value of 5 to 7 (3 to 5 moist) and chroma of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It is typically silt loam, but in some pedons it is very fine sandy loam in the lower part.

Cozad Series

The Cozad series consists of deep, well drained, moderately permeable soils on stream terraces. These soils formed in alluvium. Slopes range from 0 to 3 percent.

Cozad soils are commonly adjacent to Hobbs and Hord soils. Hord soils have a mollic epipedon that is more than 20 inches thick. They are in landscape positions similar to those of the Cozad soils. Hobbs soils are stratified throughout and are on bottom land.

Typical pedon of Cozad silt loam, terrace, 0 to 1 percent slopes, 1,150 feet west and 50 feet south of the northeast corner of sec. 16, T. 17 N., R. 12 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine and medium granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

Bw1—13 to 18 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, friable; slightly acid; clear smooth boundary.

Bw2—18 to 25 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

C1—25 to 42 inches; light brownish gray (10YR 6/2) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; very thin layers of silt loam; neutral; abrupt smooth boundary.

C2—42 to 60 inches; light gray (10YR 7/2) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, friable; very thin layers of silt loam; slight effervescence; neutral.

The thickness of the solum ranges from 15 to 30 inches. The depth to free carbonates is more than 15 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 3 to 5 and chroma of 1 or 2. The Bw horizon has value of 3 to 5 moist. It is typically silt loam, but the range includes very fine sandy loam. The C horizon has value of 6 or 7 and chroma of 2 or 3. It is typically very fine sandy loam, but the range includes silt loam. Buried soils are common below a depth of about 30 inches.

Dunday Series

The Dunday series consists of deep, well drained, and rapidly permeable soils on uplands. These soils formed in sandy eolian material. Slopes range from 0 to 6 percent.

Dunday soils are commonly adjacent to Anselmo, Gates, Hersh, and Valentine soils. Anselmo, Gates, and Hersh soils have less sand in the control section than the Dunday soils. They are in landscape positions similar to those of the Dunday soils. Valentine soils do not have a mollic epipedon. They are higher on the landscape than the Dunday soils.

Typical pedon of Dunday loamy fine sand, 0 to 3 percent slopes, 250 feet south and 75 feet west of the northeast corner of sec. 16, T. 19 N., R. 11 W.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark gray (10YR 3/1) moist; weak fine granular structure; loose; slightly acid; clear smooth boundary.

A2—6 to 13 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose; slightly acid; clear smooth boundary.

AC—13 to 24 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak coarse granular structure; loose; slightly acid; gradual smooth boundary.

C—24 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 14 to 30 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 4 or 5 (2 or 3 moist). The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4. It is typically fine sand, but the range includes loamy fine sand.

Gates Series

The Gates series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 30 percent.

Gates soils are commonly adjacent to Anselmo, Hersh, and Valentine soils. The adjacent soils have more sand in the control section than the Gates soils. They are in landscape positions similar to those of the Gates soils.

Typical pedon of Gates silt loam, 3 to 6 percent slopes, eroded, 400 feet west and 75 feet north of the southeast corner of sec. 9, T. 19 N., R. 10 W.

Ap—0 to 5 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, very friable; mildly alkaline; abrupt smooth boundary.

AC—5 to 12 inches; pale brown (10YR 6/3) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; moderately alkaline; gradual smooth boundary.

C—12 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; slightly hard, very friable; slight effervescence in places; moderately alkaline.

The depth to carbonates ranges from 12 to 30 inches. The A horizon has value of 5 to 7 (4 to 6 moist) and chroma of 1 to 3. It is typically silt loam, but the range includes fine sandy loam and loamy fine sand. The C horizon has hue of 10YR or 2.5Y, value of 5 to 8 (4 to 6 moist), and chroma of 2 or 3.

Hall Series

The Hall series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 3 percent.

Hall soils are commonly adjacent to Coly, Holdrege, and Uly soils. Coly soils do not have a mollic epipedon. They are on the steeper slopes. Holdrege soils have a mollic epipedon that is less than 20 inches thick. They are lower on the landscape than the Hall soils. Uly soils do not have an argillic horizon. They are on the steeper slopes.

Typical pedon of Hall silt loam, 0 to 1 percent slopes, 1,900 feet south and 150 feet west of the northeast corner of sec. 25, T. 17 N., R. 11 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A—6 to 12 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, very friable; slightly acid; clear smooth boundary.

Bt1—12 to 17 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, firm; organic stains on faces of peds; neutral; clear smooth boundary.

Bt2—17 to 24 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate medium and coarse subangular blocky structure; hard, firm; organic stains on faces of peds; neutral; clear smooth boundary.

Bt3—24 to 30 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm; neutral; clear smooth boundary.

BC—30 to 34 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; slightly hard, firm; neutral; clear smooth boundary.

C—34 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; soft, very friable; neutral.

The thickness of the solum ranges from 27 to 48 inches. The thickness of the mollic epipedon ranges from 20 to 38 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. The Bt horizon has value of 3 to 6 (2 to 4 moist) and chroma of 1 to 3. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3.

Hersh Series

The Hersh series consists of deep, well drained and somewhat excessively drained, moderately rapidly permeable soils on uplands. These soils formed in loamy eolian material. Slopes range from 0 to 30 percent.

Hersh soils are commonly adjacent to Dunday, Gates, and Valentine soils. Dunday and Valentine soils have more sand in the control section than the Hersh soils. Also, Dunday soils are lower on the landscape and Valentine soils are higher. Gates soils have less sand in the control section than the Hersh soils. They are in landscape positions similar to those of the Hersh soils.

Typical pedon of Hersh fine sandy loam, 3 to 6 percent slopes, 400 feet south and 75 feet west of the northeast corner of sec. 18, T. 20 N., R. 10 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

AC—5 to 10 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable; slightly acid; clear smooth boundary.

C—10 to 60 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable; neutral.

The thickness of the solum ranges from 4 to 20 inches. The A horizon has value of 4 to 6 (3 or 4 moist) and chroma of 2 or 3. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. It is fine sandy loam, but the range includes loamy fine sand in the lower part.

Hobbs Series

The Hobbs series consists of deep, well drained, moderately permeable soils on foot slopes, alluvial fans, and bottom land. These soils formed in alluvium. Slopes range from 0 to 6 percent (fig. 14).

Hobbs soils are commonly adjacent to Coly, Cozad, Holdrege, Hord, and Uly soils. Coly, Holdrege, and Uly soils are not stratified. They are on side slopes and ridgetops in the uplands. Cozad and Hord soils have a mollic epipedon and a weakly developed B horizon. They are on stream terraces.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes, 600 feet north and 50 feet west of the southeast corner of sec. 11, T. 18 N., R. 9 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

C1—6 to 22 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable; mildly alkaline; clear smooth boundary.

C2—22 to 30 inches; stratified grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; mildly alkaline; clear smooth boundary.

C3—30 to 60 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; massive; slightly hard, very friable; common bedding planes; mildly alkaline.

Most pedons do not have free carbonates in the upper 40 inches, but some have a thin surface layer of recent deposition that contains carbonates.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. Pedons in undisturbed areas have thin strata with higher or lower value. The C horizon has value of 4 to 7 (3 to 6 moist) and chroma of 1 to 3. It is dominantly silt loam, but in some pedons it has thin

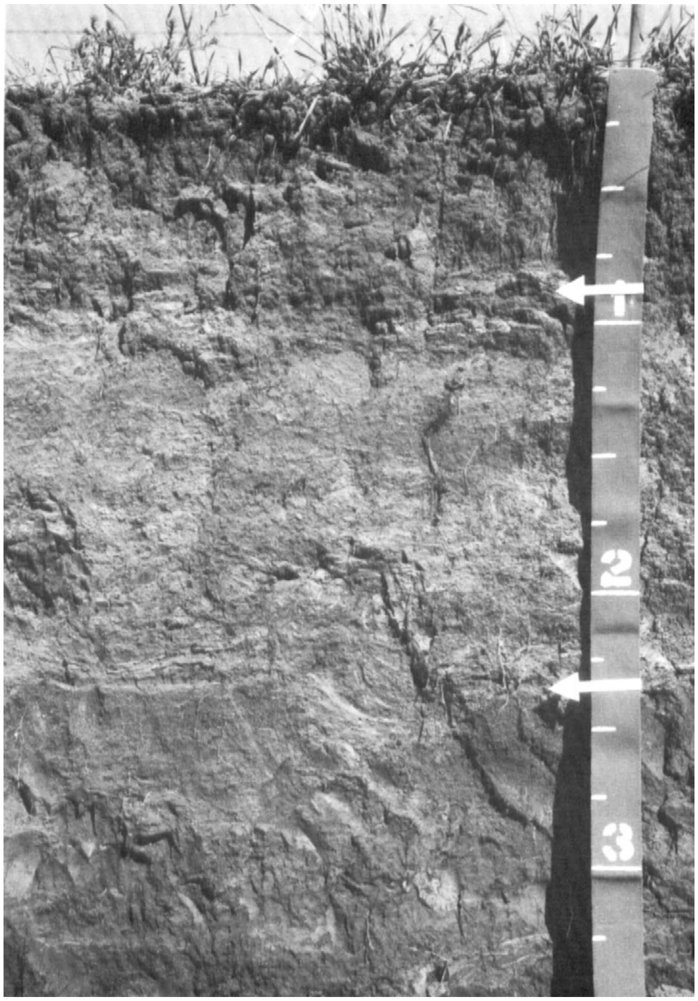

Figure 14.—Profile of a Hobbs soil. The arrows indicate stratified zones in the soil profile. Depth is marked in feet.

strata of more sandy or more clayey material. Buried soils are common.

Holdrege Series

The Holdrege series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 3 to 6 percent.

Holdrege soils are commonly adjacent to Coly, Hall, and Uly soils. Coly soils do not have a mollic epipedon. They are on the steeper slopes. Hall soils have a mollic epipedon that is more than 20 inches thick. They are nearly level and very gently sloping. Uly soils do not have an argillic horizon. They are on the steeper slopes.

Typical pedon of Holdrege silt loam, 3 to 6 percent slopes, 1,500 feet south and 100 feet east of the northwest corner of sec. 18, T. 17 N., R. 12 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, friable; slightly acid; clear smooth boundary.

Bt1—7 to 10 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable; few darker faces on peds; neutral; clear smooth boundary.

Bt2—10 to 16 inches; brown (10YR 5/3) silty clay loam, brown and dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

Bt3—16 to 25 inches; yellowish brown (10YR 5/4) silty clay loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, friable; neutral; gradual smooth boundary.

BC—25 to 38 inches; light yellowish brown (10YR 6/4) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; neutral; gradual smooth boundary.

C—38 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; soft, very friable; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to free carbonates range from 20 to 40 inches. The A horizon has value of 4 or 5 (2 or 3 moist). It is silt loam or silty clay loam. The Bt horizon has value of 4 to 7. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 to 4.

In Holdrege silty clay loam, 3 to 6 percent slopes, eroded, the mollic epipedon, the solum, and the Bt horizon are thinner than is defined as the range for the series. This difference, however, does not affect the use and management of the soil.

Hord Series

The Hord series consists of deep, well drained, moderately permeable soils on stream terraces and foot slopes. These soils formed in a mixture of loess and alluvium. Slopes range from 0 to 6 percent.

Hord soils are commonly adjacent to Cozad and Hobbs soils. Cozad soils have a mollic epipedon less than 20 inches thick. They are in landscape positions similar to those of the Hord soils. Hobbs soils are stratified throughout and are on bottom land.

Typical pedon of Hord silt loam, terrace, 0 to 1 percent slopes, 2,550 feet east and 700 feet south of the northwest corner of sec. 19, T. 18 N., R. 12 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A1—6 to 12 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, very friable; neutral; clear smooth boundary.

A2—12 to 24 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine and medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

Bw1—24 to 29 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

Bw2—29 to 36 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

BC—36 to 42 inches; pale brown (10YR 6/3) silty clay loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C1—42 to 48 inches; grayish brown (10YR 5/2), stratified silt loam and silty clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; mildly alkaline; clear smooth boundary.

C2—48 to 60 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable; mildly alkaline.

The thickness of the solum ranges from 30 to 60 inches. The thickness of the mollic epipedon ranges from 20 to 40 inches.

The A horizon has value of 4 or 5. The Bw horizon has value of 2 to 4 moist and chroma of 1 to 3. It is typically silty clay loam or silt loam. The C horizon has value of 5 to 7 (3 to 5 moist). It is typically silt loam, but the range includes silty clay loam and very fine sandy loam.

Ipage Series

The Ipage series consists of deep, moderately well drained, rapidly permeable soils on stream terraces and in valleys in the sandhills. These soils formed in sandy eolian and alluvial material. Slopes range from 0 to 3 percent.

Ipage soils are commonly adjacent to Dunday and Valentine soils. Dunday soils are well drained and are in the slightly higher uplands. Valentine soils are excessively drained and are in the higher uplands.

Typical pedon of Ipage fine sand, 0 to 3 percent slopes, 2,450 feet south and 1,850 feet west of the northeast corner of sec. 2, T. 20 N., R. 12 W.

A—0 to 8 inches; dark grayish brown (10YR 4/2) fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

AC—8 to 13 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; neutral; gradual smooth boundary.

C1—13 to 30 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grain; loose; neutral; gradual smooth boundary.

C2—30 to 50 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; few fine distinct yellowish brown (10YR 5/6 moist) mottles; single grain; loose; neutral; gradual smooth boundary.

C3—50 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; many medium distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; slightly acid.

The thickness of the solum ranges from 5 to 20 inches. The A horizon has value of 4 to 6 (3 or 4 moist) and chroma of 1 or 2. It is fine sand or loamy fine sand. The C horizon has value of 6 to 8 (4 to 7 moist) and chroma of 2 or 3.

Kenesaw Series

The Kenesaw series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in recent loess. Slopes range from 0 to 3 percent.

Kenesaw soils are commonly adjacent to Anselmo, Gates, Hersh, and Valentine soils. Anselmo and Hersh soils have more sand throughout than the Kenesaw soils. Also, they are slightly higher on the landscape. Gates soils do not have a mollic epipedon. They are on the steeper slopes. Valentine soils have more sand throughout than the Kenesaw soils. Also, they are higher on the landscape.

Typical pedon of Kenesaw very fine sandy loam, 0 to 1 percent slopes, 400 feet west and 2,500 feet north of the southeast corner of sec. 26, T. 20 N., R. 10 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure;

soft, very friable; slightly acid; abrupt smooth boundary.

A—7 to 11 inches; dark grayish brown (10YR 4/2) very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; slightly acid; clear smooth boundary.

Bw—11 to 17 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

BC—17 to 26 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable; neutral; clear smooth boundary.

C—26 to 42 inches; very pale brown (10YR 7/3) very fine sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

Ab—42 to 55 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C′—55 to 60 inches; brown (10YR 5/3) very fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; slight effervescence; mildly alkaline.

The solum ranges from 16 to 26 inches in thickness. The depth to free carbonates ranges from 15 to 36 inches.

The A horizon has value of 2 or 3 moist and chroma of 1 or 2. The Bw horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. Some pedons do not have buried soils.

Leshara Series

The Leshara series consists of deep, somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in alluvium. Slopes are 0 to 1 percent.

Leshara soils are commonly adjacent to Cozad, Hord, and Loup soils. Cozad and Hord soils are well drained and are on stream terraces. Loup soils are poorly drained and are lower on the landscape than the Leshara soils. Also, they have more sand in the control section than the Leshara soils.

Typical pedon of Leshara silt loam, 0 to 1 percent slopes, 2,500 feet north and 1,200 feet west of the southeast corner of sec. 31, T. 18 N., R. 12 W.

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

A—5 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate fine subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

C1—14 to 33 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C2—33 to 40 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; few fine faint dark yellowish brown (10YR 4/4) mottles; massive; slightly hard, very friable; slight effervescence; mildly alkaline; gradual smooth boundary.

C3—40 to 46 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; common medium distinct yellowish brown (10YR 5/4) mottles; massive; slightly hard, very friable; violent effervescence; mildly alkaline; abrupt smooth boundary.

2C—46 to 60 inches; white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; few pebbles; moderately alkaline.

The thickness of the mollic epipedon ranges from 10 to 20 inches. The depth to free carbonates ranges from 10 to 26 inches.

The A horizon has value of 3 to 5 (2 or 3 moist). Some pedons have a thin, lighter colored layer of overwash soil material on the surface. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1 or 2. It is typically silt loam, but the range includes very fine sandy loam. The 2C horizon is typically fine sand, but the range includes loamy fine sand.

Loup Series

The Loup series consists of deep, poorly drained, rapidly permeable soils on bottom land. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Loup soils are commonly adjacent to Barney, Boel, and Leshara soils. Barney soils do not have a mollic epipedon. They are slightly lower on the landscape than the Loup soils. Boel and Leshara soils are somewhat poorly drained and are slightly higher on the landscape than the Loup soils.

Typical pedon of Loup loam, 0 to 2 percent slopes, 700 feet north and 350 feet east of the southwest corner of sec. 9, T. 17 N., R. 12 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.
A2—2 to 9 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.
AC—9 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; common coarse prominent strong brown (7.5YR 5/6) mottles; weak fine and medium granular structure; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.
C1—15 to 40 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; common coarse prominent strong brown (7.5YR 5/6) mottles; single grain; loose; about 5 percent gravel by volume; mildly alkaline; clear smooth boundary.
C2—40 to 60 inches; white (10YR 8/1) sand, light gray (10YR 7/2) moist; single grain; loose; about 5 percent gravel by volume; mildly alkaline.

The mollic epipedon is 7 to 15 inches thick. The A horizon has value of 3 or 4 (2 or 3 moist). The C horizon has hue of 10YR or 2.5Y and value of 6 to 8 (5 to 7 moist).

Scott Series

The Scott series consists of deep, very poorly drained, very slowly permeable soils in depressions on uplands. These soils formed in loess. They are ponded. Slopes are 0 to 1 percent.

Scott soils are commonly adjacent to Hall and Hord soils. The adjacent soils are well drained and have less clay in the subsoil than the Scott soils. Hall soils are on uplands. Hord soils are on foot slopes and stream terraces.

Typical pedon of Scott silty clay loam, 0 to 1 percent slopes, 1,500 feet south and 100 feet west of the northeast corner of sec. 12, T. 20 N., R. 9 W.

A—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; hard, friable; medium acid; abrupt smooth boundary.
Bt1—6 to 10 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine subangular blocky; very hard, firm; medium acid; clear smooth boundary.
Bt2—10 to 16 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine subangular blocky; very hard, firm; medium acid; clear smooth boundary.
Bt3—16 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate fine subangular blocky; very hard, firm; medium acid; gradual smooth boundary.
Bt4—20 to 28 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to weak fine subangular blocky; very hard, firm; medium acid; gradual smooth boundary.
BC—28 to 36 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; few fine distinct light yellowish brown (10YR 6/4) mottles; weak coarse prismatic structure; hard, friable; neutral; gradual smooth boundary.
C1—36 to 48 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; hard, friable; neutral; gradual smooth boundary.
C2—48 to 60 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; massive; hard, friable; neutral.

The thickness of the solum ranges from 35 to 56 inches. The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The Bt horizon has value of 2 to 4 moist. It is silty clay or silty clay loam. The C horizon has hue of 10YR or 2.5Y. It is silt loam or silty clay loam.

The Scott soils in this county are taxadjuncts because they do not have an albic horizon and are not characterized by an abrupt textural change. These differences, however, do not affect the use and management of the soils.

Simeon Series

The Simeon series consists of deep, excessively drained, rapidly permeable soils on stream terraces. These soils formed in sandy alluvium. Slopes range from 0 to 3 percent.

Simeon soils are commonly adjacent to Blendon and Valentine soils. Blendon soils have less sand in the solum than the Simeon soils. Also, they are slightly lower on the landscape. Valentine soils have a lower content of coarse sand in the control section than the Simeon soils. They are on uplands.

Typical pedon of Simeon loamy sand, 0 to 3 percent slopes, 2,600 feet south and 500 feet east of the northwest corner of sec. 30, T. 18 N., R. 12 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable; about 5 percent gravel by volume; slightly acid; abrupt smooth boundary.

AC—7 to 10 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; loose; about 10 percent gravel by volume; neutral; clear smooth boundary.

C1—10 to 36 inches; light gray (10YR 7/2) sand, pale brown (10YR 6/3) moist; single grain; loose; about 8 percent gravel by volume; neutral; gradual smooth boundary.

C2—36 to 60 inches; white (10YR 8/2) sand, light gray (10YR 7/2) moist; single grain; loose; about 5 percent gravel by volume; neutral.

The thickness of the solum ranges from 7 to 20 inches. The A horizon has value of 3 to 6 (2 to 5 moist) and chroma of 1 or 2. The C horizon has value of 6 to 8 (5 to 7 moist) and chroma of 2 to 4. It is typically sand in which the content of medium and coarse sand is more than 35 percent. In some pedons, however, it is coarse sand. The content of gravel is as much as 15 percent by volume.

Uly Series

The Uly series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 6 to 30 percent (fig. 15).

Uly soils are commonly adjacent to Coly, Hobbs, and Holdrege soils. Coly soils do not have a mollic epipedon and are shallower to carbonates than the Uly soils. They are on the steeper slopes. Hobbs soils are stratified and are on bottom land. Holdrege soils have an argillic horizon. They are on gently sloping ridgetops and side slopes.

Typical pedon of Uly silt loam, 6 to 11 percent slopes, 2,200 feet east and 1,500 feet south of the northwest corner of sec. 16, T. 18 N., R. 12 W.

A—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

BA—9 to 14 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

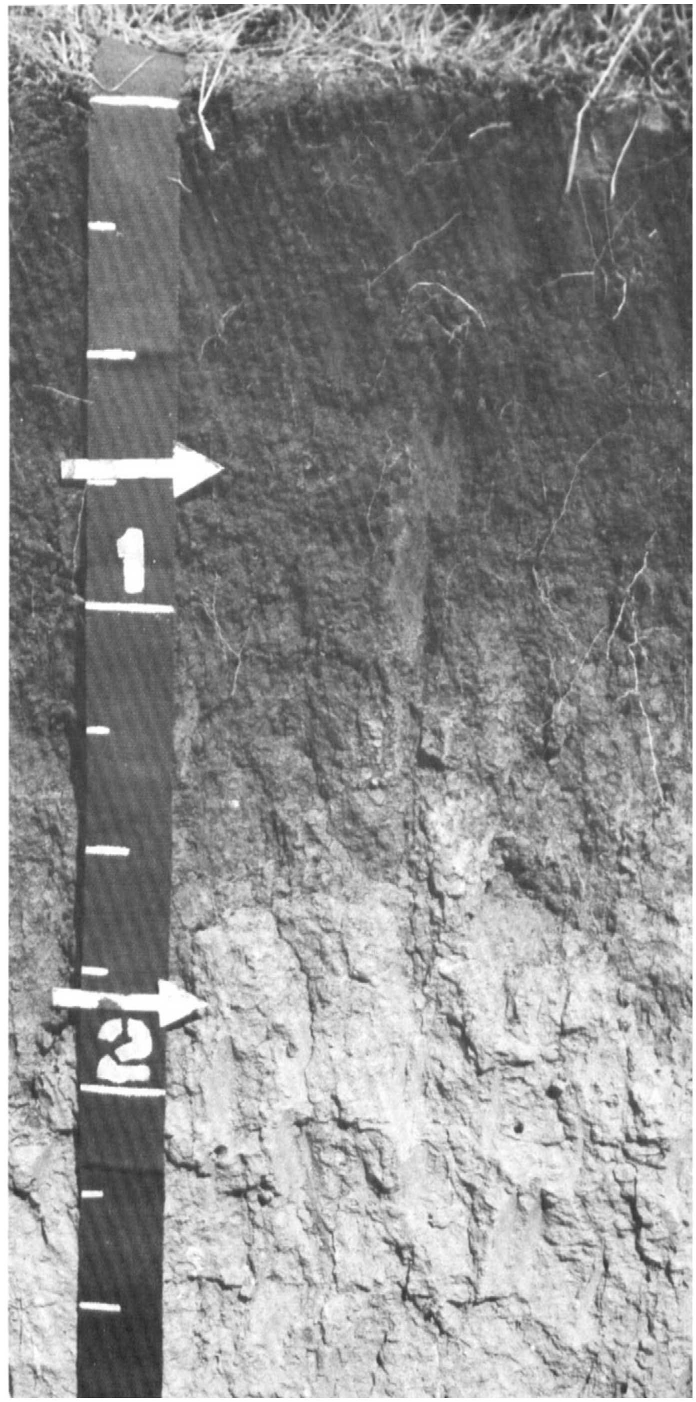

Figure 15.—Profile of a Uly soil. The upper arrow indicates the thickness of the surface layer, and the lower arrow indicates the lower boundary of the subsoil. Depth is marked in feet.

Bw—14 to 22 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

BC—22 to 27 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable; slight effervescence; neutral; gradual smooth boundary.

C—27 to 60 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; slightly hard, very friable; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 12 to 36 inches. The thickness of the mollic epipedon ranges from 7 to 18 inches. The depth to free carbonates generally ranges from 8 to 25 inches but is more than 25 inches in some pedons.

The A horizon has value of 3 to 5 (2 or 3 moist). The Bw horizon has value of 4 to 7 (3 to 5 moist). The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (4 to 6 moist), and chroma of 2 to 4.

In the Uly soils in the map units Coly-Uly silt loams, 11 to 17 percent slopes, eroded, and Uly-Coly silt loams, 6 to 11 percent slopes, eroded, the mollic epipedon is thinner than is defined as the range for the series. This difference, however, does not affect the use and management of the soils.

Valentine Series

The Valentine series consists of deep, excessively drained, rapidly permeable soils on uplands. These soils formed in sandy eolian material. Slopes range from 0 to 45 percent (fig. 16).

Valentine soils are commonly adjacent to Gates and Hersh soils. The adjacent soils have more silt than the Valentine soils. Also, they are lower on the landscape.

Typical pedon of Valentine fine sand, rolling, 500 feet north and 300 feet east of the southwest corner of sec. 25, T. 20 N., R. 11 W.

A—0 to 5 inches; grayish brown (10YR 5/2) fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose; slightly acid; clear smooth boundary.

AC—5 to 10 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; neutral; clear smooth boundary.

C—10 to 60 inches; light gray (10YR 7/2) fine sand, pale brown (10YR 6/3) moist; single grain; loose; neutral.

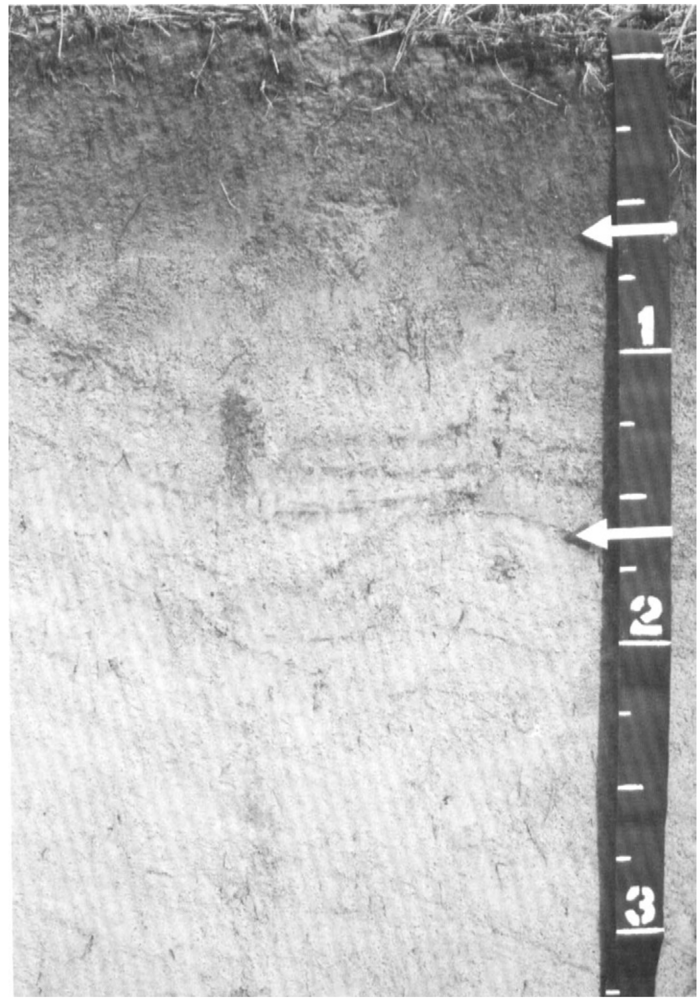

Figure 16.—Profile of a Valentine soil. The upper arrow indicates the depth of the surface layer, and the lower arrow indicates the depth of the transitional layer. Depth is marked in feet.

The thickness of the solum ranges from 5 to 15 inches. The A horizon has value of 4 to 6 (3 to 5 moist). It is typically fine sand, but the range includes loamy fine sand. The C horizon has value of 6 or 7 (5 or 6 moist).

Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Generally, a long time is needed 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.

Parent Material

Parent material is the weathered or partly weathered material in which a soil forms. It affects the chemical and mineralogical composition of the soil. The parent materials in which the soils in Greeley County formed are loess, sandy eolian material, and alluvium.

Loess is wind-deposited silty material. Peorian Loess is the most extensive parent material in the county. It is a thick mantle on tablelands, high stream terraces, and dissected uplands. It is generally grayish to brownish. The material ranges from a few feet to 75 feet in thickness. Coly, Holdrege, and Uly soils are the major soils formed in Peorian Loess. Cozad and Hord soils on stream terraces and Hobbs soils on bottom land formed in alluvial material derived mainly from Peorian Loess. Gates soils formed in the more recent Bignell Loess deposit that overlies the Peorian Loess in the loess-sand transitional areas adjacent to the sandhills. The reddish brown Loveland Loess underlies the Peorian Loess. It is exposed only at the base of deep canyons and in road cuts.

Sandy eolian material covers large areas in the northwestern and north-central parts of the county and in scattered, smaller areas elsewhere in the county. It consists of pale brown to very pale brown, wind-deposited sand. It ranges from a few feet to as much as 100 feet in thickness. Valentine soils are the dominant soil formed in sandy eolian material in the county. They have very little profile development because the sands are resistant to weathering. Hersh soils formed in loamy eolian material in the loess-sand transitional areas bordering the sandhills.

Alluvium consists of material deposited by water on bottom land. It has a wide range of textures because of the differences in parent materials and the way it was deposited. Cozad and Hord soils formed in alluvium on stream terraces. Barney, Boel, Hobbs, Leshara, and Loup soils formed in alluvium on bottom land.

Climate

Greeley County has a subhumid, continental climate characterized by wide seasonal variations in temperature and precipitation. The mean annual temperature is about 50 degrees, and the average annual rainfall is about 24 inches. The average growing season is about 150 days.

Climate indirectly affects soil formation through its effect on the kind and amount of vegetation, micro-organisms, and animal life on and in the soil. As the dead plants and animals decompose, they add organic matter and plant nutrients to the soil.

Rainfall, temperature, and wind directly affect soil formation. Rainfall moves through the soil, dissolving some of the minerals and leaching nutrients, lime, and soluble salts downward. It also breaks down and moves the soil material. Alternating periods of freezing and thawing and of wetting and drying accelerate the mechanical weathering of the parent material. They also improve the physical condition of the soil by loosening and mixing the material. The wind moves soil material from one place to another. The extensive deposits of loess and sandy eolian material in the county are examples of soils deposited by the wind.

Plant and Animal Life

Plants and animals live in or on the soil and affect the physical and chemical properties of the soil. The kinds and amounts of plants and animals are determined by the other soil-forming factors.

The soils in Greeley County formed under mid and tall grasses. As grasses die, organic matter is added to the soil. The deep, fibrous root system of the grasses improves the porosity and structure of the soil. Because of the improved porosity, the activity of bacteria and of earthworms and other burrowing animals increases. The deep roots transport minerals and plant nutrients to the surface, thus improving fertility. As the dead plants and animals decompose, humus is added to the soil and plant nutrients are released.

Some bacteria in the soil take in nitrogen from the air. After the bacteria die, the nitrogen is available to plants. Various micro-organisms decompose plant material and dead animals, forming organic matter, which darkens the surface layer. Cicadas, earthworms, and other burrowing animals help to mix the soil material, increasing the pore space.

In the wetter soils, which tend to be cooler than the drier soils, the activity of micro-organisms and animals is less extensive. As a result, the organic matter is broken down more slowly.

Relief

Relief affects soil formation through its effects on drainage, erosion, plant cover, and soil temperature. The degree of the slopes in the soils of Greeley County range from less than 1 percent in the valleys to 60 percent on the steeper dunes and breaks along drainageways. The soils on east- and north-facing slopes have slightly cooler temperatures than those on west- and south-facing slopes.

The nearly level and gently sloping soils on the loess uplands have more distinct horizons than those of the steeper soils. They absorb more moisture and are affected by percolation to a greater depth. As a result, lime and plant nutrients are leached to a greater depth. The very steep soils have a thin, light colored surface layer and are only slightly leached.

The soils on sandhills have little or no runoff. The excessively drained soils in the sandhills have indistinct horizons because the sandy material is highly resistant to chemical weathering. Lime has been leached out of the profile.

Some of the soils on bottom land have a high water table and generally have a dark surface layer that is fairly high in content of organic matter. Other soils on bottom land are periodically flooded and are subject to sedimentation. As a result, the soils are stratified and almost no horizons have developed.

Time

The resistance of the parent material to weathering and the length of time that it has been in place are the main factors determining the extent of soil formation. Soils that have been in place for a long time generally have well defined horizons.

The soils on sandhills and bottom land in Greeley County do not have well defined horizons. The parent material has not been in place long enough for profile development. The sandy parent material in the sandhills is very resistant to weathering. As a result, the rate of soil formation is slow. Because the sandy material is not very stable, soil blowing can remove the soil material from one place and deposit it in another. When this process takes place, a new cycle of soil formation begins. A new cycle also begins when floodwater on the bottom land deposits new material over older parent material.

The loess in the uplands has been in place much longer than the parent material in the sandhills and on the bottom land. As a result, the soils that formed in loess are more mature. The loess is less resistant to weathering than the sandy material. Genetic horizons have had time to develop, and subsoils have formed.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

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

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

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.
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.
Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.
Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.
Coarse textured soil. Sand or loamy sand.
Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.
Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.
Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.
Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.
Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.
Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

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

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. 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 that part of the soil profile between depths of 10 inches and 40 or 80 inches.
Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.
Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.
Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.
Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.
Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.
Depth, soil. The total thickness of weathered soil material over bedrock. In this survey the classes of soil depth are very shallow, 0 to 10 inches; shallow, 10 to 20 inches; moderately deep, 20 to 40 inches; and deep, more than 40 inches.
Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-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.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate

1.25 to 1.75 .... moderately high
1.75 to 2.5 .... high
More than 2.5 .... very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. A general term for plant and animal residue, in or on the soil, in various stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition.

Organic matter content. The amount of organic matter in soil material. The classes used in this survey are very low, less than 0.5 percent; low, 0.5 to 1.0 percent; moderately low, 1.0 to 2.0 percent; moderate, 2.0 to 4.0 percent; and high, 4.0 to 8.0 percent.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

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

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the classes of slope are:

Nearly level	0 to 1 percent, 0 to 2 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 6 percent
Strongly sloping	6 to 9 percent, 6 to 11 percent
Moderately steep	11 to 17 percent
Steep	17 to 30 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, that are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Wind stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-81 at Greeley, Nebraska)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	33.3	8.9	21.1	65	-22	0	0.42	0.11	0.66	1	4.2
February----	39.9	14.6	27.3	73	-16	11	.70	.21	1.09	2	4.6
March-------	49.4	23.4	36.4	81	-4	36	1.47	.48	2.28	4	4.0
April-------	64.9	36.1	50.5	91	15	127	2.59	1.16	3.80	5	.4
May---------	74.6	46.8	60.7	94	25	342	3.70	1.92	5.24	7	.0
June--------	84.4	56.7	70.6	102	38	618	3.77	2.18	5.17	7	.0
July--------	89.8	62.0	75.9	105	45	803	3.34	1.75	4.72	6	.0
August------	88.1	59.9	74.0	101	43	744	3.11	1.14	4.73	5	.0
September---	79.3	49.8	64.6	99	28	438	2.25	.79	3.45	4	.0
October-----	69.2	38.1	53.7	92	16	179	1.25	.26	2.03	3	.3
November----	51.1	24.7	37.9	77	0	8	.82	.07	1.38	2	.8
December----	38.7	14.5	26.6	70	-17	0	.59	.24	.89	2	4.4
Yearly:											
Average---	63.6	36.3	49.9	---	---	---	---	---	---	---	---
Extreme---	---	---	---	105	-24	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,306	24.01	18.79	28.40	48	18.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-81 at Greeley, Nebraska)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 1	May 14	May 20
2 years in 10 later than--	Apr. 26	May 9	May 16
5 years in 10 later than--	Apr. 16	Apr. 29	May 7
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 10	Sept. 28	Sept. 14
2 years in 10 earlier than--	Oct. 14	Oct. 4	Sept. 19
5 years in 10 earlier than--	Oct. 23	Oct. 14	Sept. 30

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-81 at Greeley, Nebraska)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	170	144	124
8 years in 10	176	152	131
5 years in 10	189	167	145
2 years in 10	202	181	159
1 year in 10	209	189	167

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ae	Almeria loamy fine sand, channeled	760	0.2
AnB	Anselmo fine sandy loam, 1 to 3 percent slopes	4,250	1.2
AnC	Anselmo fine sandy loam, 3 to 6 percent slopes	1,600	0.4
Ba	Barney loam, channeled	200	0.1
Be	Blendon fine sandy loam, 0 to 2 percent slopes	570	0.2
Bf	Blendon loam, 0 to 1 percent slopes	1,040	0.3
Br	Boel loam, 0 to 2 percent slopes	2,400	0.7
Ca	Cass fine sandy loam, 0 to 2 percent slopes	960	0.3
CrG	Coly-Hobbs silt loams, 2 to 60 percent slopes	13,790	3.8
CuE2	Coly-Uly silt loams, 11 to 17 percent slopes, eroded	41,955	11.4
Cy	Cozad silt loam, terrace, 0 to 1 percent slopes	2,030	0.6
CyB	Cozad silt loam, terrace, 1 to 3 percent slopes	920	0.3
DuB	Dunday loamy fine sand, 0 to 3 percent slopes	5,340	1.5
DuC	Dunday loamy fine sand, 3 to 6 percent slopes	2,350	0.6
Fu	Fluvaquents, sandy	420	0.1
GfC2	Gates silt loam, 3 to 6 percent slopes, eroded	3,070	0.8
GfD2	Gates silt loam, 6 to 11 percent slopes, eroded	4,570	1.3
GfE2	Gates silt loam, 11 to 17 percent slopes, eroded	2,930	0.8
GhB	Gates-Hersh complex, 0 to 3 percent slopes	5,260	1.4
Ha	Hall silt loam, 0 to 1 percent slopes	2,050	0.6
HaB	Hall silt loam, 1 to 3 percent slopes	4,510	1.2
HeB	Hersh fine sandy loam, 0 to 3 percent slopes	810	0.2
HeC	Hersh fine sandy loam, 3 to 6 percent slopes	2,890	0.8
HeD	Hersh fine sandy loam, 6 to 11 percent slopes	2,320	0.6
HeE	Hersh fine sandy loam, 11 to 17 percent slopes	770	0.2
HgF	Hersh-Gates complex, 15 to 30 percent slopes	5,660	1.6
Hk	Hobbs silt loam, 0 to 2 percent slopes	11,930	3.3
Hm	Hobbs silt loam, channeled	3,350	0.9
HoC	Holdrege silt loam, 3 to 6 percent slopes	1,090	0.3
HpC2	Holdrege silty clay loam, 3 to 6 percent slopes, eroded	4,400	1.2
HtC	Hord silt loam, 3 to 6 percent slopes	9,230	2.5
Hy	Hord silt loam, terrace, 0 to 1 percent slopes	8,850	2.4
HyB	Hord silt loam, terrace, 1 to 3 percent slopes	12,440	3.4
IpB	Ipage loamy fine sand, 0 to 3 percent slopes	1,660	0.4
ItB	Ipage fine sand, 0 to 3 percent slopes	1,540	0.4
Ka	Kenesaw very fine sandy loam, 0 to 1 percent slopes	1,140	0.3
KaB	Kenesaw very fine sandy loam, 1 to 3 percent slopes	940	0.3
Le	Leshara silt loam, 0 to 1 percent slopes	2,630	0.7
Lo	Loup loam, 0 to 2 percent slopes	1,550	0.4
Sc	Scott silty clay loam, 0 to 1 percent slopes	80	*
SmB	Simeon loamy sand, 0 to 3 percent slopes	350	0.1
UbD	Uly silt loam, 6 to 11 percent slopes	10,800	3.0
UbE	Uly silt loam, 11 to 17 percent slopes	8,860	2.4
UcD2	Uly-Coly silt loams, 6 to 11 percent slopes, eroded	37,576	10.3
UcF	Uly-Coly silt loams, 15 to 30 percent slopes	56,876	15.6
VaB	Valentine fine sand, 0 to 3 percent slopes	220	0.1
VaD	Valentine fine sand, 3 to 9 percent slopes	9,300	2.5
VaE	Valentine fine sand, rolling	43,436	11.9
VaF	Valentine fine sand, rolling and hilly	7,820	2.1
VeB	Valentine loamy fine sand, 0 to 3 percent slopes	1,000	0.3
VeD	Valentine loamy fine sand, 3 to 9 percent slopes	14,570	4.0
	Total	365,063	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
AnB	Anselmo fine sandy loam, 1 to 3 percent slopes
AnC	Anselmo fine sandy loam, 3 to 6 percent slopes
Be	Blendon fine sandy loam, 0 to 2 percent slopes
Bf	Blendon loam, 0 to 1 percent slopes
Ca	Cass fine sandy loam, 0 to 2 percent slopes
Cy	Cozad silt loam, terrace, 0 to 1 percent slopes
CyB	Cozad silt loam, terrace, 1 to 3 percent slopes
GfC2	Gates silt loam, 3 to 6 percent slopes, eroded
GhB	Gates-Hersh complex, 0 to 3 percent slopes
Ha	Hall silt loam, 0 to 1 percent slopes
HaB	Hall silt loam, 1 to 3 percent slopes
HeB	Hersh fine sandy loam, 0 to 3 percent slopes
HeC	Hersh fine sandy loam, 3 to 6 percent slopes
Hk	Hobbs silt loam, 0 to 2 percent slopes
HoC	Holdrege silt loam, 3 to 6 percent slopes
HpC2	Holdrege silty clay loam, 3 to 6 percent slopes, eroded
HtC	Hord silt loam, 3 to 6 percent slopes
Hy	Hord silt loam, terrace, 0 to 1 percent slopes
HyB	Hord silt loam, terrace, 1 to 3 percent slopes
Ka	Kenesaw very fine sandy loam, 0 to 1 percent slopes
KaB	Kenesaw very fine sandy loam, 1 to 3 percent slopes
Le	Leshara silt loam, 0 to 1 percent slopes (where drained)

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS

(Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability		Corn		Grain sorghum		Winter wheat		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
Ae: Almeria	VIw	---	---	---	---	---	---	---	---	---
AnB: Anselmo	IIe	IIe	52	143	62	121	38	---	2.7	5.3
AnC: Anselmo	IIIe	IIIe	47	138	53	115	31	---	1.7	5.0
Ba: Barney	VIw	---	---	---	---	---	---	---	---	---
Be: Blendon	IIe	IIe	54	145	62	120	39	---	2.7	5.5
Bf: Blendon	IIc	I	56	150	64	128	42	---	3.2	6.4
Br: Boel	IIIw	IIIw	51	136	57	116	36	---	2.0	4.5
Ca: Cass	IIe	IIe	52	143	57	121	38	---	2.6	5.3
CrG: Coly-Hobbs	VIIe	---	---	---	---	---	---	---	---	---
CuE2: Coly-Uly	VIe	---	---	---	---	---	---	---	---	---
Cy: Cozad	IIc	I	58	151	65	128	43	---	3.8	6.5
CyB: Cozad	IIe	IIe	56	147	63	125	42	---	3.0	6.0
DuB: Dunday	IVe	IIIe	38	135	37	105	24	---	1.3	4.1
DuC: Dunday	IVe	IVe	35	112	34	100	21	---	1.0	3.0
Fu: Fluvaquents	VIIIw	---	---	---	---	---	---	---	---	---
GfC2: Gates	IIIe	IIIe	44	138	55	118	35	---	1.8	5.0
GfD2: Gates	IVe	IVe	39	132	44	100	28	---	1.5	3.5
GfE2: Gates	VIe	---	---	---	---	---	---	---	---	---
GhB: Gates-Hersh	IIIe	IIIe	40	141	51	119	29	---	1.5	4.3

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Corn		Grain sorghum		Winter wheat		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
Ha: Hall	IIc	I	57	149	64	127	42	---	3.5	6.3
HaB: Hall	IIe	IIe	56	145	62	123	41	---	3.0	6.0
HeB: Hersh	IIIe	IIe	47	142	49	119	31	---	1.8	5.2
HeC: Hersh	IIIe	IIIe	43	139	48	106	30	---	1.6	4.5
HeD: Hersh	IVe	IVe	40	131	41	100	27	---	1.2	4.0
HeE: Hersh	VIe	---	---	---	---	---	---	---	---	---
HgF: Hersh-Gates	VIe	---	---	---	---	---	---	---	---	---
Hk: Hobbs	IIw	IIw	60	147	66	129	42	---	3.4	6.1
Hm: Hobbs	VIw	---	---	---	---	---	---	---	---	---
HoC: Holdrege	IIIe	IIIe	53	140	58	120	38	---	2.3	5.1
HpC2: Holdrege	IIIe	IIIe	50	138	56	118	35	---	1.9	5.0
HtC: Hord	IIIe	IIIe	53	141	59	121	38	---	2.3	5.1
Hy: Hord	IIc	I	58	152	67	130	43	---	3.8	6.5
HyB: Hord	IIe	IIe	56	147	65	125	42	---	3.0	6.0
IpB: Ipage	IVe	IVe	30	115	35	100	24	---	1.3	3.0
ItB: Ipage	VIe	IVe	---	110	---	90	---	---	---	2.5
Ka: Kenesaw	IIc	I	57	150	61	126	42	---	3.2	6.3
KaB: Kenesaw	IIe	IIe	55	146	57	120	41	---	3.0	6.0
Le: Leshara	IIw	IIw	65	148	68	129	45	---	4.5	6.2
Lo: Loup	Vw	---	---	---	---	---	---	---	---	---

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Corn		Grain sorghum		Winter wheat		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
Sc------------------ Scott	IVw	---	36	---	30	---	16	---	---	---
SmB----------------- Simeon	VIs	IVs	---	90	---	84	---	---	---	2.0
UbD----------------- Uly	IVe	IVe	46	135	48	104	30	---	1.7	4.0
UbE----------------- Uly	VIe	---	---	---	---	---	---	---	---	---
UcD2---------------- Uly-Coly	IVe	IVe	44	132	45	100	28	---	1.5	3.5
UcF----------------- Uly-Coly	VIe	---	---	---	---	---	---	---	---	---
VaB----------------- Valentine	VIe	IVe	---	97	---	86	---	---	---	2.5
VaD----------------- Valentine	VIe	IVe	---	91	---	84	---	---	---	2.2
VaE----------------- Valentine	VIe	---	---	---	---	---	---	---	---	---
VaF----------------- Valentine	VIIe	---	---	---	---	---	---	---	---	---
VeB----------------- Valentine	IVe	IVe	28	110	35	95	18	---	0.8	2.7
VeD----------------- Valentine	VIe	IVe	---	105	---	90	---	---	---	2.3

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass) Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	---	---	---	---	---
(I)	15,110	---	---	---	---
II (N)	54,260	24,590	14,560	---	15,110
(I)	39,960	25,400	14,560	---	---
III (N)	30,750	28,350	2,400	---	---
(I)	35,280	32,880	2,400	---	---
IV (N)	65,320	65,240	80	---	---
(I)	85,680	85,330	---	350	---
V (N)	1,550	---	1,550	---	---
VI (N)	191,153	186,493	4,310	350	---
VII (N)	21,610	21,610	---	---	---
VIII (N)	420	---	420	---	---

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Ae: Almeria	Wet Subirrigated	Favorable	5,700	Prairie cordgrass	25
		Normal	5,200	Switchgrass	20
		Unfavorable	4,700	Big bluestem	20
				Reedgrass	15
				Sedge	10
AnB, AnC: Anselmo	Sandy	Favorable	3,500	Little bluestem	25
		Normal	3,300	Sand bluestem	15
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	15
				Blue grama	10
				Switchgrass	5
				Western wheatgrass	5
Ba: Barney	Wetland	Favorable	5,500	Prairie cordgrass	20
		Normal	5,200	Northern reedgrass	20
		Unfavorable	5,000	Bluejoint reedgrass	20
				Sedge	10
				Rush	10
				Plains bluegrass	5
Be, Bf: Blendon	Sandy	Favorable	3,500	Little bluestem	25
		Normal	2,900	Prairie sandreed	20
		Unfavorable	2,000	Needleandthread	15
				Big bluestem	10
				Blue grama	10
				Porcupinegrass	5
				Leadplant	5
				Sedge	5
				Sand bluestem	5
Br: Boel	Subirrigated	Favorable	5,200	Big bluestem	30
		Normal	4,900	Indiangrass	15
		Unfavorable	4,600	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
Ca: Cass	Sandy Lowland	Favorable	3,500	Sand bluestem	25
		Normal	3,200	Little bluestem	20
		Unfavorable	3,000	Prairie sandreed	20
				Switchgrass	10
				Needleandthread	10
				Blue grama	5
CrG*:					
Coly	Thin Loess	Favorable	2,800	Little bluestem	35
		Normal	2,600	Big bluestem	20
		Unfavorable	2,400	Sideoats grama	10
				Plains muhly	5
				Sedge	5
				Indiangrass	5
				Switchgrass	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
CrG*:					
Hobbs	Silty Overflow	Favorable	4,500	Big bluestem	30
		Normal	4,000	Western wheatgrass	20
		Unfavorable	3,800	Little bluestem	15
				Switchgrass	10
				Sideoats grama	5
				Sedge	5
CuE2*:					
Coly	Limy Upland	Favorable	3,300	Little bluestem	30
		Normal	3,000	Big bluestem	20
		Unfavorable	2,700	Sideoats grama	10
				Western wheatgrass	10
				Sedge	5
				Blue grama	5
				Indiangrass	5
Uly	Silty	Favorable	3,700	Big bluestem	25
		Normal	3,200	Little bluestem	25
		Unfavorable	2,700	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Sedge	5
Cy, CyB Cozad	Silty Lowland	Favorable	4,500	Big bluestem	30
		Normal	4,200	Little bluestem	20
		Unfavorable	3,800	Western wheatgrass	15
				Sideoats grama	10
				Blue grama	5
				Sedge	5
DuB, DuC Dunday	Sandy	Favorable	3,300	Sand bluestem	25
		Normal	3,000	Little bluestem	20
		Unfavorable	2,600	Prairie sandreed	15
				Needleandthread	10
				Blue grama	10
				Switchgrass	5
				Sedge	5
GfC2, GfD2, GfE2 Gates	Silty	Favorable	3,700	Big bluestem	30
		Normal	3,200	Little bluestem	15
		Unfavorable	2,700	Indiangrass	10
				Switchgrass	10
				Sideoats grama	5
				Blue grama	5
				Needleandthread	5
				Sedge	5
				Leadplant	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
GhB*:					
Gates	Sandy	Favorable	3,700	Sand bluestem	30
		Normal	3,200	Prairie sandreed	15
		Unfavorable	2,700	Little bluestem	15
				Switchgrass	10
				Needleandthread	10
				Blue grama	5
				Sedge	5
Hersh	Sandy	Favorable	3,500	Sand bluestem	30
		Normal	3,300	Little bluestem	25
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
Ha, HaB: Hall	Silty	Favorable	4,000	Little bluestem	25
		Normal	3,600	Big bluestem	20
		Unfavorable	3,300	Western wheatgrass	15
				Blue grama	10
				Sideoats grama	10
				Switchgrass	5
				Sedge	5
HeB, HeC, HeD, HeE: Hersh	Sandy	Favorable	3,500	Sand bluestem	30
		Normal	3,300	Little bluestem	25
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
HgF*:					
Hersh	Sandy	Favorable	3,500	Sand bluestem	30
		Normal	3,300	Little bluestem	25
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
Gates	Silty	Favorable	3,700	Big bluestem	30
		Normal	3,200	Little bluestem	15
		Unfavorable	2,700	Indiangrass	10
				Switchgrass	10
				Sideoats grama	5
				Blue grama	5
				Needleandthread	5
				Sedge	5
				Leadplant	5
Hk, Hm: Hobbs	Silty Overflow	Favorable	4,500	Big bluestem	30
		Normal	4,000	Western wheatgrass	20
		Unfavorable	3,800	Little bluestem	15
				Switchgrass	10
				Sideoats grama	5
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
HoC, HpC2	Silty	Favorable	4,000	Big bluestem	20
Holdrege		Normal	3,600	Little bluestem	20
		Unfavorable	3,300	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Indiangrass	5
				Buffalograss	5
				Sand dropseed	5
				Sedge	5
HtC	Silty	Favorable	4,000	Big bluestem	20
Hord		Normal	3,600	Little bluestem	20
		Unfavorable	3,300	Blue grama	10
				Needleandthread	10
				Western wheatgrass	10
				Sideoats grama	5
				Buffalograss	5
Hy, HyB	Silty Lowland	Favorable	4,500	Big bluestem	30
Hord		Normal	4,200	Little bluestem	20
		Unfavorable	3,800	Switchgrass	10
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5
IpB, ItB	Sandy Lowland	Favorable	3,500	Sand bluestem	25
Ipage		Normal	3,200	Little bluestem	20
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Indiangrass	5
				Sedge	5
				Switchgrass	5
				Blue grama	5
Ka, KaB	Silty	Favorable	4,000	Little bluestem	25
Kenesaw		Normal	3,600	Big bluestem	20
		Unfavorable	3,300	Western wheatgrass	15
				Sideoats grama	10
				Switchgrass	5
				Blue grama	5
				Sedge	5
Le	Subirrigated	Favorable	5,500	Big bluestem	30
Leshara		Normal	5,300	Little bluestem	20
		Unfavorable	5,000	Switchgrass	10
				Indiangrass	10
				Prairie cordgrass	10
				Sedge	10
Lo	Wet Subirrigated	Favorable	5,800	Switchgrass	25
Loup		Normal	5,500	Indiangrass	15
		Unfavorable	5,300	Prairie cordgrass	15
				Big bluestem	15
				Plains bluegrass	5
				Northern reedgrass	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
SmB----------------Simeon	Shallow to Gravel	Favorable	1,800	Blue grama	20
		Normal	1,600	Prairie sandreed	15
		Unfavorable	1,100	Needleandthread	15
				Sand bluestem	10
				Little bluestem	10
				Clubmoss	10
				Hairy grama	5
				Sand dropseed	5
UbD, UbE-----------Uly	Silty	Favorable	3,700	Big bluestem	25
		Normal	3,200	Little bluestem	25
		Unfavorable	2,700	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Sedge	5
UcD2*, UcF*:					
Uly	Silty	Favorable	3,700	Big bluestem	25
		Normal	3,200	Little bluestem	25
		Unfavorable	2,700	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Sedge	5
Coly	Limy Upland	Favorable	3,300	Little bluestem	30
		Normal	3,000	Big bluestem	20
		Unfavorable	2,700	Sideoats grama	10
				Western wheatgrass	10
				Sedge	5
				Blue grama	5
				Indiangrass	5
VaB----------------Valentine	Sandy	Favorable	3,300	Sand bluestem	20
		Normal	3,000	Little bluestem	20
		Unfavorable	2,600	Prairie sandreed	20
				Needleandthread	15
				Blue grama	10
				Switchgrass	5
				Sand dropseed	5
VaD, VaE-----------Valentine	Sands	Favorable	3,000	Sand bluestem	25
		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	20
				Switchgrass	10
				Sand lovegrass	5
				Blue grama	5
				Needleandthread	5
VaF*:					
Valentine, rolling	Sands	Favorable	3,000	Sand bluestem	25
		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	20
				Switchgrass	10
				Sand lovegrass	5
				Blue grama	5
				Needleandthread	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
VaF*:					
Valentine, hilly	Choppy Sands	Favorable	2,800	Sand bluestem	20
		Normal	2,400	Prairie sandreed	20
		Unfavorable	2,000	Little bluestem	15
				Switchgrass	10
				Needleandthread	10
				Sand lovegrass	5
				Blue grama	5
				Sandhill muhly	5
VeB Valentine	Sandy	Favorable	3,300	Sand bluestem	20
		Normal	3,000	Little bluestem	20
		Unfavorable	2,600	Prairie sandreed	20
				Needleandthread	15
				Blue grama	10
				Switchgrass	5
				Sand dropseed	5
VeD Valentine	Sands	Favorable	3,000	Sand bluestem	25
		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	20
				Switchgrass	10
				Sand lovegrass	5
				Blue grama	5
				Needleandthread	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ae. Almeria					
AnB, AnC---------- Anselmo	Lilac, American plum.	Common chokecherry	Eastern redcedar, Austrian pine, ponderosa pine, Scotch pine, honeylocust, green ash, hackberry, Russian mulberry.	Siberian elm------	---
Ba. Barney					
Be, Bf------------ Blendon	Skunkbush sumac, lilac.	Eastern redcedar, Siberian peashrub, Russian olive, Manchurian crabapple.	Green ash, honeylocust, hackberry, ponderosa pine.	Siberian elm------	---
Br---------------- Boel	Redosier dogwood, American plum.	Common chokecherry	Hackberry, green ash, Austrian pine, Russian mulberry, eastern redcedar.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
Ca---------------- Cass	American plum-----	Amur honeysuckle, lilac.	Eastern redcedar, ponderosa pine, Russian olive, Austrian pine, green ash, Russian mulberry.	Honeylocust, hackberry.	Eastern cottonwood.
CrG*: Coly.					
Hobbs------------	American plum-----	Amur honeysuckle, lilac, Siberian peashrub.	Eastern redcedar, Austrian pine, ponderosa pine, green ash, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
CuE2*: Coly-------------	Silver buffaloberry, fragrant sumac, Siberian peashrub.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
Uly--------------	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm------	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Cy, CyB----------- Cozad	American plum-----	Lilac, Amur honeysuckle.	Eastern redcedar, Austrian pine, Russian olive, ponderosa pine, green ash, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
DuB, DuC---------- Dunday	Skunkbush sumac, lilac.	Eastern redcedar, Manchurian crabapple, Russian olive, Siberian peashrub.	Ponderosa pine, green ash, hackberry, honeylocust.	Siberian elm------	---
Fu. Fluvaquents					
GfC2, GfD2, GfE2-- Gates	Amur honeysuckle, fragrant sumac, lilac.	Russian mulberry	Green ash, honeylocust, Russian olive, eastern redcedar, bur oak, ponderosa pine, hackberry.	Siberian elm------	---
GhB*:					
Gates------------	Amur honeysuckle, fragrant sumac, lilac.	Russian mulberry	Green ash, honeylocust, Russian olive, eastern redcedar, bur oak, ponderosa pine, hackberry.	Siberian elm------	---
Hersh------------	Lilac, American plum.	Common chokecherry	Eastern redcedar, honeylocust, hackberry, ponderosa pine, green ash, Russian mulberry, Scotch pine, Austrian pine.	Siberian elm------	---
Ha, HaB----------- Hall	Amur honeysuckle, lilac, fragrant sumac.	Russian mulberry	Eastern redcedar, Austrian pine, green ash, honeylocust, hackberry, bur oak, Russian olive.	Siberian elm------	---
HeB, HeC, HeD, HeE-------------- Hersh	Lilac, American plum.	Common chokecherry	Eastern redcedar, honeylocust, hackberry, ponderosa pine, green ash, Russian mulberry, Scotch pine, Austrian pine.	Siberian elm------	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
HgF: Hersh.					
Gates.					
Hk: Hobbs	American plum.	Amur honeysuckle, lilac, Siberian peashrub.	Eastern redcedar, Austrian pine, ponderosa pine, green ash, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
Hm. Hobbs					
HoC, HpC2: Holdrege	Lilac, Amur honeysuckle, fragrant sumac.	Russian mulberry	Eastern redcedar, Austrian pine, green ash, honeylocust, hackberry, bur oak, Russian olive.	Siberian elm	---
HtC: Hord	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Ponderosa pine, hackberry, blue spruce, bur oak, Russian olive.	Green ash, honeylocust.	---
Hy, HyB: Hord	Peking cotoneaster	Lilac, Siberian peashrub, American plum.	Eastern redcedar, ponderosa pine, blue spruce, Manchurian crabapple.	Golden willow, green ash, hackberry.	Eastern cottonwood.
IpB: Ipage	Lilac, skunkbush sumac.	Eastern redcedar, Siberian peashrub, Manchurian crabapple, Russian olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
ItB: Ipage	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
Ka, KaB: Kenesaw	Fragrant sumac, Amur honeysuckle, lilac.	Russian mulberry	Eastern redcedar, green ash, honeylocust, hackberry, Russian olive, bur oak, Austrian pine.	Siberian elm	---
Le: Leshara	Redosier dogwood, American plum.	Common chokecherry	Eastern redcedar, Russian mulberry, hackberry, Austrian pine, green ash.	Golden willow, honeylocust, silver maple.	Eastern cottonwood.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Lo----------------- Loup	Redosier dogwood	---	---	Golden willow-----	Eastern cottonwood.
Sc. Scott					
SmB. Simeon					
UbD, UbE---------- Uly	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm------	---
UcD2*:					
Uly--------------	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm------	---
Coly-------------	Silver buffaloberry, fragrant sumac, Siberian peashrub.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
UcF*:					
Uly.					
Coly.					
VaB, VaD, VaE, VaF Valentine	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
VeB--------------- Valentine	Lilac, skunkbush sumac.	Eastern redcedar, Russian olive, Manchurian crabapple, Siberian peashrub.	Hackberry, ponderosa pine, green ash, honeylocust.	Siberian elm------	---
VeD--------------- Valentine	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ae-------------------- Almeria	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
AnB------------------- Anselmo	Slight---------------	Slight---------------	Slight---------------	Slight.
AnC------------------- Anselmo	Slight---------------	Slight---------------	Moderate: slope.	Slight.
Ba-------------------- Barney	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Be, Bf---------------- Blendon	Slight---------------	Slight---------------	Slight---------------	Slight.
Br-------------------- Boel	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Ca-------------------- Cass	Severe: flooding.	Slight---------------	Slight---------------	Slight.
CrG*:				
Coly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Hobbs----------------	Severe: flooding.	Slight---------------	Moderate: slope, flooding.	Slight.
CuE2*:				
Coly-----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Uly------------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Cy-------------------- Cozad	Severe: flooding.	Slight---------------	Slight---------------	Slight.
CyB------------------- Cozad	Severe: flooding.	Slight---------------	Moderate: slope.	Slight.
DuB------------------- Dunday	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
DuC------------------- Dunday	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.
Fu-------------------- Fluvaquents	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
GfC2: Gates	Slight	Slight	Moderate: slope.	Severe: erodes easily.
GfD2, GfE2: Gates	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
GhB*:				
Gates	Slight	Slight	Slight	Slight.
Hersh	Slight	Slight	Slight	Slight.
Ha: Hall	Slight	Slight	Slight	Slight.
HaB: Hall	Slight	Slight	Moderate: slope.	Slight.
HeB: Hersh	Slight	Slight	Slight	Slight.
HeC: Hersh	Slight	Slight	Moderate: slope.	Slight.
HeD, HeE: Hersh	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
HgF*:				
Hersh	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Gates	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
Hk: Hobbs	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Hm: Hobbs	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
HoC, HpC2: Holdrege	Slight	Slight	Moderate: slope.	Slight.
HtC: Hord	Slight	Slight	Moderate: slope.	Slight.
Hy, HyB: Hord	Severe: flooding.	Slight	Slight	Slight.
IpB: Ipage	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
ItB: Ipage	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Ka, KaB: Kenesaw	Slight	Slight	Slight	Slight.
Le: Leshara	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lo: Loup	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Sc: Scott	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
SmB: Simeon	Slight	Slight	Slight	Slight.
UbD, UbE: Uly	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
UcD2*:				
Uly	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Coly	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
UcF*:				
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
VaB: Valentine	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
VaD: Valentine	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
VaE: Valentine	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
VaF*:				
Valentine, rolling	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Valentine, hilly	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.
VeB: Valentine	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
VeD: Valentine	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ae----------------- Almeria	Poor	Fair	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
AnB---------------- Anselmo	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
AnC---------------- Anselmo	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Ba----------------- Barney	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Be, Bf------------- Blendon	Fair	Fair	Good	Fair	Very poor.	---	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Good.
Br----------------- Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair.
Ca----------------- Cass	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
CrG*:												
Coly---------------	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Hobbs--------------	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
CuE2*:												
Coly---------------	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Uly----------------	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Cy, CyB------------ Cozad	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
DuB, DuC----------- Dunday	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Fu----------------- Fluvaquents	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good	Very poor.
GfC2, GfD2--------- Gates	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
GfE2--------------- Gates	Poor	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
GhB*:												
Gates--------------	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
GhB*:												
Hersh	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Ha, HaB Hall	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
HeB, HeC, HeD Hersh	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
HeE Hersh	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
HgF*:												
Hersh	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Gates	Poor	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Hk Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Hm Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
HoC, HpC2 Holdrege	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
HtC Hord	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Hy, HyB Hord	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
IpB, ItB Ipage	Poor	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Ka, KaB Kenesaw	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Le Leshara	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Lo Loup	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Sc Scott	Poor	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Fair.
SmB Simeon	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
UbD Uly	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
UbE Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
UcD2*:												
Uly	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Coly	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
UcF*:												
Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Coly	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
VaB, VaD, VaE Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VaF*:												
Valentine, rolling	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Valentine, hilly	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
VeB Valentine	Fair	Good	Fair	Poor	Fair	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VeD Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ae----------------- Almeria	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
AnB---------------- Anselmo	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
AnC---------------- Anselmo	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
Ba----------------- Barney	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Be, Bf------------- Blendon	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Br----------------- Boel	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, droughty, flooding.
Ca----------------- Cass	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
CrG*:						
Coly--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hobbs-------------	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
CuE2*:						
Coly--------------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
Uly---------------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Cy, CyB------------ Cozad	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
DuB---------------- Dunday	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
DuC---------------- Dunday	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Fu----------------- Fluvaquents	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding.
GfC2-------------- Gates	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
GfD2, GfE2-------- Gates	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
GhB*:						
Gates------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Hersh------------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Ha, HaB----------- Hall	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
HeB--------------- Hersh	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
HeC--------------- Hersh	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
HeD, HeE---------- Hersh	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
HgF*:						
Hersh------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gates------------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hk---------------- Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Hm---------------- Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
HoC, HpC2--------- Holdrege	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
HtC--------------- Hord	Slight---------	Slight---------	Slight---------	Moderate: slope.	Severe: low strength.	Slight.
Hy, HyB----------- Hord	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
IpB, ItB---------- Ipage	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Severe: droughty.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ka, KaB----------- Kenesaw	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength, frost action.	Slight.
Le---------------- Leshara	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Lo---------------- Loup	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
Sc---------------- Scott	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
SmB--------------- Simeon	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
UbD, UbE---------- Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
UcD2*:						
Uly--------------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Coly-------------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
UcF*:						
Uly--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Coly-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VaB--------------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
VaD--------------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
VaE, VaF---------- Valentine	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VeB--------------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
VeD--------------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ae: Almeria	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
AnB, AnC: Anselmo	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Ba: Barney	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Be, Bf: Blendon	Slight: percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Br: Boel	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Ca: Cass	Moderate: flooding.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
CrG*:					
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
CuE2*:					
Coly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Cy: Cozad	Moderate: flooding.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
CyB: Cozad	Moderate: flooding.	Moderate: seepage, slope.	Moderate: flooding.	Moderate: flooding.	Good.
DuB, DuC: Dunday	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Fu: Fluvaquents	Severe: flooding, ponding.	Severe: seepage, flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding.

See footnote at end of table.

TABLE 13.--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
GfC2: Gates	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too sandy.	Slight	Good.
GfD2, GfE2: Gates	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too sandy.	Moderate: slope.	Fair: slope.
GhB*:					
Gates	Slight	Moderate: seepage.	Moderate: too sandy.	Slight	Good.
Hersh	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
Ha, HaB: Hall	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
HeB, HeC: Hersh	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
HeD, HeE: Hersh	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
HgF*:					
Hersh	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Gates	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hk, Hm: Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
HoC, HpC2: Holdrege	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
HtC: Hord	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Hy, HyB: Hord	Moderate: flooding.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
IpB, ItB: Ipage	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Ka, KaB: Kenesaw	Slight	Moderate: seepage.	Slight	Slight	Good.

See footnote at end of table.

TABLE 13.--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
Le------------------ Leshara	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness, thin layer.
Lo------------------ Loup	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Sc------------------ Scott	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
SmB----------------- Simeon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
UbD, UbE------------ Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UcD2*:					
Uly----------------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Coly---------------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UcF*:					
Uly----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Coly---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
VaB, VaD------------ Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VaE, VaF------------ Valentine	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
VeB, VeD------------ Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ae-------------------- Almeria	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
AnB, AnC-------------- Anselmo	Good------------------	Probable-------------	Improbable: too sandy.	Fair: thin layer.
Ba-------------------- Barney	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: area reclaim, wetness.
Be, Bf---------------- Blendon	Good------------------	Probable-------------	Improbable: too sandy.	Fair: small stones.
Br-------------------- Boel	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
Ca-------------------- Cass	Good------------------	Probable-------------	Improbable: too sandy.	Good.
CrG*:				
Coly------------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hobbs-----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CuE2*:				
Coly------------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Uly-------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Cy, CyB--------------- Cozad	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Good.
DuB, DuC-------------- Dunday	Good------------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
Fu-------------------- Fluvaquents	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
GfC2------------------ Gates	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
GfD2, GfE2------------ Gates	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
GhB*:				
Gates-----------------	Good------------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GhB*:				
Hersh	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Ha, HaB Hall	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
HeB, HeC Hersh	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
HeD, HeE Hersh	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
HgF*:				
Hersh	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Gates	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hk, Hm Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HoC Holdrege	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HpC2 Holdrege	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
HtC, Hy, HyB Hord	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
IpB, ItB Ipage	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Ka, KaB Kenesaw	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Le Leshara	Fair: wetness.	Probable	Improbable: too sandy.	Good.
Lo Loup	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Sc Scott	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
SmB Simeon	Good	Probable	Improbable: too sandy.	Poor: too sandy.
UbD, UbE Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UcD2*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
UcD2*:				
Coly	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UcF*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Coly	Fair: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
VaB, VaD Valentine	Good	Probable	Improbable: too sandy.	Poor: too sandy.
VaE Valentine	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
VaF*:				
Valentine, rolling	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
Valentine, hilly	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
VeB, VeD Valentine	Good	Probable	Improbable: too sandy.	Poor: too sandy.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ae: Almeria	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy.	Wetness, droughty, rooting depth.
AnB: Anselmo	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable	Too sandy, soil blowing.	Favorable.
AnC: Anselmo	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope	Too sandy, soil blowing.	Favorable.
Ba: Barney	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Be: Blendon	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Soil blowing	Favorable.
Bf: Blendon	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
Br: Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Droughty.
Ca: Cass	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Soil blowing	Favorable.
CrG*:							
Coly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Hobbs	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, flooding.	Favorable	Favorable.
CuE2*:							
Coly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
CuE2*:							
Uly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Cy, CyB Cozad	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
DuB Dunday	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
DuC Dunday	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Fu Fluvaquents	Severe: seepage.	Severe: seepage, ponding.	Slight	Ponding, flooding.	Ponding, droughty, rooting depth.	Too clayey	Wetness, droughty, rooting depth.
GfC2 Gates	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
GfD2, GfE2 Gates	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
GhB*:							
Gates	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Fast intake, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
Hersh	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Soil blowing	Favorable.
Ha, HaB Hall	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Favorable	Erodes easily	Erodes easily.
HeB Hersh	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Soil blowing	Favorable.
HeC Hersh	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
HeD, HeE Hersh	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Slope.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
HgF*:							
Hersh	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Slope.
Gates	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Hk, Hm: Hobbs	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Flooding	Favorable	Favorable.
HoC, HpC2: Holdrege	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Erodes easily	Erodes easily.
HtC: Hord	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope	Favorable	Favorable.
Hy, HyB: Hord	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Favorable	Favorable	Favorable.
IpB, ItB: Ipage	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Ka, KaB: Kenesaw	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Soil blowing, erodes easily.	Erodes easily.
Le: Leshara	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Erodes easily.
Lo: Loup	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Sc: Scott	Moderate: seepage.	Severe: hard to pack, ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Not needed	Not needed.
SmB: Simeon	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
UbD, UbE: Uly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
UcD2*, UcF*:							
Uly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Coly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
VaB Valentine	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
VaD Valentine	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
VaE, VaF Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
VeB Valentine	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
VeD Valentine	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In								Pct	
Ae----------------- Almeria	0-2	Loamy fine sand	SM, SM-SC, ML, CL-ML	A-2, A-4	100	100	50-80	15-55	<20	NP-5
	2-60	Stratified sand to fine sandy loam.	SM, SP-SM, SM-SC, SP	A-2, A-3, A-4	90-100	80-100	50-80	0-50	<20	NP-5
AnB, AnC--------- Anselmo	0-11	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	100	100	60-100	30-65	<25	NP-7
	11-24	Fine sandy loam, loam.	SM, ML, SM-SC, CL-ML	A-4	100	100	70-95	35-65	<25	NP-7
	24-60	Fine sandy loam	SM, SM-SC	A-4	100	100	70-85	40-50	<25	NP-7
Ba----------------- Barney	0-8	Loam-------------	ML, CL, CL-ML	A-4, A-6	90-100	90-100	85-95	60-95	20-35	3-15
	8-12	Stratified loam to sand.	SM, ML	A-2, A-4	90-100	90-100	55-80	20-60	---	NP
	12-60	Coarse sand, sand, fine sand.	SP, SM, SP-SM	A-1, A-2, A-3	90-100	85-100	30-70	3-15	---	NP
Be----------------- Blendon	0-13	Fine sandy loam	SM	A-4	100	90-100	60-100	35-50	20-30	NP-5
	13-21	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	100	85-100	60-100	20-65	20-30	NP-10
	21-27	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-4, A-2	100	85-100	60-100	20-45	<30	NP-10
	27-60	Fine sand, sand	SP, SP-SM, SM, SM-SC	A-3, A-2	100	95-100	60-80	0-20	<20	NP-5
Bf----------------- Blendon	0-17	Loam-------------	CL, CL-ML, ML	A-4, A-6	100	90-100	85-100	60-75	20-40	NP-15
	17-33	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	100	85-100	60-100	20-65	20-30	NP-10
	33-42	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-4, A-2	100	85-100	60-100	20-45	<30	NP-10
	42-54	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	85-100	65-100	50-100	10-45	<25	NP-5
	54-60	Fine sand, sand	SP, SP-SM, SM, SM-SC	A-3, A-2	100	95-100	60-80	0-20	<20	NP-5
Br----------------- Boel	0-14	Loam-------------	ML	A-4	100	100	85-100	70-95	24-37	2-10
	14-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	100	95-100	85-95	0-25	---	NP
Ca----------------- Cass	0-16	Fine sandy loam	SM, SM-SC	A-2, A-4	100	95-100	85-95	20-40	<20	NP-5
	16-60	Fine sandy loam, sandy loam, very fine sandy loam.	SM, SM-SC	A-2, A-4	100	95-100	85-95	20-50	<20	NP-5

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	4	10	40	200		
	In								Pct	
CrG*:										
Coly	0-4	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	100	100	85-100	85-100	20-45	2-20
	4-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	100	100	85-100	85-100	20-40	2-15
Hobbs	0-10	Silt loam	CL, CL-ML	A-4, A-6	100	100	95-100	85-100	25-40	5-20
	10-60	Stratified silt loam.	CL, CL-ML	A-4, A-6	100	100	95-100	85-100	25-40	5-20
CuE2*:										
Coly	0-5	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	100	100	85-100	85-100	20-45	2-20
	5-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	100	100	85-100	85-100	20-40	2-15
Uly	0-5	Silt loam	ML, CL	A-4, A-6	100	100	100	95-100	20-40	2-20
	5-18	Silt loam, silty clay loam.	ML, CL	A-4, A-6	100	100	100	95-100	25-40	3-15
	18-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	100	100	100	95-100	25-40	3-15
Cy, CyB Cozad	0-13	Silt loam	ML, CL, CL-ML	A-4, A-6	100	100	100	75-100	20-35	2-12
	13-25	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	95-100	95-100	90-100	80-95	20-35	2-12
	25-60	Silt loam, very fine sandy loam, fine sandy loam.	ML, CL, CL-ML	A-4, A-6	95-100	95-100	80-100	50-100	20-35	2-12
DuB, DuC Dunday	0-13	Loamy fine sand	SM, SM-SC	A-2	100	100	90-100	13-35	<25	NP-4
	13-60	Fine sand, loamy sand, loamy fine sand.	SM, SP-SM, SM-SC	A-2, A-3	100	100	50-95	5-35	<25	NP-4
Fu Fluvaquents	0-60	Loamy sand	SM, SP-SM	A-2, A-3, A-4	100	100	50-70	5-40	<25	NP-5
	60-80	Variable	---	---	---	---	---	---	---	---
GfC2, GfD2, GfE2- Gates	0-5	Silt loam	ML	A-4	100	100	95-100	65-100	20-40	NP-10
	5-60	Very fine sandy loam, silt loam, loamy very fine sand.	ML	A-4	100	100	95-100	85-100	20-40	NP-10
GhB*:										
Gates	0-11	Loamy fine sand	SM	A-2	100	95-100	65-85	15-30	---	NP
	11-17	Very fine sandy loam.	ML, CL-ML	A-4	100	100	95-100	65-100	<25	NP-5
	17-60	Very fine sandy loam, silt loam, loamy very fine sand.	ML, SM, CL-ML, SM-SC	A-4	100	100	95-100	35-100	<25	NP-5

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In								Pct	
GhB*:										
Hersh-----------	0-6	Fine sandy loam	SM, SC, SM-SC, ML	A-4	100	100	85-100	40-75	<25	NP-10
	6-10	Fine sandy loam, loamy very fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	100	100	80-100	40-65	<20	NP-5
	10-60	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SM-SC	A-4, A-2	100	100	80-100	25-50	<20	NP-5
Ha, HaB---------- Hall	0-12	Silt loam--------	CL, CL-ML, ML	A-4, A-6	100	100	95-100	95-100	25-40	3-18
	12-34	Silty clay loam, silt loam.	CL	A-6, A-7	100	100	95-100	95-100	35-50	15-30
	34-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	100	100	95-100	90-100	25-40	5-20
HeB, HeC, HeD, HeE------------- Hersh	0-5	Fine sandy loam	SM, SC, SM-SC, ML	A-4	100	100	85-100	40-75	<25	NP-10
	5-10	Fine sandy loam, loamy very fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	100	100	80-100	40-65	<20	NP-5
	10-60	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SM-SC	A-4, A-2	100	100	80-100	25-50	<20	NP-5
HgF*:										
Hersh-----------	0-5	Fine sandy loam	SM, SC, SM-SC, ML	A-4	100	100	85-100	40-75	<25	NP-10
	5-9	Fine sandy loam, loamy very fine sand, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	100	100	80-100	40-65	<20	NP-5
	9-60	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SM-SC	A-4, A-2	100	100	80-100	25-50	<20	NP-5
Gates-----------	0-5	Silt loam--------	ML	A-4	100	100	95-100	65-100	20-40	NP-10
	5-60	Very fine sandy loam, silt loam, loamy very fine sand.	ML	A-4	100	100	95-100	85-100	20-40	NP-10
Hk, Hm----------- Hobbs	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	100	100	95-100	85-100	25-40	5-20
	6-60	Stratified silt loam.	CL, CL-ML	A-4, A-6	100	100	95-100	85-100	25-40	5-20
HoC-------------- Holdrege	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	100	100	95-100	85-100	20-45	2-20
	7-25	Silty clay loam	CL, CH	A-7, A-6	100	100	98-100	90-100	30-55	15-35
	25-38	Silt loam, silty clay loam.	CL	A-6, A-4	100	100	95-100	95-100	25-40	9-17
	38-60	Silt loam--------	CL, ML	A-4, A-6	100	100	95-100	90-100	30-40	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	4	10	40	200		
	In								Pct	
HpC2------------- Holdrege	0-4	Silty clay loam	CL	A-7, A-6	100	100	95-100	85-100	30-50	15-35
	4-11	Silty clay loam	CL, CH	A-7, A-6	100	100	98-100	90-100	30-55	15-35
	11-28	Silt loam, silty clay loam.	CL	A-6, A-4	100	100	95-100	95-100	25-40	9-17
	28-60	Silt loam--------	CL, ML	A-4, A-6	100	100	95-100	90-100	30-40	5-15
HtC, Hy, HyB----- Hord	0-24	Silt loam--------	CL, ML, CL-ML	A-4, A-6	100	100	95-100	85-100	20-35	3-18
	24-42	Silt loam, silty clay loam, loam.	CL	A-6, A-4	100	100	98-100	85-100	25-40	8-23
	42-60	Silt loam, very fine sandy loam, silty clay loam.	CL, CL-ML	A-6, A-4	100	100	100	85-100	25-40	6-21
IpB-------------- Ipage	0-8	Loamy fine sand	SM, SP-SM	A-2	100	100	50-90	10-35	---	NP
	8-60	Fine sand, loamy sand, sand.	SM, SP-SM, SP	A-2, A-3	100	95-100	50-100	2-30	---	NP
ItB-------------- Ipage	0-8	Fine sand--------	SM, SP-SM	A-2, A-3	100	100	50-100	5-30	---	NP
	8-60	Fine sand, loamy sand, sand.	SM, SP-SM, SP	A-2, A-3	100	95-100	50-100	2-30	---	NP
Ka, KaB---------- Kenesaw	0-11	Very fine sandy loam.	SM, SC, ML, CL	A-4	100	100	85-100	35-80	20-30	2-10
	11-26	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	100	100	90-100	85-100	18-35	2-13
	26-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	100	100	95-100	80-100	20-35	2-12
Le--------------- Leshara	0-14	Silt loam--------	ML, CL, CL-ML	A-4, A-6	100	100	90-100	60-90	20-35	3-15
	14-46	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	100	100	90-100	60-90	20-35	3-15
	46-60	Coarse sand, gravelly sand, loamy sand.	SP, SP-SM, SM	A-2, A-1, A-3	85-100	65-95	30-65	3-15	---	NP
Lo--------------- Loup	0-9	Loam-------------	CL, CL-ML	A-4, A-6	100	100	90-100	55-80	15-35	4-15
	9-60	Fine sand, loamy sand, sand.	SP-SM, SM	A-2, A-3	95-100	95-100	65-100	5-20	---	NP
Sc--------------- Scott	0-6	Silty clay loam	CL	A-6, A-7	100	100	100	95-100	35-45	15-25
	6-28	Silty clay, clay	CH, CL	A-7	100	100	100	95-100	41-75	20-45
	28-36	Silty clay loam	CL, CH	A-7, A-6	100	100	100	95-100	35-60	20-40
	36-60	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6, A-7	100	100	90-100	90-100	25-50	8-24
SmB-------------- Simeon	0-7	Loamy sand-------	SM, SP-SM	A-2, A-3	95-100	90-100	51-95	5-35	<20	NP
	7-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	90-100	80-100	35-95	0-30	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	4	10	40	200		
	In								Pct	
UbD, UbE---------Uly	0-9	Silt loam--------	ML, CL	A-4, A-6	100	100	100	95-100	20-40	2-20
	9-27	Silt loam, silty clay loam.	ML, CL	A-4, A-6	100	100	100	95-100	25-40	3-15
	27-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	100	100	100	95-100	25-40	3-15
UcD2*:										
Uly--------------	0-6	Silt loam--------	ML, CL	A-4, A-6	100	100	100	95-100	20-40	2-20
	6-25	Silt loam, silty clay loam.	ML, CL	A-4, A-6	100	100	100	95-100	25-40	3-15
	25-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	100	100	100	95-100	25-40	3-15
Coly------------	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	100	100	85-100	85-100	20-45	2-20
	6-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	100	100	85-100	85-100	20-40	2-15
UcF*:										
Uly--------------	0-8	Silt loam--------	ML, CL	A-4, A-6	100	100	100	95-100	20-40	2-20
	8-25	Silt loam, silty clay loam.	ML, CL	A-4, A-6	100	100	100	95-100	25-40	3-15
	25-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	100	100	100	95-100	25-40	3-15
Coly------------	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	100	100	85-100	85-100	20-45	2-20
	4-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	100	100	85-100	85-100	20-40	2-15
VaB, VaD, VaE----Valentine	0-5	Fine sand--------	SM, SP-SM, SP	A-2, A-3	100	100	70-100	2-25	---	NP
	5-60	Fine sand, sand	SM, SP-SM, SP	A-2, A-3	100	100	70-100	2-25	---	NP
VaF--------------Valentine	0-4	Fine sand--------	SM, SP-SM, SP	A-2, A-3	100	100	70-100	2-25	---	NP
	4-60	Fine sand, sand	SM, SP-SM, SP	A-2, A-3	100	100	70-100	2-25	---	NP
VeB, VeD---------Valentine	0-6	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	100	100	95-100	2-35	---	NP
	6-11	Loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	100	100	90-100	2-35	---	NP
	11-60	Fine sand, sand	SM, SP-SM, SP	A-2, A-3	100	100	70-100	2-25	---	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Ae----------------- Almeria	0-2	3-10	1.35-1.55	6.0-20	0.10-0.12	6.1-8.4	<4	Low--------	0.17	5	8	.5-4
	2-60	1-10	1.55-1.80	6.0-20	0.05-0.12	6.1-8.4	<4	Low--------	0.15			
AnB, AnC---------- Anselmo	0-11	10-18	1.30-1.60	0.6-6.0	0.13-0.18	5.6-7.3	<2	Low--------	0.20	5	3	1-2
	11-24	10-18	1.40-1.60	2.0-6.0	0.15-0.19	6.6-7.8	<2	Low--------	0.20			
	24-60	10-18	1.40-1.60	2.0-6.0	0.12-0.16	6.6-7.8	<2	Low--------	0.24			
Ba----------------- Barney	0-8	10-20	1.40-1.50	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	4L	2-4
	8-12	3-10	1.60-1.80	2.0-20	0.09-0.14	6.6-8.4	<2	Low--------	0.17			
	12-60	0-5	1.70-1.90	>6.0	0.02-0.04	6.6-7.8	<2	Low--------	0.10			
Be----------------- Blendon	0-13	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low--------	0.20	5	3	2-4
	13-21	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20			
	21-27	10-15	1.25-1.35	2.0-6.0	0.09-0.15	6.1-8.4	<2	Low--------	0.20			
	27-60	0-7	1.55-1.75	>6.0	0.03-0.06	6.1-7.8	<2	Low--------	0.15			
Bf----------------- Blendon	0-17	15-25	1.20-1.30	0.6-2.0	0.18-0.20	5.6-7.3	<2	Low--------	0.28	5	5	2-4
	17-33	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20			
	33-42	10-15	1.25-1.35	2.0-6.0	0.09-0.15	6.1-8.4	<2	Low--------	0.20			
	42-54	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20			
	54-60	0-7	1.55-1.75	>6.0	0.03-0.06	6.1-7.8	<2	Low--------	0.15			
Br----------------- Boel	0-14	15-25	1.30-1.40	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	4L	1-3
	14-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.20			
Ca----------------- Cass	0-16	7-17	1.40-1.60	2.0-6.0	0.16-0.18	5.6-7.3	<2	Low--------	0.20	5	3	1-2
	16-60	5-15	1.40-1.60	2.0-6.0	0.15-0.17	6.1-8.4	<2	Low--------	0.20			
CrG*:												
Coly--------------	0-4	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	1-2
	4-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
Hobbs-------------	0-10	15-27	1.20-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	10-60	15-27	1.20-1.40	0.6-2.0	0.18-0.20	6.1-7.8	<2	Low--------	0.32			
CuE2*:												
Coly--------------	0-5	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	5-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
Uly---------------	0-5	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	1-3
	5-18	20-30	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	18-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Cy, CyB----------- Cozad	0-13	11-25	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low--------	0.32	5	6	1-2
	13-25	10-18	1.30-1.40	0.6-2.0	0.17-0.19	6.1-8.4	<2	Low--------	0.43			
	25-60	8-18	1.20-1.50	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low--------	0.24			
DuB, DuC---------- Dunday	0-13	3-10	1.40-1.60	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-2
	13-60	2-7	1.50-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low--------	0.17			
Fu----------------- Fluvaquents	0-60	1-18	1.30-1.80	6.0-20	0.07-0.13	6.6-8.4	<2	Low--------	0.17	5	8	2-8
	60-80	---	---	---	---	---	---	-----------	----			
GfC2, GfD2, GfE2-- Gates	0-5	14-17	1.20-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.37	5	5	<1
	5-60	14-17	1.20-1.40	0.6-2.0	0.17-0.19	7.4-8.4	<2	Low--------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
GhB*:												
Gates	0-11	8-15	1.50-1.70	>6.0	0.10-0.12	6.6-8.4	<2	Low	0.17	5	2	<1
	11-17	13-15	1.20-1.40	0.6-2.0	0.17-0.19	7.4-8.4	<2	Low	0.37			
	17-60	14-17	1.20-1.40	0.6-2.0	0.17-0.19	7.4-8.4	<2	Low	0.37			
Hersh	0-6	10-18	1.30-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low	0.24	5	3	.5-2
	6-10	8-18	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.3	<2	Low	0.24			
	10-60	10-18	1.20-1.50	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	0.24			
Ha, HaB Hall	0-12	20-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Moderate	0.32	5	6	2-4
	12-34	28-35	1.30-1.50	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	34-60	15-30	1.30-1.40	0.6-2.0	0.18-0.22	6.6-7.8	<2	Moderate	0.43			
HeB, HeC, HeD, HeE Hersh	0-5	10-18	1.30-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low	0.24	5	3	.5-2
	5-10	8-18	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.3	<2	Low	0.24			
	10-60	10-18	1.20-1.50	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	0.24			
HgF*:												
Hersh	0-5	10-18	1.30-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low	0.24	5	3	.5-2
	5-9	8-18	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.3	<2	Low	0.24			
	9-60	10-18	1.20-1.50	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	0.24			
Gates	0-5	14-17	1.20-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low	0.37	5	5	<1
	5-60	14-17	1.20-1.40	0.6-2.0	0.17-0.19	7.4-8.4	<2	Low	0.37			
Hk, Hm Hobbs	0-6	15-27	1.20-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low	0.32	5	6	2-4
	6-60	15-27	1.20-1.40	0.6-2.0	0.18-0.20	6.1-7.8	<2	Low	0.32			
HoC Holdrege	0-7	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-3
	7-25	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	25-38	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate	0.43			
	38-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43			
HpC2 Holdrege	0-4	28-35	1.40-1.60	0.6-2.0	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	1-3
	4-11	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	11-28	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate	0.43			
	28-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43			
HtC, Hy, HyB Hord	0-24	17-27	1.30-1.40	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low	0.32	5	6	2-4
	24-42	20-35	1.35-1.45	0.6-2.0	0.17-0.22	6.1-7.8	<2	Low	0.32			
	42-60	18-30	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low	0.43			
IpB Ipage	0-8	3-10	1.40-1.50	6.0-20	0.10-0.12	5.1-7.3	<2	Low	0.17	5	2	.5-2
	8-60	1-8	1.50-1.60	6.0-20	0.04-0.10	5.1-7.3	<2	Low	0.15			
ItB Ipage	0-8	1-5	1.40-1.50	6.0-20	0.07-0.09	5.1-7.3	<2	Low	0.15	5	1	.5-1
	8-60	1-8	1.50-1.60	6.0-20	0.04-0.10	5.1-7.3	<2	Low	0.15			
Ka, KaB Kenesaw	0-11	5-18	1.30-1.50	0.6-2.0	0.20-0.23	6.1-7.3	<2	Low	0.32	5	3	1-3
	11-26	10-18	1.20-1.30	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low	0.43			
	26-60	8-18	1.30-1.40	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low	0.43			
Le Leshara	0-14	15-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-8.4	<2	Low	0.32	5	6	1-3
	14-46	12-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low	0.43			
	46-60	0-8	1.70-1.90	>6.0	0.02-0.07	6.6-8.4	<2	Low	0.15			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Lo---------------- Loup	0-9	8-18	1.10-1.30	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	5	8	4-8
	9-60	2-7	1.50-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.17			
Sc---------------- Scott	0-6	27-35	1.15-1.30	0.6-2.0	0.21-0.24	5.6-7.3	<2	Moderate	0.37	3	7	2-4
	6-28	40-55	1.20-1.40	<0.06	0.08-0.16	6.1-7.8	<2	High-------	0.37			
	28-36	27-40	1.15-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	High-------	0.37			
	36-60	18-35	1.30-1.50	0.6-2.0	0.14-0.22	6.6-8.4	<2	Moderate	0.37			
SmB-------------- Simeon	0-7	5-12	1.30-1.50	6.0-20	0.08-0.14	6.1-7.8	<2	Low--------	0.17	5	2	.5-1
	7-60	2-10	1.50-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low--------	0.15			
UbD, UbE--------- Uly	0-9	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	1-3
	9-27	20-30	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	27-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
UcD2*:												
Uly--------------	0-6	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	1-2
	6-25	20-30	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	25-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Coly-------------	0-6	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	6-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
UcF*:												
Uly--------------	0-8	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	1-3
	8-25	20-30	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	25-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Coly-------------	0-4	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	1-2
	4-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
VaB, VaD, VaE---- Valentine	0-5	0-6	1.70-1.90	6.0-20	0.07-0.09	5.6-7.3	<2	Low--------	0.15	5	1	.5-1
	5-60	0-6	1.70-1.90	6.0-20	0.05-0.07	5.6-7.3	<2	Low--------	0.15			
VaF-------------- Valentine	0-4	0-6	1.70-1.90	6.0-20	0.07-0.09	5.6-7.3	<2	Low--------	0.15	5	1	.5-1
	4-60	0-6	1.70-1.90	6.0-20	0.05-0.07	5.6-7.3	<2	Low--------	0.15			
VeB, VeD--------- Valentine	0-6	2-10	1.70-1.90	6.0-20	0.10-0.12	5.6-7.3	<2	Low--------	0.17	5	2	.5-1
	6-11	2-10	1.70-1.90	6.0-20	0.09-0.11	5.6-7.3	<2	Low--------	0.17			
	11-60	0-6	1.70-1.90	6.0-20	0.05-0.07	5.6-7.3	<2	Low--------	0.15			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft					
Ae: Almeria	D	Frequent	Brief	Apr-Jun	0-1.5	Apparent	Nov-May	Moderate	High	Low.
AnB, AnC: Anselmo	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Ba: Barney	D	Frequent	Long	Mar-Jun	0-2.0	Apparent	Nov-Jun	Moderate	High	Low.
Be, Bf: Blendon	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Br: Boel	A	Occasional	Brief	Mar-Jun	1.5-3.5	Apparent	Nov-May	Moderate	High	Low.
Ca: Cass	B	Rare	---	---	>6.0	---	---	Moderate	Moderate	Low.
CrG*:										
Coly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Hobbs	B	Occasional	Brief	Apr-Sep	>6.0	---	---	Moderate	Low	Low.
CuE2*:										
Coly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Uly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Cy, CyB: Cozad	B	Rare	---	---	>6.0	---	---	Moderate	Low	Low.
DuB, DuC: Dunday	A	None	---	---	>6.0	---	---	Low	Low	Low.
Fu: Fluvaquents	D	Frequent	Brief to very long.	Nov-Jun	+2-1.0	Apparent	Jan-Dec	Moderate	High	Low.
GfC2, GfD2, GfE2: Gates	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
GhB*:										
Gates	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Hersh	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Ha, HaB: Hall	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
HeB, HeC, HeD, HeE: Hersh	B	None	---	---	>6.0	---	---	Moderate	Low	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
HgF*:										
Hersh	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Gates	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Hk Hobbs	B	Occasional	Brief	Apr-Sep	>6.0	---	---	Moderate	Low	Low.
Hm Hobbs	B	Frequent	Brief	Apr-Sep	>6.0	---	---	Moderate	Low	Low.
HoC, HpC2 Holdrege	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
HtC Hord	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Hy, HyB Hord	B	Rare	---	---	>6.0	---	---	Moderate	High	Low.
IpB, ItB Ipage	A	None	---	---	3.0-6.0	Apparent	Dec-Jun	Moderate	Low	Moderate.
Ka, KaB Kenesaw	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Le Leshara	B	Occasional	Very brief	Mar-Jul	1.5-3.0	Apparent	Mar-May	High	High	Low.
Lo Loup	D	Occasional	Brief	Jan-Jul	0-1.5	Apparent	Nov-May	Moderate	High	Low.
Sc Scott	D	None	---	---	+.5-1.0	Perched	Mar-Aug	High	High	Low.
SmB Simeon	A	None	---	---	>6.0	---	---	Low	Low	Low.
UbD, UbE Uly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
UcD2*, UcF*:										
Uly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Coly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
VaB, VaD, VaE, VaF, VeB, VeD Valentine	A	None	---	---	>6.0	---	---	Low	Low	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--ENGINEERING INDEX TEST DATA

(Dashes indicate that data were not available. LL means liquid limit; PI, plasticity index; and NP, nonplastic)

Soil name, report number, horizon, and depth in inches*	Classification		Grain-size distribution**						LL	PI	Specific gravity
			Percentage passing sieve--				Percentage smaller than--				
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.05 mm	.002 mm			
									Pct		g/cc
Blendon loam:											
(S84NE77-12)											
Ap----- 0 to 6	A-4(8)	ML	100	99	97	74	59	8	22	NP	2.63
Bw----- 17 to 33	A-4(2)	CL-ML	100	99	90	45	38	10	23	6	2.66
C1----- 42 to 54	A-2-4(0)	SM	100	100	91	32	27	9	16	NP	2.64
Boel loam:											
(S85NE77-11)											
A1----- 0 to 5	A-4(8)	ML	---	100	99	74	59	6	37	5	2.58
AC----- 9 to 14	A-4(8)	ML	---	100	100	77	53	9	29	5	2.65
C1----- 14 to 34	A-2-4(2)	SP-SM	---	100	93	15	10	2	NP	NP	2.67
Coly silt loam:											
(S84NE77-57)											
A------ 0 to 4	A-4(8)	ML	---	100	99	98	81	12	31	5	2.66
C------ 8 to 60	A-4(8)	ML	---	100	100	99	90	12	30	5	2.72
Gates silt loam:											
(S84NE77-41)											
Ap----- 0 to 5	A-4(8)	ML	---	---	100	96	71	17	32	5	2.61
AC----- 5 to 12	A-4(8)	ML	---	---	100	97	76	17	32	6	2.60
C------ 12 to 60	A-4(8)	ML	---	---	100	97	80	16	31	5	2.60
Hall silt loam:											
(S82NE77-18)											
Ap----- 0 to 6	A-4(8)	CL-ML	---	---	100	96	84	23	31	8	2.56
Bt2---- 24 to 30	A-7-6(15)	CL	---	---	100	98	89	32	46	25	2.65
C------ 34 to 60	A-6(10)	CL	---	---	100	99	88	25	38	16	2.65
Holdrege silt loam:											
(S84NE77-37)											
A------ 0 to 7	A-7-6(12)	CL	---	---	100	92	83	28	42	20	2.61
Bt1---- 10 to 16	A-7-6(17)	CL	---	---	100	98	89	33	49	29	2.64
C------ 38 to 60	A-4(8)	CL-ML	---	---	100	98	89	17	34	10	2.62

See footnotes at end of table.

TABLE 19.--ENGINEERING INDEX TEST DATA--Continued

Soil name, report number, horizon, and depth in inches*	Classification		Grain-size distribution**						LL	PI	Specific gravity
			Percentage passing sieve--				Percentage smaller than--				
	AASHTO	Unified	No. 4	No. 10	No. 40	No. 200	.05 mm	.002 mm			
									Pct		g/cc
Valentine fine sand:											
(S83NE77-1)											
A------ 0 to 5	A-2-4(2)	SP-SM	---	100	97	14	9	3	NP	NP	2.60
C------ 10 to 60	A-3(2)	SP-SM	---	100	98	10	10	7	NP	NP	2.63

* Locations of the sampled pedons are as follows:

Blendon loam: 2,575 feet west and 1,200 feet north of the southeast corner of sec. 26, T. 17 N., R. 12 W.

Boel loam: 900 feet west and 400 feet south of the northeast corner of sec. 21, T. 17 N., R. 12 W.

Coly silt loam: 1,800 feet north and 300 feet west of the southeast corner of sec. 1, T. 17 N., R. 12 W.

Gates silt loam: 75 feet north and 400 feet west of the southeast corner of sec. 9, T. 19 N., R. 10 W.

Hall silt loam: 1,900 feet south and 150 feet west of the northeast corner of sec. 25, T. 17 N., R. 11 W.

Holdrege silt loam: 1,200 feet south and 100 feet east of the northwest corner of sec. 18, T. 17 N., R. 12 W.

Valentine fine sand: 300 feet north and 250 feet west of the southeast corner of sec. 25, T. 20 N., R. 11 W.

** The results of testing by American Association of State Highway Officials (AASHTO) methods may differ somewhat from the results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated for all the material. In the SCS soil survey procedure, the organic matter is removed from the fine material and calcareous material may be treated to remove carbonates. The fine material is then analyzed by the pipette method, and the grain-size fractions are calculated and reported for the fraction less than 2 millimeters in size.

TABLE 20.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Almeria	Sandy, mixed, mesic Typic Fluvaquents
Anselmo	Coarse-loamy, mixed, mesic Typic Haplustolls
Barney	Sandy, mixed, mesic Mollic Fluvaquents
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
Cass	Coarse-loamy, mixed, mesic Fluventic Haplustolls
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Cozad	Coarse-silty, mixed, mesic Fluventic Haplustolls
Dunday	Sandy, mixed, mesic Entic Haplustolls
Fluvaquents	Sandy, mixed, mesic Fluvaquents
Gates	Coarse-silty, mixed, nonacid, mesic Typic Ustorthents
Hall	Fine-silty, mixed, mesic Pachic Argiustolls
Hersh	Coarse-loamy, mixed, nonacid, mesic Typic Ustorthents
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Holdrege	Fine-silty, mixed, mesic Typic Argiustolls
Hord	Fine-silty, mixed, mesic Cumulic Haplustolls
Ipage	Mixed, mesic Aquic Ustipsamments
Kenesaw	Coarse-silty, mixed, mesic Typic Haplustolls
Leshara	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Loup	Sandy, mixed, mesic Typic Haplaquolls
*Scott	Fine, montmorillonitic, mesic Typic Argialbolls
Simeon	Mixed, mesic Typic Ustipsamments
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Valentine	Mixed, mesic Typic Ustipsamments

Interpretive Groups

INTERPRETIVE GROUPS

(Dashes indicate that the soil was not assigned to the interpretive group)

Map symbol and soil name	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
Ae: Almeria	VIw-7	---	---	Wet Subirrigated	10
AnB: Anselmo	IIe-3	IIe-8	Yes	Sandy	5
AnC: Anselmo	IIIe-3	IIIe-8	Yes	Sandy	5
Ba: Barney	VIw-7	---	---	Wetland	10
Be: Blendon	IIe-3	IIe-8	Yes	Sandy	5
Bf: Blendon	IIc-1	I-8	Yes	Sandy	5
Br: Boel	IIIw-4	IIIw-8	---	Subirrigated	2S
Ca: Cass	IIe-3	IIe-8	Yes	Sandy Lowland	1
CrG:	VIIe-9	---	---		
Coly				Thin Loess	10
Hobbs				Silty Overflow	1
CuE2:	VIe-8	---	---		
Coly				Limy Upland	8
Uly				Silty	3
Cy: Cozad	IIc-1	I-6	Yes	Silty Lowland	1
CyB: Cozad	IIe-1	IIe-6	Yes	Silty Lowland	1
DuB: Dunday	IVe-5	IIIe-11	---	Sandy	5
DuC: Dunday	IVe-5	IVe-11	---	Sandy	5
Fu: Fluvaquents, sandy	VIIIw-7	---	---	---	10
GfC2: Gates	IIIe-8	IIIe-6	Yes	Silty	3
GfD2: Gates	IVe-8	IVe-6	---	Silty	3
GfE2: Gates	VIe-8	---	---	Silty	3
GhB: Gates-Hersh	IIIe-3	IIIe-8	Yes	Sandy	5

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
Ha------------------------- Hall	IIc-1	I-4	Yes	Silty---------------	3
HaB------------------------ Hall	IIe-1	IIe-4	Yes	Silty---------------	3
HeB------------------------ Hersh	IIIe-3	IIe-8	Yes	Sandy---------------	5
HeC------------------------ Hersh	IIIe-3	IIIe-8	Yes	Sandy---------------	5
HeD------------------------ Hersh	IVe-3	IVe-8	---	Sandy---------------	5
HeE------------------------ Hersh	VIe-3	---	---	Sandy---------------	5
HgF------------------------	VIe-3	---	---		10
Hersh---------------------				Sandy---------------	
Gates---------------------				Silty---------------	
Hk------------------------- Hobbs	IIw-3	IIw-6	Yes	Silty Overflow-------	1
Hm------------------------- Hobbs	VIw-7	---	---	Silty Overflow-------	10
HoC------------------------ Holdrege	IIIe-1	IIIe-4	Yes	Silty---------------	3
HpC2----------------------- Holdrege	IIIe-8	IIIe-3	Yes	Silty---------------	3
HtC------------------------ Hord	IIIe-1	IIIe-6	Yes	Silty---------------	3
Hy------------------------- Hord	IIc-1	I-6	Yes	Silty Lowland--------	1
HyB------------------------ Hord	IIe-1	IIe-6	Yes	Silty Lowland--------	1
IpB------------------------ Ipage	IVe-5	IVe-11	---	Sandy Lowland--------	5
ItB------------------------ Ipage	VIe-5	IVe-12	---	Sandy Lowland--------	7
Ka------------------------- Kenesaw	IIc-1	I-6	Yes	Silty---------------	3
KaB------------------------ Kenesaw	IIe-1	IIe-6	Yes	Silty---------------	3
Le------------------------- Leshara	IIw-4	IIw-6	Yes**	Subirrigated---------	2S

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
Lo---------------------------- Loup	Vw-7	---	---	Wet Subirrigated-----	2D
Sc---------------------------- Scott	IVw-2	---	---	---	10
SmB--------------------------- Simeon	VIs-4	IVs-11	---	Shallow to Gravel----	10
UbD--------------------------- Uly	IVe-1	IVe-6	---	Silty----------------	3
UbE--------------------------- Uly	VIe-1	---	---	Silty----------------	3
UcD2--------------------------	IVe-8	IVe-6	---		
Uly--------------------------				Silty----------------	3
Coly-------------------------				Limy Upland----------	8
UcF---------------------------	VIe-1	---	---		10
Uly--------------------------				Silty----------------	
Coly-------------------------				Limy Upland----------	
VaB--------------------------- Valentine	VIe-5	IVe-12	---	Sandy----------------	7
VaD--------------------------- Valentine	VIe-5	IVe-12	---	Sands----------------	7
VaE--------------------------- Valentine	VIe-5	---	---	Sands----------------	7
VaF---------------------------	VIIe-5	---	---		
Valentine, rolling-----------				Sands----------------	7
Valentine, hilly-------------				Choppy Sands---------	10
VeB--------------------------- Valentine	IVe-5	IVe-11	---	Sandy----------------	5
VeD--------------------------- Valentine	VIe-5	IVe-11	---	Sands----------------	7

* A complex is treated as a single management unit in the land capability and prime farmland columns. The N column is for nonirrigated soils; the I column is for irrigated soils.
** Where drained.

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