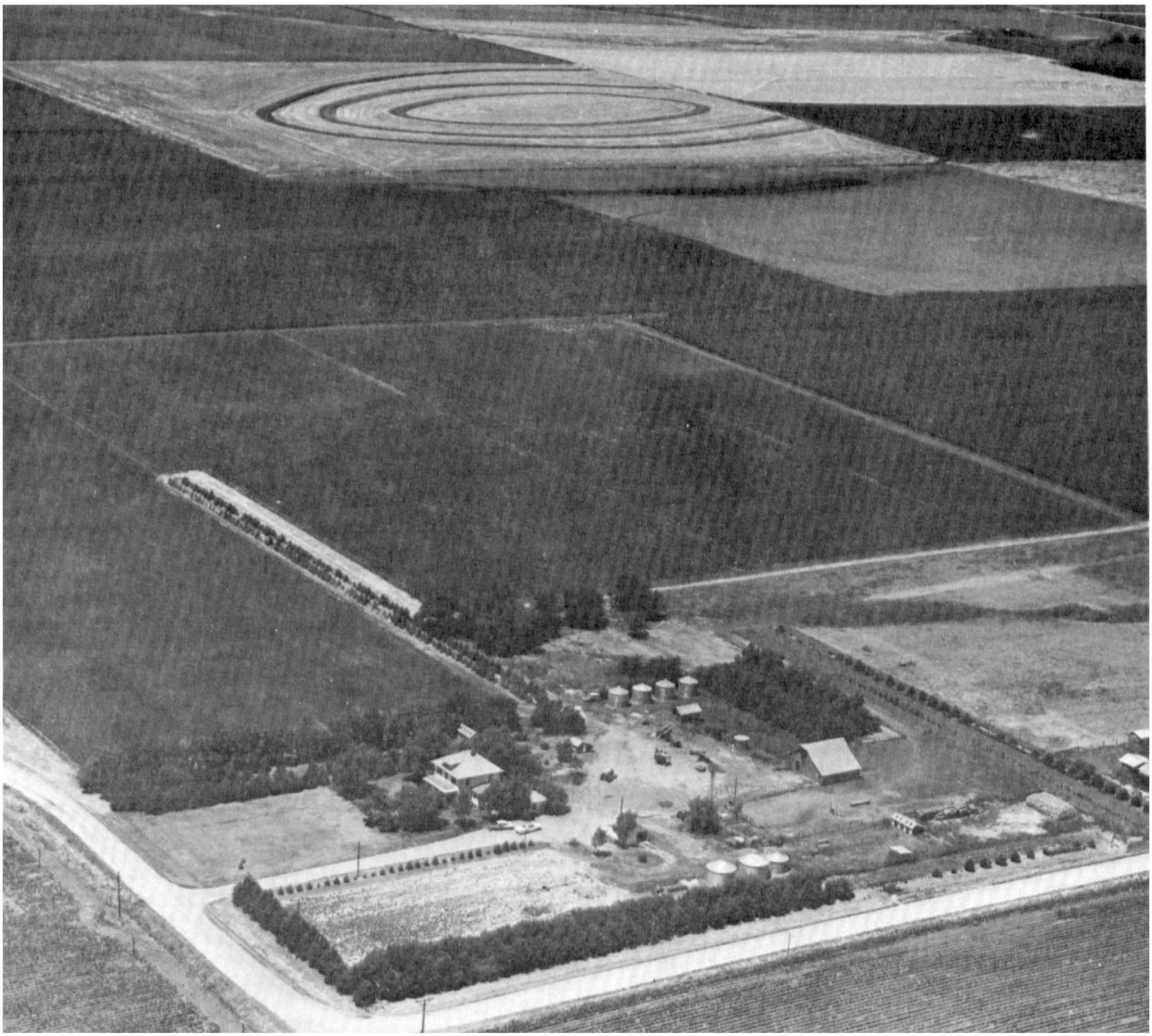
United States
Department of
Agriculture

Soil
Conservation
Service

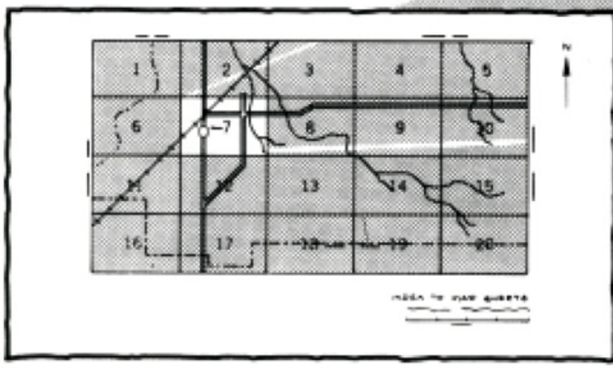
In cooperation with the
University of Nebraska,
Conservation and
Survey Division

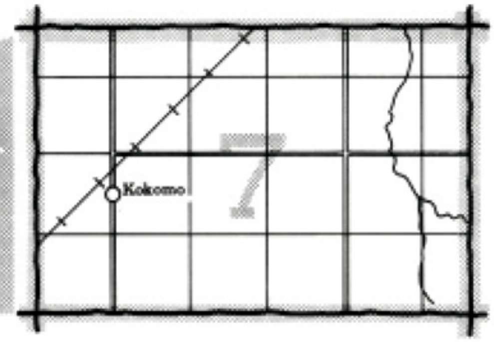
Soil Survey of Kearney County, Nebraska



HOW TO USE

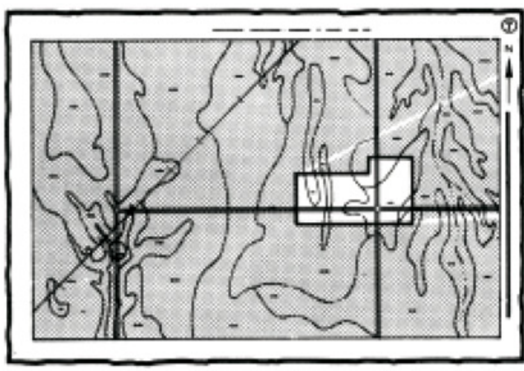
1. Locate your area of interest on the "Index to Map Sheets"

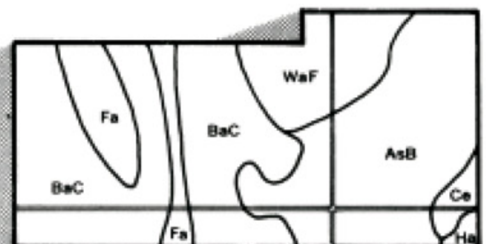




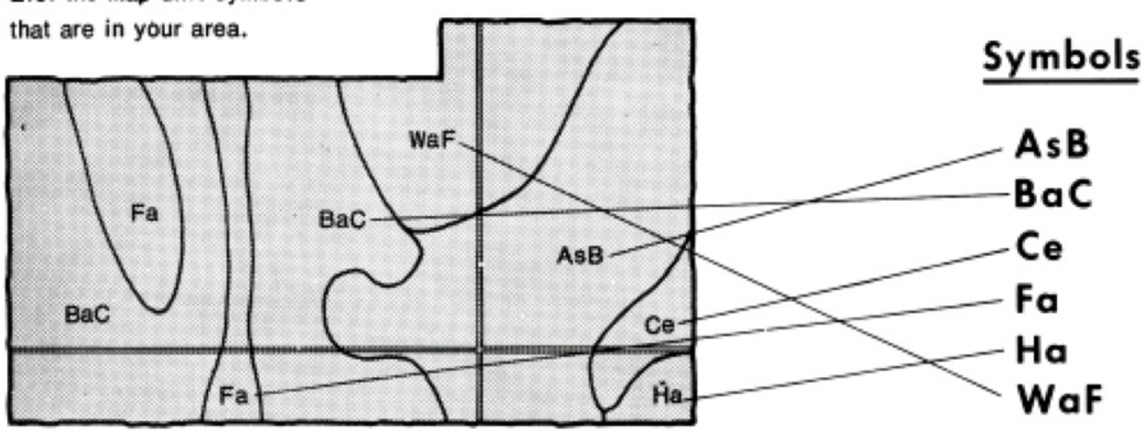
2. Note the number of the map sheet and turn to that sheet.

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



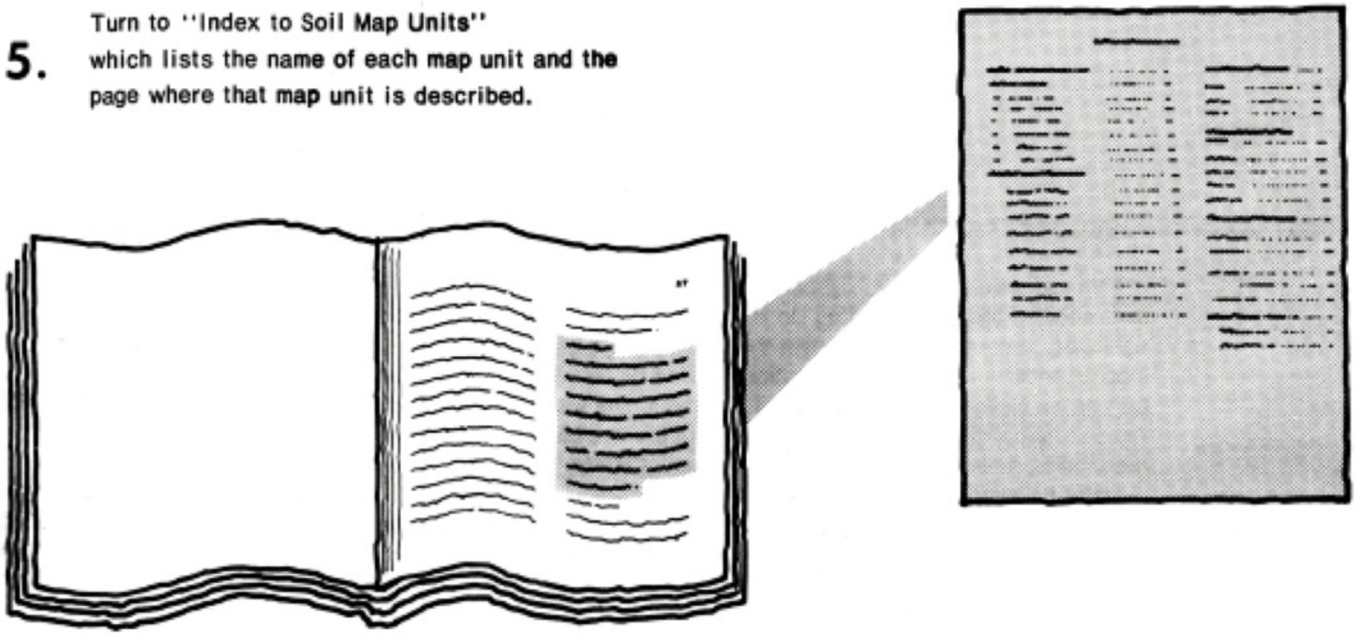


4. List the map unit symbols that are in your area.

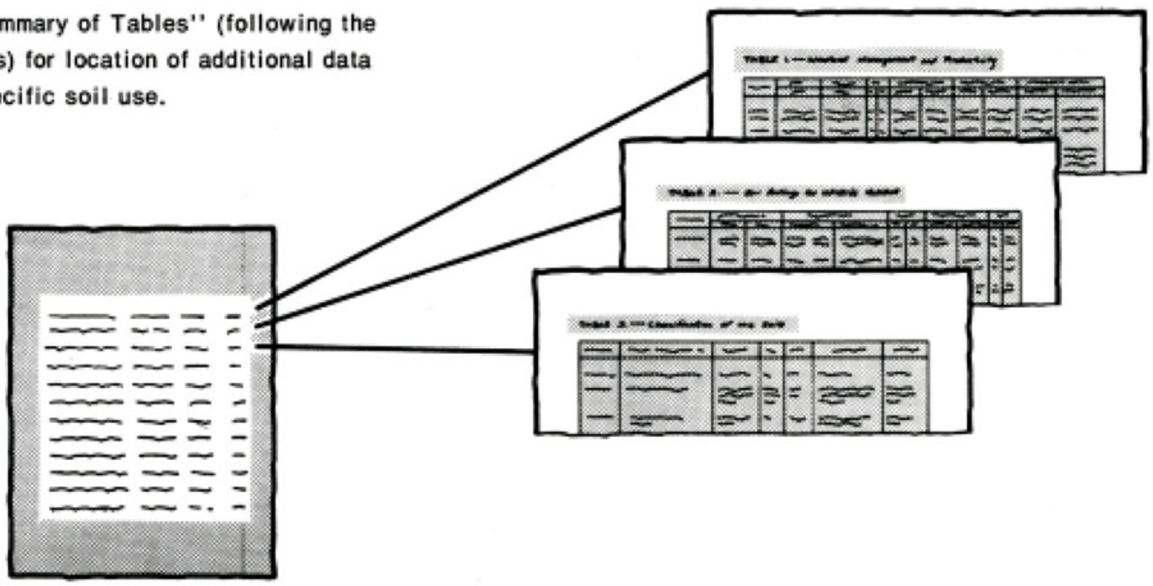


THIS SOIL SURVEY

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



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



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

This 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. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

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 Tri-Basin Natural Resources District. The Kearney County supervisors provided financial assistance to purchase the high-flight photography used in this survey. Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1980.

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.

Cover: Farmstead windbreaks and improved irrigation water management are among the conservation practices on this Kearney County farm. The terraces at the top of the photograph are on gently sloping Holdrege silt loam.

Contents

Soil Series

Issued September 1984

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Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Kearney County, Nebraska. An earlier survey was published in 1927 (*5*). This survey updates the earlier survey and provides additional information and larger maps that show the soils in greater detail. 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 shallow to bedrock. 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.

S. L. Lewis
State Conservationist
Soil Conservation Service

Soil Survey of
Kearney County, Nebraska

By Frank Wahl, Jay Wilson, and Steve Scheinost,
Soil Conservation Service

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

KEARNEY COUNTY is in south-central Nebraska (fig. 1). The total land area is approximately 327,680 acres, or about 512 square miles. The county is 24 miles across from east to west and ranges from 21 to 23 miles from north to south. It is bordered on the north by Buffalo County, on the east by Adams County, on the south by Franklin County, and on the west by Phelps County. The Platte River separates Kearney County and Buffalo County.

The population of Kearney County, according to the 1980 census, is about 7,000. The largest town is Minden, the county seat, which has a population of fewer than 3,000. It is located near the center of the county, about 12 miles south of Interstate 80 and 140 miles southwest of Lincoln. Other, smaller towns in the county include Axtell, Heartwell, Norman, and Wilcox.

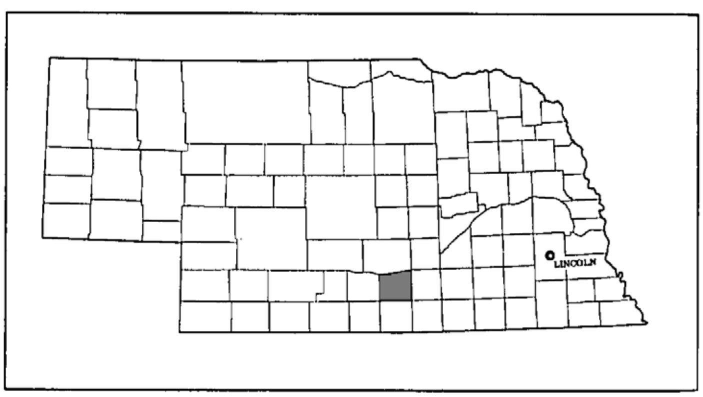

Figure 1.—Location of Kearney County in Nebraska.

Kearney County has excellent transportation facilities. A main railroad line provides service to Axtell, Minden, and Heartwell, and a branch line serves Norman, Minden, and Wilcox. All towns have at least one all-weather road. Combined U.S. Highway 6 and 34 crosses Kearney County (east and west), and State Highway 10 passes through the center of the county (north and south). These roads intersect at Minden. Highway 10 links Interstate 80 in the Platte Valley with east-west highways in the Republican River Valley in south-central Nebraska, near the Kansas state line. State Highway 44 passes (north and south) through the western part of the county connecting Interstate 80 with U.S. Highway 6 and 34 at Axtell and to the southwestern part of the county. State Highway 74 carries traffic from Adams County and joins Highway 10 at Minden. Section lines have roads, except for some in very sandy areas and some crossing major upland drainageways. Most section-line roads are gravel, and a few are blacktop. School buses and mail service are available in all parts of the county.

Farming is the leading occupation in Kearney County, and most employment is in farming or farm-related businesses. Farm equipment, fertilizers, and other agricultural supplies are readily available. Several land-leveling contractors reside in the county. There are two irrigation well drillers in Minden. Other small industries in Minden and a small beef slaughterhouse east of Minden provide employment. County residents are also employed in industries in the communities of Holdrege and Kearney in adjacent counties.

More than 81 percent of the county is cropland, and 66 percent of this cropland is irrigated. About 15 percent of the county is rangeland. Cash-grain cropping is the most common type of farming enterprise. Irrigated corn is the main crop. Smaller acreages of alfalfa and soybeans are also grown. Wheat and grain sorghum are the most common nonirrigated crops. Hogs, cattle, and a few sheep are regularly included in some farming operations, but many farmers raise livestock only intermittently. There are two large feedlots and several medium-sized cattle-feeding enterprises. Farmers commonly have cow-calf operations to use the native grass if their land includes rolling sandhills or steeper upland soils.

Kearney County is about 11 percent bottom land and terraces of the Platte River Valley. The bottomland soils formed in mostly loamy and sandy alluvium. They are somewhat excessively drained to somewhat poorly drained. Soils on the terraces formed in rapidly permeable sandy alluvium.

The county is 89 percent loess uplands. Soils formed in wind-deposited sands on side slopes along both north and south branches of Sand Creek and in a 2- to 3-mile-wide strip across the county along the south edge of the Platte Valley. This landscape is one of hummocky or rolling sandhills. The dominant land use is range, but many areas have been developed as cropland with center-pivot irrigation. The soils have a low available water capacity and a severe soil blowing hazard that are management concerns.

A 3- to 6-mile-wide band of silty soils south of the sandhills makes up about a fourth of the county. This landscape is hummocky, and the surface drainage is intermittent and indefinite. The soils are generally moderately low in organic matter content. Most of this area is cropland, and more than half is irrigated. Pivot sprinklers are common.

Approximately the southern half of the county consists of nearly level or gently sloping silty soils. A few shallow drainageways extending towards the south or southeast provide the only definite relief. The only runoff out of this area is through tributaries to the Little Blue River and the west branch of Thompson Creek. Storm-water runoff drains mostly to the numerous low rainwater basins that have been constructed in the area. Nearly all of this area is cropland, and irrigated corn is the main crop. Deep wells generally supply adequate irrigation water. The maintenance of fertility and soil tilth and the efficient use of irrigation water are important concerns. Crops on low flats are destroyed occasionally by slow runoff after rains.

Through the Tri-Basin Natural Resources District, farmers and ranchers can receive technical assistance from the Soil Conservation Service in planning and applying soil and water conservation practices on the land.

General Nature of the County

This section provides general information about Kearney County. It describes the history and development; climate; geology; ground water; and physiography, relief, and drainage.

History and Development

The area that is now Kearney County was part of an area formerly inhabited by the Pawnee Indians. The Pawnees were an agricultural people. They grew corn, beans, and squash and usually traveled only in hunting parties. The Pawnees were peaceful except for sporadic conflicts with the Sioux from the west.

Soldiers assigned to protect immigrants and freighters on the Oregon Trail later stayed in the area. Fort Childs, later renamed Fort Kearney, was established alongside the Platte River in 1848. A civilian settlement was made at Kearney City, about 2 miles west of the fort (*3*). It was called "Dobytown" because most of the buildings were constructed of locally made adobe bricks.

In 1860 the first unit of local government had jurisdiction over an area extending to what is now the Kansas state line. The seat of government was at Kearney City. In 1872 the county was organized to include the present area, and the county seat was moved to Lowell in the northeastern part of the county. By this time most people coming to the area were farmers searching for new land and permanent homes.

The first railroad in Kearney County came to Lowell in the summer of 1872 and greatly affected the pattern of settlement. Most of the desirable land available from the government in the Platte Valley was taken up in 1873, and the railroad company controlled the remaining land. Many subsequent settlers could not afford to buy this land from the railroad so they made claims for land on the plains south of the sandhills, on what was called "the divide," even though it was some distance from the railroad.

Settlement was rapid, and demands were soon made for a more centrally located county seat. Minden became the county seat in 1878. The population of the county increased rapidly from the inhabitants of a few scattered settlements in 1876 to about 5,000 people by 1883. Several thousand acres in the central part of the county were producing excellent crops, and farmers needed transportation closer than the Platte Valley. The railroad came to Minden in 1883. This marked the end of the frontier period and the beginning of modern agriculture in the county.

Irrigation has been the most important factor affecting the growth of agriculture in the county. In the late 1880's plans were made to promote industry in Minden by generating electricity with water from the Platte River. A severe drought in 1894 increased the demand for irrigation, but an economic depression forced the plan to be abandoned. Twenty years later, plans were made on a much larger scale for a system of canals and irrigation (*4*). Plans for what is now the Tri-County system and Central Nebraska Public Power and Irrigation District were first developed in 1910, and construction was completed in 1943. The first water from the Tri-County system was brought to Kearney County farmland through the Phelps County Canal in 1938. About 22,500 acres in the county can now be irrigated from this source. In addition, ground water levels in some areas have been stabilized by recharge from the system. Electricity is produced by a combination of water power and steam power generation managed by Central Nebraska Power District.

The first irrigation wells were 30 to 60 feet deep in the Platte River Valley. The first well deeper than 60 feet was installed in 1936. The Kearney County Soil and Water Conservation District was organized in the fall of 1943, and Soil Conservation Service technicians began working with farmers in developing irrigation systems and preparing farmland for efficient production of irrigated crops. In 1981 there were more than 1,500 irrigation wells in the county. More than 250 provide water for sprinkler systems.

Climate

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

Winters are cold in Kearney County because of incursions of cold continental air that bring fairly frequent spells of low temperature. Summers are hot, but occasionally relieved by cooler air from the north. Snowfall is fairly frequent in winter, but snow cover is usually not continuous. Rainfall is heaviest late in spring and early in summer. 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 Minden, Nebraska, in the period 1951 to 1979. 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 27 degrees F, and the average daily minimum temperature is 16 degrees. The lowest temperature on record, which occurred on January 12, 1974, is minus 21 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on July 12, 1954, is 112 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 24 inches. Of this, 19 inches, or 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 15 inches. The heaviest 1-day rainfall during the period of record was 5.30 inches on June 14, 1967. Thunderstorms occur on about 50 days each year, and most occur in summer.

The average seasonal snowfall is 25 inches. The greatest snow depth at any one time during the period of record was 23 inches. On an average of 21 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

Severe duststorms occur on occasion in spring when strong, dry winds blow over unprotected soils. Tornadoes and severe thunderstorms, some with hail, strike occasionally. These storms are local and of short duration, and the pattern of damage is variable and spotty.

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.

Geology

The soils in Kearney County formed in loess, eolian sands, and alluvium. These materials were deposited over an uneven bedrock surface.

Pierre Shale underlies the entire county. It consists of black to bluish gray marine shales deposited late in the Cretaceous age.

The Ogallala Group of Miocene age, at depths of 50 to 300 feet, is the youngest bedrock in the county. The Ogallala Group is primarily alluvial in origin and is composed of silt, sand, gravel, and weakly cemented sandstone. It overlies the Pierre Shale in most of the western third of the county. In places it extends eastward in old valleys in the Pierre Shale, and there is at least one isolated area in the southeast corner of the county.

Unconsolidated Pleistocene age alluvial silts, sand, and gravel overlie both the Pierre Shale and the Ogallala Group. The thickest deposits are in old valleys cut into the Pierre Shale and Ogallala Group. In a small area along the county line southeast of Wilcox the Pleistocene sand and gravel is not present except for a thin layer interbedded with Ogallala materials.

The loess is slightly clayey silt with varying amounts of very fine sand. It contains very little, if any, fine, medium, or coarse sand. Such soils as Holdrege, Detroit, Uly, and Coly soils formed on loess-covered uplands. The very sandy Valentine soils and the less sandy Hersh soils formed in eolian sand material. The Simeon soils on stream terraces and the Inavale, Boel, Alda, and Lex soils on the bottom lands are examples of soils that formed in alluvium.

Ground Water

Wells could provide adequate water for irrigation, livestock, and domestic use throughout the county. The rocks containing water consist of the Ogallala Group of Miocene age and the overlying unconsolidated deposits of Quaternary age.

The Ogallala Group is composed of weakly cemented silt, sand, gravel, and layers of sandstone.

The Quaternary deposits are composed principally of eolian sand and unconsolidated sand and gravel and some beds of silt and clay.

The water from the Ogallala Group is similar to that from the Quaternary deposits. The water from both is of the calcium bicarbonate type and rated hard or very hard according to Public Health Service standards. It is suitable for most uses.

Physiography, Relief, and Drainage

Kearney County is in the Central Plains section of the Great Plains physiographic province. It is in the Central Loess Plains Major Land Resource Area (*8*).

Most of the county is part of a large, gently undulating, generally east-sloping loess plain (fig. 2). The alluvial bottom lands and terrace south of the Platte River occupy a 2- to 3-mile-wide strip along the northern boundary. The bottom lands are mostly very flat, and water runoff is slow. Most bottomland soils developed in loamy material, and they are somewhat poorly drained because of an apparent seasonal high water table. The terrace is flat to slightly hummocky. It is mostly excessively drained because of sandy soil textures. The soils have rapid permeability and low available water capacity. South of and bordering the valley terrace is an area of low sandhills about 3 miles wide. Topography is hummocky. The landscape is mostly a succession of ridges and dunes with intermittent swales, pockets, and indefinite drainageways. The swales and small valleys commonly have apparent high water tables. Another area of sandhills is south and east of Norman along both north and south branches of Sand Creek. Most are low rounded hills, but some areas are choppy and have relief up to 30 feet. These areas are either an old, severely wind-reworked, sandy alluvial terrace or consist of sandy material moved by the wind out of the Platte Valley and over the northern edge of the upland plain. Silty materials under the coarse sands indicate either sandy overblown areas or a mixed deposit of sandy and silty material. South of the sandhills is a transitional area of recent silts deposited on the old loess plain. This area in northern and eastern Kearney County has mostly low hummocky topography with some intermittently scattered, nearly level areas. Drainage patterns are indefinite and complex. In southern and eastern Kearney County, where the landscape is transitional, areas are more rolling and slopes are more uniform.

The largest uniform area in the county is the flat loess plain in the southern half. It has very little relief, except that produced by shallow swales and a few moderate elevations. Most of it is nearly level or very gently sloping, and runoff is generally slow. Numerous lower closed depressions, which are scattered over the plain, collect and hold storm runoff for periods of a few days to several weeks. There is very little drainage out of the area, except where flats and slopes are near more defined upland drainageways. Side slopes are steeper and drainageways are more deeply entrenched where the drainageways enter Adams County on the east or Franklin County on the south.

Drainage in the county is to three main river basins: the Platte River, the Republican River, and the Little Blue River. The main channel of the Platte flows eastward along the northern county line to a point north of Newark where the stream divides and its south channel becomes the northern boundary of the county. The western, northern, and central parts of the county drain north and east into the Platte, or its south channel, either directly or through Dry Creek and Lost Creek. A small area in the southwestern part drains southward through Thompson Creek into the Republican River in Franklin County. The runoff in the southeastern and east-central part flows east through Cottonwood and Sand Creeks into the Little Blue River in Adams County. The North Sand Creek drainage begins in a small upland drainageway just west of and around the north side of Minden. The south-central area drains directly into the Little Blue River beginning about 3 miles south of Minden.

Elevations in the county range from 2,266 feet above sea level at the southwest corner of the county near Wilcox to 2,003 feet in the Sand Creek drainageway as it enters Adams County. The elevation near the Platte River on the Phelps County line is 2,128 feet and 2,015 feet at the Adams County line. Elevation is 2,220 feet at Axtell, 2,176 feet at Minden, 2,100 feet at Heartwell, and 2,079 feet at Norman.

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; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. 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

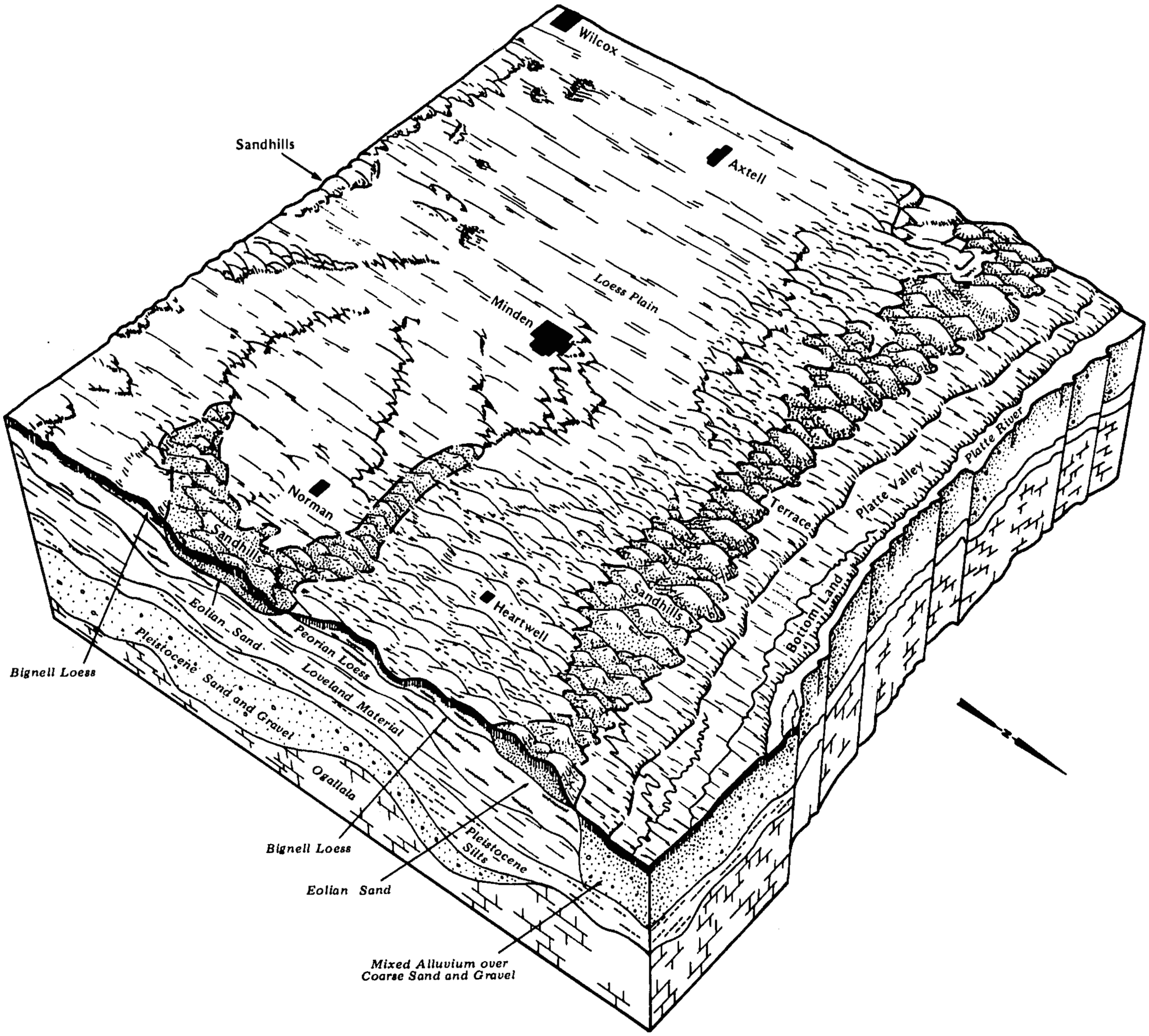

Figure 2.—Landscape and parent material in Kearney County.

living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the 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 considerable 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, acidity, 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 interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were 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 were 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 state with a fairly high degree of probability 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 several 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 soils 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 broad areas that have a distinctive pattern of soils, relief, and drainage. Each soil association on the general soil map is a unique natural landscape. Typically, a soil 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 other units 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 soil association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Association Descriptions

1. Holdrege Association

Deep, nearly level to gently sloping, well drained, silty soils formed in loess; on uplands

This association consists of soils on broad, smooth areas on uplands (fig. 3). Slopes range from 0 to 6 percent.

This association occupies about 160,500 acres, or 49 percent of the county. It is about 72 percent Holdrege soils and 28 percent soils of minor extent (figs. 3 and 4).

Typically, Holdrege soils have a surface layer of dark grayish brown, friable silt loam about 5 inches thick. The subsurface layer is also dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is dark grayish brown and grayish brown silty clay loam. The lower part is light brownish gray silt loam. The underlying material is a light gray, calcareous silt loam to a depth of more than 60 inches.

The minor soils in this association are Butler, Detroit, Fillmore, Hord, Massie, and Scott soils. The somewhat poorly drained Butler soils are on flats or in shallow depressions. Detroit and Hord soils are in swales or on broad flats lower in the landscape than the Holdrege soils. They have dark surface layers more than 20 inches thick. Fillmore, Massie, and Scott soils are in well-defined, upland depressions. They are poorly or very poorly drained and have more clay in the subsoil than do the Holdrege soils.

Farms in this association are mainly cash-grain operations or a combination of cash-grain and livestock enterprises. The soils are mainly under irrigation farming (fig. 4). Corn is the main crop. There are small fields of alfalfa and soybeans. Water is applied mostly with gravity systems using gated pipe. A plentiful supply of water is available from wells, except in the extreme southeast corner of the county where wells produce less water and there have been slight declines in the static water level. Water is obtained from canals in the northwestern part near Phelps County. Wheat and grain sorghum are the main dryfarmed crops. There are small alfalfa fields and small pastures in odd areas. Some livestock is fattened and marketed.

Water erosion is slight or moderate on the very gently sloping and gently sloping soils. Soil blowing is a hazard if the soils are not protected by plant cover or crop residue.

2. Kenesaw-Coly Association

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

This association consists of soils on uplands (figs. 5 and 6). Slopes range from 0 to 20 percent.

This association occupies about 76,000 acres, or about 23 percent of the county. It is about 51 percent Kenesaw soils, 40 percent Coly soils, and 9 percent soils of minor extent.

Kenesaw soils are nearly level to very gently sloping and are well drained. Typically, the surface layer is grayish brown, friable silt loam about 8 inches thick. The subsoil is friable silt loam about 14 inches thick. It is pale brown in the upper part and light gray in the lower part. The underlying material is light gray, calcareous silt loam to a depth of more than 60 inches.

Coly soils are very gently sloping to moderately steep and are well drained and somewhat excessively drained. Typically, the surface layer is brown, very friable silt loam about 6 inches thick. The next layer is grayish brown, very friable silt loam about 5 inches thick. The underlying material is light brownish gray, calcareous silt loam and very fine sandy loam to a depth of more than 60 inches.

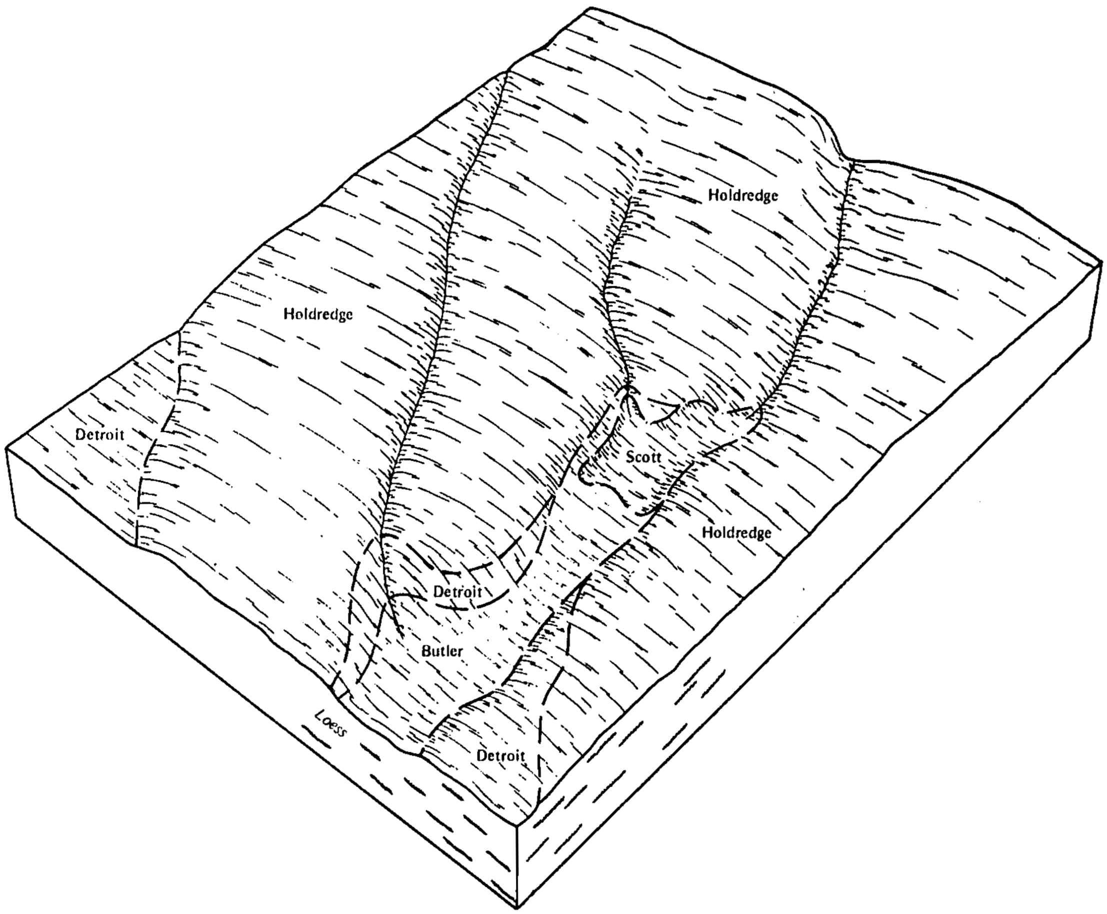

Figure 3.—Typical pattern of soils in the Holdrege association.

The minor soils in this association are Hersh and Rusco soils. The loamy Hersh soils are on nearly level to strongly sloping hummocks or ridges. The moderately well drained Rusco soils are in swales or depressions and contain more clay throughout.

Farms in this association are mainly cash-grain operations or a combination of cash-grain and livestock enterprises. The nearly level to strongly sloping soils are used largely for cultivated crops. The soils on moderately steep slopes along drainageways support native grasses and are used for grazing. About 50 percent of the cultivated areas are irrigated. Corn is the main crop, and smaller acreages of alfalfa and soybeans are grown. The main dryfarmed crops are grain sorghum, wheat, and smaller acreages of corn and alfalfa. Only a small acreage is used for range or pasture.

Irrigation water is obtained from both wells and canals in this association. Ground water is abundant. Many of the irrigated areas have been leveled for gravity irrigation systems. Development of center-pivot sprinkler systems has been increasing in recent years, especially on the more sloping or hummocky areas.

Water erosion is a hazard on the gently sloping to moderately steep soils. Soil blowing is a hazard if the soils are not protected by plant cover or crop residue. Maintaining organic matter content and soil fertility is a concern of management. Range management that includes proper grazing use and timely deferment of grazing helps maintain or improve the range condition.

3. Valentine Association

Deep, nearly level to rolling, excessively drained, sandy soils formed in eolian sand; on uplands

This association consists of soils on uplands, commonly known as the sandhills of the county (fig. 7). Slopes range from 0 to 17 percent.

Figure 4.—Gravity irrigation on Holdrege silt loam. Land-leveling operations and a tailwater reuse pit have increased its efficiency.

This association occupies about 46,000 acres, or about 14 percent of the county. It is about 77 percent Valentine soils and 23 percent soils of minor extent.

Typically, Valentine soils have a surface layer of grayish brown, very friable loamy fine sand about 5 inches thick. The next layer is brown, loose fine sand about 3 inches thick. The underlying material is light yellowish brown fine sand to a depth of more than 60 inches.

The minor soils in this association are Els, Inavale, Tryon, Libory, and Hersh soils. The somewhat poorly drained Els soils and the poorly drained Tryon soils are nearly level and are in swales. They have a seasonal high water table. Inavale soils are on bottom lands and are stratified throughout. Libory soils are moderately well drained and are silty in the lower part. They are lower in the landscape than Valentine soils. The loamy, well drained Hersh soils are nearly level to strongly sloping.

Farms in this association are mainly cash-grain operations or a combination of cash-grain and livestock enterprises. About 70 percent of this association is in range and used for grazing cattle. Most of the remaining 30 percent has been developed for center-pivot irrigation. Corn is the main crop. The soils in much of this association are poorly suited to irrigated crops because of low fertility, low available water capacity, and a severe soil-blowing hazard. Center-pivot irrigation is successful on some of the less sloping soils or where land leveling has reduced the slope. Some areas with underlying silty materials respond well to sprinkler irrigation. Ground water is readily available in this association.

Soil blowing is a severe hazard if the soils are not protected by plant cover or crop residues. Maintaining soil fertility and available moisture for crops is the main concern in management of cultivated land. The leaching of nutrients is also a concern during periods of high rainfall or if the soil is overirrigated. Range management

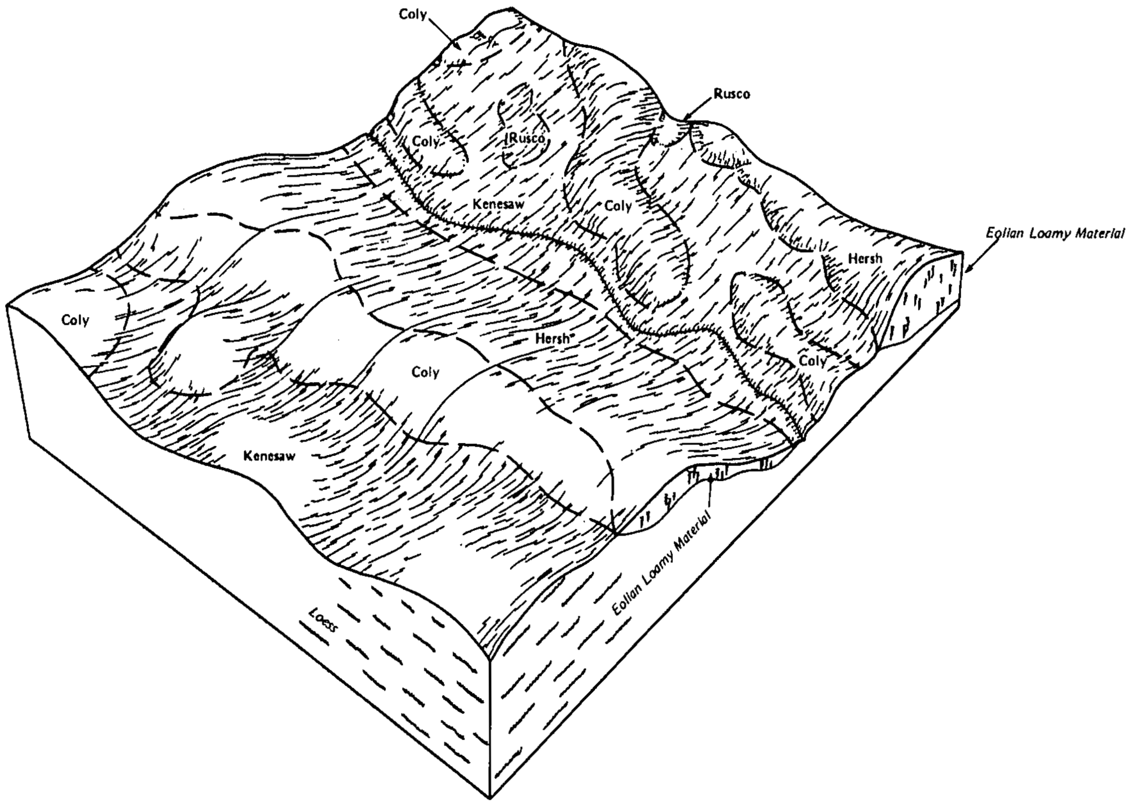

Figure 5.—Typical pattern of soils in the Kenesaw-Coly association.

that includes timely deferment of grazing and a system of use and rest with the order changed each year helps maintain and improve the range condition.

4. Alda-Wann-Boel Association

Nearly level, somewhat poorly drained, loamy alluvial soils that are moderately deep or deep over sand and gravel; on bottom lands

This association consists of soils on bottom lands along the Platte River (fig. 8). Slopes range from 0 to 1 percent.

This association occupies about 23,600 acres, or about 7 percent of the county. It is about 40 percent Alda soils, 24 percent Wann soils, 12 percent Boel soils, and 24 percent soils of minor extent.

Alda soils are moderately deep over coarse sand and gravelly sand. Typically, the surface layer is grayish brown, friable loam about 6 inches thick. The next layer is brown, very friable fine sandy loam about 4 inches thick. The underlying material, to a depth of 60 inches, is pale brown and very pale brown fine sandy loam in the upper part and light gray and very pale brown coarse sand in the lower part.

Wann soils are deep. Typically, the surface layer is grayish brown, very friable, calcareous fine sandy loam about 9 inches thick. The next layer is grayish brown, very friable, calcareous fine sandy loam about 5 inches thick. The upper part of the underlying material is light brownish gray, mottled fine sandy loam about 19 inches thick. The middle part is light gray, mottled fine sandy loam about 9 inches thick. The lower part is light gray, mottled loam. At a depth of 48 inches is light gray, mottled coarse sand that extends to a depth of 60 inches or more.

Boel soils are deep and are on slightly higher bottomland positions than Alda and Wann soils. Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is dark gray, very friable fine sandy loam about 3 inches thick. The next layer is grayish brown, very friable fine sandy loam about 6 inches thick. The underlying material, which extends to a depth of more than 60 inches, is light brownish gray and pale brown fine sand in the upper part and very pale brown loamy fine sand in the lower part.

The minor soils in this association are Platte, Lex, Gibbon, and Gothenburg soils. Platte, Lex, and Gibbon

Figure 6.—Area in the Kenesaw-Coly association. Coly silt loam is on the ridges, and Kenesaw silt loam is in the swales.

soils are at the same or slightly lower elevations in this association. Platte soils are shallow over sand and gravel. Lex soils are moderately deep over sand and gravel and contain more clay in the upper part. Gibbon soils are deep and contain more silt and clay throughout. Lex and Gibbon soils also include some saline areas. Gothenburg soils are near the Platte River channel and are very shallow over sand and gravel.

Farms in this association are mainly cash-grain operations or a combination of cash-grain and livestock enterprises. Irrigated corn is the main crop, and some small acreages of alfalfa are grown. This association is almost entirely under gravity irrigation. The saline areas are used for crops or pasture.

This association has a network of drainage ditches to help keep the water table below detrimental levels in spring. During seasons of above average rainfall, tillage can be delayed by soil wetness. Soil blowing is a hazard if the soils are left unprotected during the fall and winter.

5. Simeon Association

Deep, nearly level and very gently sloping, excessively drained, loamy soils formed in sandy and loamy alluvium; on stream terraces

This association consists of soils on smooth areas of stream terraces (fig. 8).

This association occupies about 11,200 acres, or about 4 percent of the county. It is about 82 percent Simeon and 18 percent soils of minor extent.

Typically, Simeon soils have a surface layer of dark grayish brown, very friable sandy loam about 6 inches thick. The next layer is brown coarse sand about 6 inches thick. The underlying material is very pale brown coarse sand to a depth of more than 60 inches.

Minor soils in this association are mainly Valentine and Libory soils. Valentine soils are on low ridges or areas slightly higher than the Simeon soils. They contain less coarse and medium sand. Libory soils are commonly in swales. They are moderately well drained and have silty materials in the underlying material.

Farms in this association are mainly cash-grain operations or a combination of cash-grain and livestock enterprises. The soils are mainly under sprinkler irrigation for production of corn or in native range for grazing cattle. The soils in most of this association are poorly suited to irrigated crops because of low available water capacity, low fertility, and a severe soil-blowing hazard. Because of the abundance of ground water and the development of center-pivot irrigation, more than half of this association has been developed for irrigation. Moderate success with pivot irrigation has been achieved with careful management. Pollution of ground water from overirrigation and leaching of applied chemicals and fertilizers through the rapidly permeable soils is a severe hazard. Range yields in this association are very low. The dominant grasses are short and are low producers. The low available water capacity causes droughty conditions that do not encourage growth.

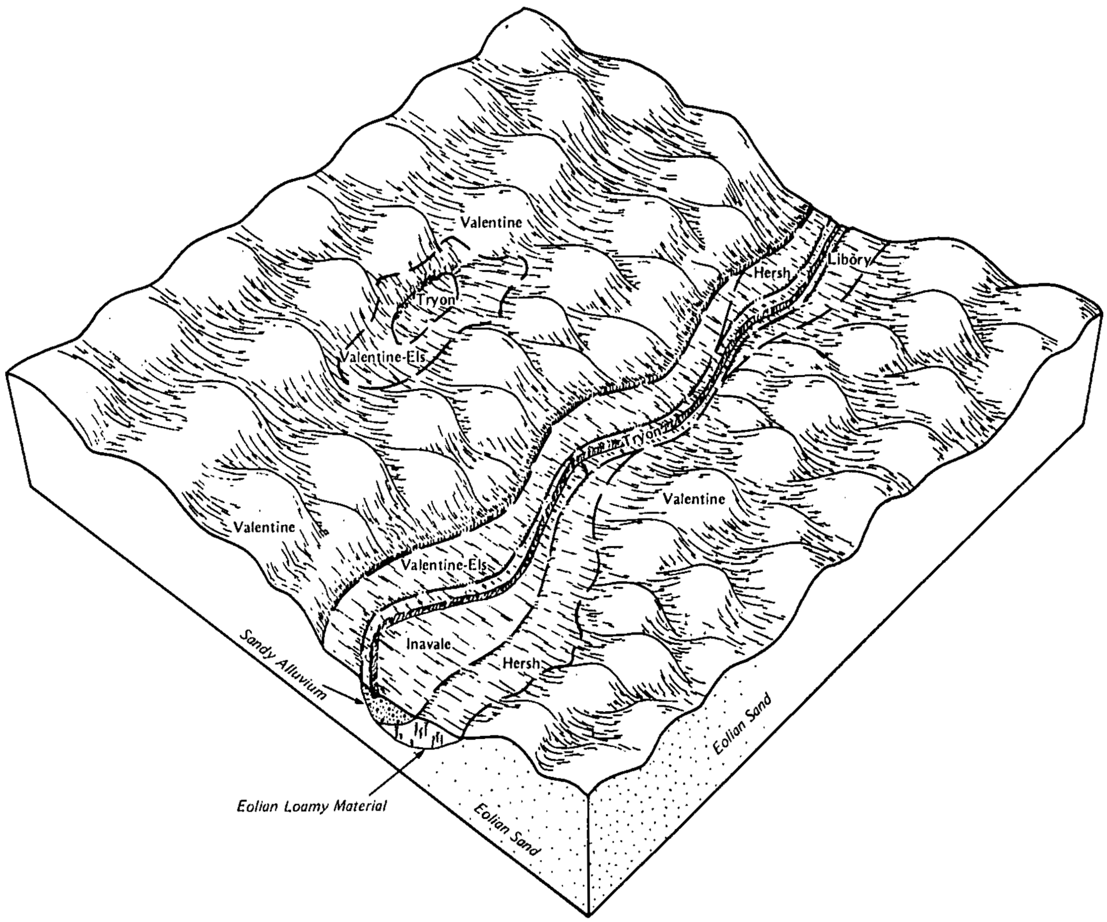

Figure 7.—Typical pattern of soils in the Valentine association.

When the soils in this association are cultivated, there is a serious hazard of soil blowing if they are left unprotected. Maintaining adequate moisture and fertility for growing crops is a main concern in management. Range management that includes proper grazing use, timely deferment of grazing, and a system of use and rest with the order changed each year helps maintain or improve the range condition.

6. Coly-Uly-Holdrege Association

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

This association consists of soils along upland drainageways.

This association occupies about 10,380 acres, or about 3 percent of the county. It is about 30 percent Coly soils, 25 percent Uly soils, 23 percent Holdrege soils, and 22 percent soils of minor extent.

Coly soils are strongly sloping and moderately steep and are well drained and somewhat excessively drained. Typically, the surface layer is grayish brown, very friable silt loam about 5 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of more than 60 inches.

Uly soils are higher in the landscape than the Coly soils. They are strongly sloping and moderately steep and are well drained and somewhat excessively drained. 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. The upper part is dark grayish brown, the middle part is grayish brown, and the lower part is light brownish gray. The underlying material is light gray, calcareous silt loam to a depth of more than 60 inches.

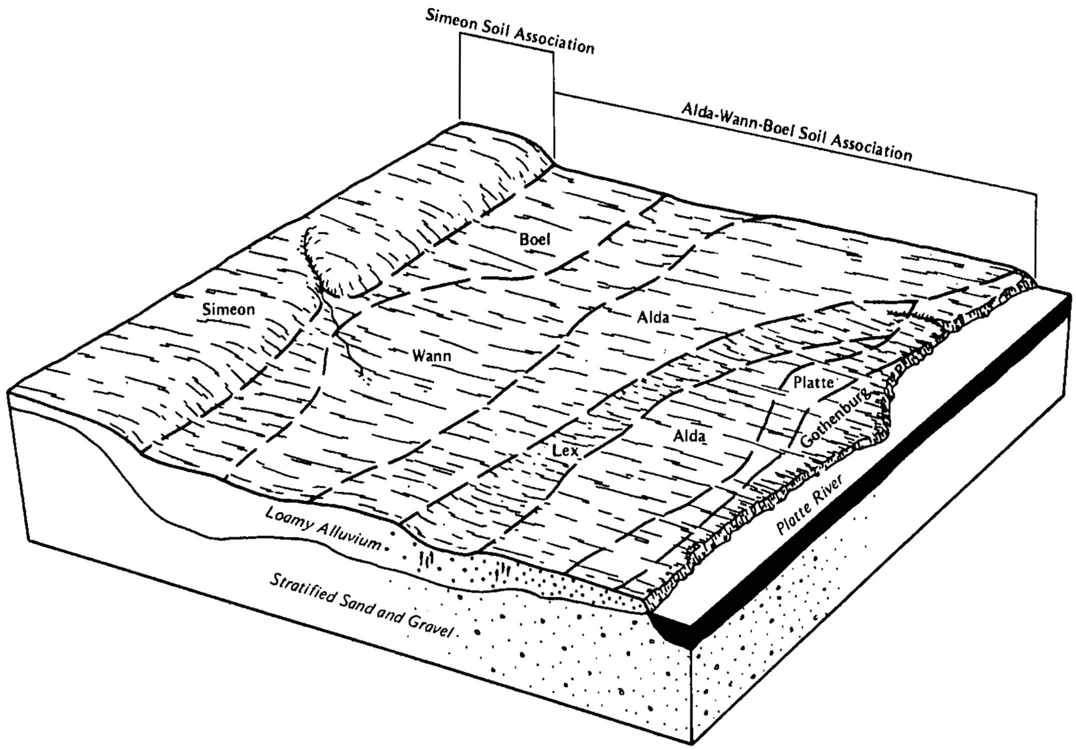

Figure 8.—Typical pattern of soils in the Alda-Wann-Boel association and the Simeon association.

Holdrege soils are higher in the landscape than the Coly and Uly soils. They are nearly level to gently sloping and are well drained. Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is silty clay loam about 17 inches thick. It is dark grayish brown in the upper part, the next layer is brown, and the lower part is pale brown. The underlying material is very pale brown silt loam to a depth of 36 inches. Below this, to a depth of 60 inches, is light gray silt loam.

The minor soils in this association are Hobbs and Hord soils. Hobbs soils are in bottom lands along the drainageways and are occasionally and frequently flooded. Hord soils are on nearly level areas near or slightly lower than Holdrege soils in the landscape. They have a dark surface layer more than 20 inches thick.

Farms in this association are mainly cash-grain operations or a combination of cash-grain and livestock enterprises. The nearly level to strongly sloping soils are used for range and cultivated crops. The soils on moderately steep slopes are used for range. Cultivated areas are mainly dryfarmed and used for production of grain sorghum, wheat, and alfalfa. A few areas are used for growing corn under center-pivot irrigation systems. Yields are considerably lower on Coly soils than on surrounding soils that are better suited to crops. Many areas used for range are in poor condition and produce low yields because of overgrazing and the presence of low-producing grasses.

Water erosion is a hazard on the gently sloping to moderately steep soils. Soil blowing is a hazard if the soils are not protected by plant cover or crop residues. Maintaining soil fertility and adequate moisture is a concern of management. Range management that includes proper grazing use and timely deferment of grazing helps maintain or improve the range condition.

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, Holdrege silt loam, 0 to 1 percent slopes, is one of several phases in the Holdrege 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 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. Kenesaw-Coly silt loams, 1 to 3 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.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, sand and gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

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.

Some soil boundaries and soil names in this survey may not fully match those of adjoining areas that were published at an earlier date. This is a result of changes and refinement in the series concept, different slope groupings, and application of the latest soil classification system.

Soil Descriptions

Ad—Alda loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands of the Platte River Valley. It is moderately deep over coarse sand or gravelly sand. The soil formed in alluvium. Flooding is rare. Areas range from 50 to 600 acres in size.

Typically, the surface layer is grayish brown, friable, calcareous loam about 6 inches thick. The subsurface layer is also grayish brown, friable, calcareous loam about 6 inches thick. The next layer is brown, very friable, calcareous fine sandy loam about 4 inches thick. The underlying material, to a depth of 60 inches, is pale brown and very pale brown fine sandy loam in the upper part and light gray and very pale brown coarse sand in the lower part. In places, the coarse material is within 20 inches of the surface because of extensive land grading for gravity irrigation systems. Some small areas of this soil have thin layers of loam material and carbonate accumulations in the lower part of the underlying material. In a few areas the loam surface texture extends to the coarse sand, and in some areas the surface layer is very fine sandy loam.

Included with this soil in mapping are small areas of Boel, Gibbon, and Platte soils. Boel soils are sandy throughout. Platte soils are shallow over coarse sand or gravelly sand and occur along the narrow, shallow drainageways that cross areas of this unit. Gibbon soils are finer textured and have coarse sand at depths below 48 inches. These included soils make up less than 15 percent of the unit.

Permeability of this Alda soil is moderately rapid in the upper part and very rapid in the lower part. Available water capacity is low. Runoff is slow. The surface layer is friable and easily tilled over a wide range of moisture conditions. Plant roots are generally limited to the material above the coarse sand or gravelly sand. The organic matter content is moderate. Depth to the seasonal high water table ranges from about 2 feet in wet years to about 3 feet in dry years.

Most of the acreage of this soil is farmed. Most areas are irrigated, but some are dryfarmed.

If this soil is dryfarmed, it is suited to corn, grain sorghum, wheat, oats, and introduced grasses and alfalfa for hay or pasture. Soil wetness is a limitation, and tillage is commonly delayed early in spring. The fluctuating water table, however, provides some moisture for crops in summer when rainfall is inadequate. Soil blowing is a hazard if the soil is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as stubble mulching, chiseling, and discing, help prevent soil blowing and maintain tilth. Returning crop residue and applying feedlot manure helps maintain organic matter content and fertility. Perforated tile or V-ditches can help lower the water table where a suitable outlet is available.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, soybeans, and introduced grasses for hay and pasture. Tillage is commonly delayed by wetness in spring. Conservation tillage practices that leave all or part of the crop residue on the surface, such as chiseling, discing, and no-till planting, help control soil blowing. Generally, some land leveling is needed for gravity irrigation, but deep cuts should be avoided to prevent exposing the coarse underlying material. The coarse texture of the underlying material and the low available water capacity of this soil make light and frequent applications of water and fertilizer necessary to help reduce the waste of water and the leaching of plant nutrients into the water table. Sprinklers allow better control of water application and require little land preparation. Fertilizers can be applied through sprinklers. Returning crop residue to the soil helps maintain and improve the organic matter content and reduce soil blowing.

This soil is suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome alone or in a mixture with legumes, such as alfalfa, can be grown. Rotation grazing and proper stocking can help maintain grasses in good condition. Nitrogen fertilizer can increase the growth and vigor of the grasses. Sprinklers are the most suitable method of irrigation because of the rapid permeability.

This soil generally provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Plants selected should be able to tolerate occasional wetness. Weeds and grasses can be controlled by careful cultivation between rows and the use of selected herbicides. Annual cover crops can be used between the rows to prevent soil blowing.

The hazard of rare flooding should be considered when planning sanitary facilities and building sites. Septic tank absorption fields can be constructed on fill material so that the field is sufficiently above the seasonal high water table. This soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter it. This poor filtering capacity may result in pollution of the ground water. Sewage lagoons should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table. They should be lined or sealed to prevent seepage and diked for protection from flooding. Dwellings and buildings should be constructed on elevated, well-compacted fill material for protection against flooding and to reduce wetness caused by the high water table. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is in capability unit IIIw-4, nonirrigated, and IIIw-7, irrigated. It is in the Subirrigated range site and windbreak suitability group 2S.

Bo—Boel fine sandy loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands of the Platte River Valley. The soil formed in alluvium. Flooding is rare. Areas are long and narrow in shape and generally parallel to the river. They range from 5 to 150 acres in size.

Typically, the surface layer is dark grayish brown, very friable, calcareous fine sandy loam about 8 inches thick. The subsurface layer is dark gray, very friable, calcareous fine sandy loam about 3 inches thick. The next layer is grayish brown, very friable fine sandy loam about 6 inches thick. The underlying material, which extends to a depth of more than 60 inches, is light brownish gray and pale brown fine sand in the upper part and very pale brown loamy fine sand in the lower part. There are brown and strong brown mottles in the underlying material.

Included with this soil in mapping are small areas of Alda, Lex, and Wann soils. Alda and Lex soils have mixed coarse sand and gravel at depths of 20 to 40 inches. Wann soils are less sandy. These included soils make up about 5 to 10 percent of the unit.

Permeability of this Boel soil is rapid. Available water capacity is low. Runoff is very slow. The intake rate is moderately high. Organic matter content is moderately low. The surface layer is very friable and easily tilled over a wide range of moisture conditions. Land-leveling operations have caused much variation in surface layer thickness, color, and texture in some areas. Depth to the seasonal high water table ranges from 2.5 feet in wet years to 3.5 feet in dry years.

Most of the acreage of this soil is farmed. Most areas are irrigated, but some are dryfarmed.

If this soil is dryfarmed, it is suited to grain sorghum, wheat, oats, and alfalfa. Spring tillage can be delayed in wet years by the fluctuating seasonal high water table. Soil blowing is a hazard if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as stubble mulching, chiseling, and discing, help prevent soil blowing as well as conserve soil moisture. Returning crop residue to the soil helps maintain and improve organic matter content. Use of commercial fertilizers and manure can help maintain fertility.

If this soil is irrigated, it is suited to corn, soybeans, and alfalfa. A system of drainage ditches has generally stabilized the seasonal high water table. Soil blowing is a hazard if the surface is not protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as chiseling and discing or no-till planting, help prevent soil blowing and conserve moisture. Gravity irrigation systems require short irrigation runs and application times because the permeability is rapid and the water intake rate is moderately high. Sprinklers are more efficient. Leaching of nitrates and other applied materials into the ground water is a hazard, especially during periods of high rainfall. Light, frequent applications of water and fertilizer are necessary because the available water capacity is low. Fertilizers can be applied through sprinkler systems.

This soil is suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome alone or in a mixture with legumes, such as alfalfa, can be grown. Rotation grazing and proper stocking can help maintain grasses in good condition. Nitrogen fertilizer can increase the growth and vigor of the grasses. Sprinklers are the irrigation system best suited to this soil because of the rapid permeability.

This soil generally provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Establishment of seedlings can be difficult during wet years. Plants selected should be able to tolerate occasional wetness. Occasionally, competition from undesirable grasses and weeds is a concern on this soil. This can be controlled by cultivating between the rows and carefully applying selected herbicides. Soil blowing is a hazard, especially during dry periods when trees are small. It can be reduced by planting cover crops and using tillage practices that leave a protective cover on the surface between the rows.

The hazard of rare flooding should be considered when planning sanitary facilities or building sites. Septic tank absorption fields can be constructed on fill material so that the field is sufficiently above the seasonal high water table. Care should be taken to be certain that seepage does not contaminate the ground water. Sewage lagoons should be diked for protection from flooding. They should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table. They should also be lined or sealed to prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Dwellings and buildings can be constructed on elevated, well-compacted fill material for protection against flooding. Dwellings with basements should be constructed on raised, well-compacted fill material to avoid wetness caused by the water table. Constructing roads on suitable, well-compacted fill material above flood level and providing adequate side ditches and culverts help protect roads from flood damage and wetness.

This soil is in capability unit IIIw-6, nonirrigated, and IIIw-8, irrigated. It is in the Subirrigated range site and windbreak suitability group 2S.

Bu—Butler silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on flat or slightly concave areas of uplands and terraces. Some areas occupy broad basins of uplands. The soil formed in loess. Areas range from 5 to 200 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsurface layer is also dark gray, friable silt loam about 6 inches thick. The subsoil is about 29 inches thick. The upper part is dark gray, very firm silty clay, and the lower part is light brownish gray, firm silty clay loam. The underlying material is light gray, calcareous silt loam to a depth of more than 60 inches. In some areas the surface layer is less than 6 inches thick or more than 14 inches thick because of cuts and fills made during land-leveling operations.

Included with this soil in mapping are small areas of Detroit, Fillmore, and Scott soils and areas where the clayey subsoil has been exposed at the surface by land-leveling operations. Detroit soils occupy slightly higher positions in the landscape and are better drained. Fillmore soils are commonly slightly lower in the landscape on flats or small depressions and are poorly drained. Scott soils occupy depressions and are very poorly drained. These included areas make up less than 15 percent of the unit.

Permeability of this Butler soil is slow, and the water intake rate is low in the claypan subsoil. Available water capacity is high. Runoff is slow. There is a perched seasonal high water table at a depth of 0.5 foot to 2 feet. Organic matter content is moderate. Organic matter is low, tilth is poor, and available zinc is deficient in areas where the subsoil has been exposed by land-leveling operations. The shrink-swell potential is moderate in the surface and high in the subsoil.

Most of the acreage of this soil is farmed. Most areas are irrigated, but some are dryfarmed. The rest are in native grasses and generally are adjacent to wetlands. Most of these areas are used for waterfowl production and provide habitat for openland and rangeland wildlife as well as waterfowl.

If this soil is dryfarmed, it is suited to corn, grain sorghum, small grains, and grasses and legumes for hay and pasture. Grain sorghum and small grains are best suited to the slow release of moisture from the claypan subsoil. Small grains such as wheat mature before the weather becomes hot and dry. Soil blowing is a hazard if the soil surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as stubble mulching, chiseling, and discing, conserve soil moisture and prevent soil blowing. Runoff from adjacent areas often ponds on this soil for a few hours or days, especially in spring. The excessive water delays tillage and may retard crop growth, but only infrequently destroys the crop. Field terraces on the adjacent higher areas can reduce the runoff onto this soil. Puddling and compaction occur if this soil is tilled when it is wet, and it becomes hard and difficult to work when dry. Returning crop residue, green-manure crops, and barnyard manure to this soil improves the fertility and reduces crusting and compacting. The tilth and water intake rate are also improved. Chiseling or other deep tillage temporarily helps to increase water intake and root penetration. The inclusion of a deep-rooted legume, such as alfalfa, in the cropping sequence opens compacted layers and the claypan subsoil for improved water movement and improves fertility and tilth.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses and legumes for hay and pasture. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as chiseling, discing, and no-till planting, help to reduce crusting and puddling of the soil surface from heavy rains. Returning crop residues and applying feedlot manure to this soil help to increase organic matter content. This helps maintain the soil tilth and improves the water intake rate.

Either a gravity or a sprinkler irrigation system can be used on this soil. Some land leveling is generally needed with either system to provide uniform surface drainage and eliminate small basins that tend to hold water. Sites where cuts expose the clayey subsoil are often cloddy, and seedling establishment is difficult. Tillage should be delayed when this soil is wet and plastic. Adding available crop residues and feedlot manure helps to maintain the organic matter content and improve the structure of the soil. Burning crop residues is usually not a good practice.

The rate of water application should be adjusted to the low water intake rate to reduce runoff. Under gravity irrigation the length of run can be longer on this soil than on soils with higher intake rates. A tailwater recovery system can be constructed to help conserve water.

This soil is suited to introduced grasses or grass-legume mixtures for hay and pasture. Pastures can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass, either alone or in a mixture with a legume such as alfalfa, can be grown. Overgrazing or grazing when this soil is wet causes compaction and poor soil tilth. Rotation grazing and proper stocking help maintain the grasses in good condition. Nitrogen and phosphate fertilizers can increase the growth and vigor of the grasses.

This soil generally provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is good for survival of suitable species. Trees selected should be able to tolerate occasional wetness. Establishment of seedlings can be difficult in wet years because of ponding of excess water. The soil should be tilled and seedlings planted when the soil is moist, but not wet. This soil has a high shrink-swell potential and will crack in dry seasons, allowing air to dry out roots of shallowly rooted plants. A light cultivation after heavy rains can help prevent cracks at the surface, but supplemental water is needed to keep the subsoil from cracking or to close existing cracks.

This soil is generally not suited to septic tank absorption fields because of the wetness and slow permeability. A suitable alternate site is needed. Sewage lagoons should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table. Dwellings and buildings should be constructed on raised, well-compacted fill material to overcome wetness caused by the high water table and brief ponding during wet seasons. Foundations for buildings should be strengthened and backfilled with coarse materials to prevent damage by the shrinking and swelling of the soil. Constructing roads on suitable, well-compacted fill material and providing adequate side ditches and culverts help protect roads from wetness. Design roads so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarse-grained material can be used for subgrade or base material to ensure better performance. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the roads by grading and constructing adequate side ditches help to provide the needed surface drainage.

This soil is in capability unit IIw-2, nonirrigated, and IIw-2, irrigated. It is in the Clayey range site and windbreak suitability group 2W.

CaC—Coly silt loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on loess uplands. It occurs on rounded knolls and short, uneven side slopes. Areas range from 5 to 100 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The next layer is about 14 inches thick. It is light brownish gray, friable very fine sandy loam in the upper part and light brownish gray silt loam in the lower part. The underlying material is light brownish gray and light gray silt loam to a depth of more than 60 inches. The underlying material commonly has a few fine lime accumulations. In some areas the underlying material contains less clay.

Included with this soil in mapping are small areas of Hersh, Kenesaw, and Valentine soils. Hersh and Valentine soils have more sand throughout and are in similar positions. Kenesaw soils are in swales and have thicker, dark surface layers. These included soils make up 5 to 10 percent of the unit.

Permeability of this Coly soil is moderate. Available water capacity is high. Runoff is medium. Organic matter content is moderately low.

Most of the acreage of this soil is farmed. A few areas are irrigated by a sprinkler method. A few areas are in native grass.

If this soil is dryfarmed, it is suited to grain sorghum, wheat, and grasses and legumes for hay and pasture. A few areas that have uniform, smooth slopes can be terraced and farmed on the contour. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as stubble mulching, chiseling, and discing, help prevent soil blowing and water erosion as well as conserve soil moisture. Returning crop residue to the soil helps maintain and improve organic matter content, increase infiltration of water, and reduce runoff.

If this soil is irrigated, it is suited to corn, alfalfa, and introduced grasses and legumes for hay and pasture. Sprinklers are the irrigation method best suited to this soil because of the slope. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as no-till planting or chiseling, discing, and planting, help prevent soil blowing and water erosion as well as conserve soil moisture. Careful regulation of water application is necessary to avoid excessive runoff and erosion. Maintaining and improving organic matter content is a concern of management on this soil. Returning available crop residues to the soil, adding available feedlot manure, and applying commercial fertilizers at the proper times help to maintain organic matter content and fertility.

This soil is suited to range, which is very effective in controlling water erosion. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, and western wheatgrass. If the site is abused by overgrazing, the big bluestem and little bluestem decrease in abundance and sideoats grama, blue grama, tall dropseed, western wheatgrass, and other annual and perennial weeds increase. Woody plants may also migrate or invade the site. These might include bur oak, eastern redcedar, buckbrush, snowberry, and sumac. Brush management and prescribed burning may be needed to control the woody plants.

This soil provides fair sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The calcareous nature of this soil and a lack of moisture at either planting time or some other period during the growing season are limitations. Survival and growth of seedlings can be accomplished by good site preparation, timely cultivation, and careful use of herbicides to remove competing weeds and grasses. Soil blowing and water erosion are hazards when establishing windbreaks. Planting on the contour and the controlled use of cover crops between rows help to reduce soil loss.

This soil is generally suited to septic tank absorption fields and dwellings. Sewage lagoons should be lined or sealed to prevent seepage. Grading is required to modify the slope and shape the lagoon. Small commercial buildings should be designed to accommodate the natural slope of the land, or the soil can be graded to an acceptable gradient. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the necessary surface drainage.

This soil is in capability unit IIIe-9, nonirrigated, and IIIe-6, irrigated. It is in the Limy Upland range site and windbreak suitability group 8.

CaD—Coly silt loam, 6 to 11 percent slopes. This deep, strongly sloping, well drained soil is on loess uplands. It occupies rounded knolls and short, uneven side slopes and intermittent drainageways. Areas are long and narrow in shape and range from 5 to 120 acres in size.

Typically, the surface soil is pale brown, very friable silt loam about 5 inches thick. The underlying material is pale brown silt loam to a depth of more than 60 inches. Free carbonates, in soft, rounded accumulations, and a few medium yellowish brown mottles, not associated with wetness, occur in the underlying material. In some areas, the underlying material contains less clay.

Included with this soil in mapping are small areas of Hersh, Kenesaw, and Valentine soils. Hersh and Valentine soils are in landscape positions similar to those of the Coly soils, but they have more sand throughout. Kenesaw soils are in swales and drainageways and have a thicker, darker surface layer. Included soils make up about 10 percent of the unit.

Permeability is moderate. Available water capacity is high. Runoff is rapid. Organic matter content is moderately low.

Most of the acreage of this map unit is farmed. A few areas are irrigated. The remaining acreage is in native grass used for range. A few areas have been farmed and reseeded to native grasses.

If this soil is dryfarmed, it is poorly suited to wheat, alfalfa, and grain sorghum. Water erosion and soil blowing are hazards if the surface is not adequately protected by plant cover or crop residues. Soil loss is difficult to control where this soil is farmed. Row crops should not be grown. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as stubble mulching, chiseling, and no-till planting, help prevent soil blowing and water erosion. Returning crop residue to the soil helps maintain organic matter content and increase infiltration of water. Terraces and contour farming can be used where the slopes are smooth and uniform. Grassed waterways can remove runoff with minimal soil loss.

If this soil is irrigated, it is poorly suited to cultivated crops. Close-spaced crops, alfalfa, and introduced grass and legume mixtures for hay and pasture should be grown most of the time. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as no-till planting, discing, and chiseling, help prevent soil blowing and water erosion and conserve soil moisture. Maintaining organic matter content is a concern, and crop residues should be returned to the soil. Sprinklers are the only suitable method of irrigation on this soil because of the slope. Erosion in wheel tracks is a common problem under pivot sprinkler systems. This can be reduced by packing the track with about a half-inch application of water during the pivot's first round. Once compacted, tracks remain hard. Efficient management of water application is needed to control runoff. The rate of application should be adjusted according to the water intake rate of the soil.

This soil is suited to range, which is very effective in controlling water erosion. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, and western wheatgrass. If the site is abused by overgrazing, the big bluestem and little bluestem decrease in abundance, and sideoats grama, blue grama, tall dropseed, western wheatgrass, and other annual and perennial weeds increase. Woody plants may also migrate or invade the site. These include bur oak, eastern redcedar, buckbrush, snowberry, and sumac. Brush management and burning may be needed to control the woody plants.

This soil provides fair sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Trees should be selected that are somewhat tolerant of calcareous soils and dry conditions. Dryness and competition from weeds and grasses are hazards to seedling establishment. Water erosion is a hazard on these strongly sloping soils. Trees can be planted on the contour to prevent erosion and excessive runoff of water. Annual cover crops can be used between the rows. The low organic matter content of this soil makes caution necessary in applying herbicides. The type and amount applied should be carefully selected.

This soil is generally suited to septic tank absorption fields. For proper operation, it is generally necessary to shape the land and install septic tank absorption fields on the contour. For sewage lagoons, grading is required to modify the slope and shape the lagoon. Lagoons should be lined or sealed to prevent seepage. Dwellings and small commercial buildings should be designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Cutting and filling is generally needed to provide a suitable grade for roads and streets. Damage by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help to provide the necessary surface drainage.

This soil is in capability unit IVe-9, nonirrigated, and IVe-6, irrigated. It is in the Limy Upland range site and windbreak suitability group 8.

CaF—Coly silt loam, 11 to 20 percent slopes. This deep, moderately steep, somewhat excessively drained soil is on loess uplands. It commonly occupies short, uneven side slopes and drainageways. Areas are long and narrow in shape and range from 5 to 75 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 4 inches thick. The next layer is light brownish gray, friable silt loam about 4 inches thick. The underlying material is light brownish gray and light gray silt loam to a depth of more than 60 inches. It commonly has free lime in threads and soft, rounded accumulations. In some areas, the underlying material contains less clay.

Included with this soil in mapping are small areas of Hersh, Kenesaw, and Valentine soils. Hersh and Valentine soils are on similar landscape positions, but are sandier throughout. Kenesaw soils are in swales and have a thicker, dark surface layer. Included soils make up about 10 percent of the unit.

Permeability of this Coly soil is moderate. Available water capacity is high. Organic matter content is moderately low. Runoff is rapid.

Most of the acreage of this soil is in native grasses and is used for range.

This soil is unsuited to cultivated crops. Any removal of grass cover on the steep slopes would quickly result in severe water erosion.

This soil is suited to range, which is very effective in controlling water erosion. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, and western wheatgrass. If the site is abused by overgrazing, the big bluestem and little bluestem decrease in abundance and sideoats grama, blue grama, tall dropseed, western wheatgrass, and other annual and perennial weeds increase. Woody plants may also migrate or invade the site. These might include bur oak, eastern redcedar, buckbrush, snowberry, and sumac. Brush management and burning may be needed to control the woody plants.

Areas of this soil are generally suited to planting trees in windbreaks. The steep slopes limit the number of areas that can be planted with machines and increase the water erosion hazard. A few areas may be suitable for wildlife or recreational plantings if trees and shrubs tolerant of dry conditions and limy soils are hand planted and special practices are used to cope with the steep side slopes and the occasional flooding in the canyon bottom.

This soil generally is not suitable for sanitary facilities because of the moderately steep slope. A suitable alternate site is needed. Dwellings should be designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Cutting and filling is needed to provide a suitable grade for roads.

This soil is in capability unit VIe-9, nonirrigated. It is in the Limy Upland range site and windbreak suitability group 8.

CkB—Coly-Kenesaw silt loams, 0 to 3 percent slopes. This map unit consists of deep, nearly level and very gently sloping, well drained soils on slightly hummocky uplands. They formed in loess. Areas range from 10 to 500 acres in size. The Coly soil is on narrow ridges and side slopes of low hummocks. The Kenesaw soil occupies swales and flats at slightly lower elevations. The Coly soil makes up about 60 to 65 percent of each individual area, and the Kenesaw soil makes up about 30 to 35 percent. Areas of these two soils are so intricately mixed or so small in size that it was not practical to separate them in mapping. Areas of this unit range from 15 to several hundred acres in size.

Typically, the Coly soil has a surface layer that is brown, very friable silt loam about 6 inches thick. The next layer is grayish brown, very friable silt loam about 5 inches thick. The underlying material is light brownish gray, calcareous silt loam and very fine sandy loam to a depth of more than 60 inches.

Typically, the Kenesaw soil has a surface layer that is grayish brown, friable silt loam about 6 inches thick. The subsurface layer is also grayish brown, friable silt loam about 4 inches thick. The subsoil is friable silt loam about 13 inches thick. The upper part is brown, and the lower part is pale brown. The underlying material is very pale brown, calcareous silt loam to a depth of more than 60 inches.

Included with this unit in mapping are small areas of Hersh and Rusco soils. Hersh soils contain more sand throughout and are on hummocks. Rusco soils are in shallow depressions and have more clay in the subsoil. These included areas make up 5 to 10 percent of the unit.

Permeability of the Coly and Kenesaw soils is moderate. Available water capacity is high. Organic matter content is moderately low. Runoff is medium on the Coly soil and slow on the Kenesaw soil.

Most of the acreage of this unit is farmed. Most areas are irrigated.

If these soils are dryfarmed, they are suited to wheat, grain sorghum, alfalfa, and mixtures of introduced grasses for hay and pasture. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Inadequate rainfall, mostly in mid and late summer, is a limitation. Conservation tillage practices that keep crop residues on the surface, such as stubble mulching, chiseling, and discing, help prevent soil blowing and water erosion as well as conserve moisture. Applying crop residues, green-manure crops, and feedlot manure to the soil helps maintain and improve the organic matter content and soil tilth. These practices along with the use of commercial fertilizers help to improve fertility.

If these soils are irrigated, they are suited to corn, alfalfa, soybeans, and mixtures of legumes and introduced grasses for hay and pasture. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as no-till planting, discing, and chiseling, help prevent soil blowing and water erosion as well as conserve soil moisture. Efficient water distribution is a concern of management. Gravity irrigation systems can be used if proper uniform grade and orderly surface drainage can be achieved. Extensive land-leveling operations are commonly necessary. Tailwater recovery systems can be constructed to reduce waste of water and plant nutrients. Seepage can occur from some systems, and pits may need to be lined or sealed. Leaching plant nutrients to a depth below most plant roots is probable if too much water is applied. It is important to return all crop residues and available feedlot manure to these soils to increase the organic matter content. These practices along with proper use of commercial fertilizers help to increase available water capacity, improve fertility, and reduce soil blowing.

The soils in this unit are suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Cool-season grasses, such as smooth brome or orchardgrass, are suited either alone or in a mixture with legumes, such as alfalfa. Separate pastures of cool- and warm-season grasses can be used to provide season-long grazing. Rotation grazing and proper stocking help to maintain grasses in good condition. Nitrogen and phosphate fertilizers increase growth and vigor of grasses. Irrigation water can be applied by sprinkler or gravity systems. A gravity system would require land leveling and a system of border dikes for effective water distribution.

The soils in this unit provide fair to good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is good for survival and growth of suitable plants. Tillage and chemical methods are effective in preparing a favorable site for plantings. Supplemental watering can provide needed moisture during periods of insufficient rainfall. Conventional equipment can be used to cultivate between the rows. Tillage practices that leave crop residue on the surface or annual cover crops between the tree rows help control soil blowing. Careful use of appropriate herbicides in the row can help control weeds and undesirable grasses.

The soils in this unit are generally suited to septic tank absorption fields, dwellings, and small commercial buildings. Sewage lagoons should be lined or sealed to prevent seepage. Roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for subgrade or base material to ensure better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help provide the necessary surface drainage.

The soils in this unit are assigned to capability unit IIe-9, nonirrigated, and IIe-6, irrigated. The Coly soil is in the Limy Upland range site and windbreak suitability group 8. The Kenesaw soil is in the Silty range site and windbreak suitability group 3.

CoD2—Coly-Uly silt loams, 6 to 11 percent slopes, eroded. This map unit consists of deep, strongly sloping, well drained soils on loess uplands. Individual areas in the landscape occupy short, eroded slopes below nearly level divides and above and adjacent to steeply sloping upland drainageways. The Coly soil occupies the crest of ridges and strongly sloping sides of drainageways. The Uly soil is on slightly concave smooth slopes or swales and foot slopes near the drainageways. Small rills are common after rains, but most of them can be eliminated by tillage operations. Erosion has removed most of the original surface layer from the Coly soil. The Coly soil makes up about 50 percent of each individual area, and the Uly soil makes up about 35 percent. Areas of these soils are mixed in such varying, irregular patterns or are so small that it was not practical to separate them in mapping. Areas of this unit range from 5 to 50 acres in size.

Typically, the Coly soil has a surface layer that is grayish brown, very friable silt loam about 5 inches thick (fig. 9). The underlying material is very pale brown silt loam to a depth of more than 60 inches. Lime is visible in threads and soft, rounded accumulations in the underlying material.

Typically, the Uly soil has a surface layer that is dark grayish brown very friable silt loam about 7 inches thick. The subsoil is very friable silt loam about 21 inches thick. It is dark grayish brown in the upper part, grayish brown in the middle part, and light gray in the lower part. The underlying material is light gray silt loam to a depth of more than 60 inches. Carbonates are commonly at a depth of about 28 inches.

Included with this unit in mapping are small areas of Hobbs and Holdrege soils. Hobbs soils are in drainageways and are stratified. Holdrege soils are in landscape positions similar to the Uly soil. They have more clay in the subsoil. These included soils make up about 15 percent of the unit.

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

Almost all of the acreage of this unit has been cultivated at one time, and more than 80 percent of it continues to be used as cropland. Some areas are irrigated. A few areas have been reseeded to native grass.

If these soils are dryfarmed, they are poorly suited to wheat, grain sorghum, and alfalfa. Soil blowing and water erosion are the main hazards if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residue on the surface, such as chiseling and discing, help control soil blowing and water erosion and conserve moisture. Terraces, contour farming, and grassed waterways help to control water erosion.

If these soils are irrigated, they are poorly suited to cultivated crops. Sprinklers are the only method of irrigation suitable to these soils because of the slope. Close-spaced crops, legumes, and introduced grasses should be used. Efficient water management is needed. Water erosion is the principal hazard. Conservation tillage practices that keep all or most of the crop residue on the surface, such as chiseling, discing, and no-till planting systems, help control water erosion. Terraces and farming on the contour are useful. Water erosion can be more easily controlled if alfalfa and introduced grasses for hay and grazing are grown.

The soils in this unit are suited to introduced grasses and legumes for hay and pasture. Such cool-season grasses as smooth brome and orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa or warm-season grasses such as switchgrass. The soils in this unit are subject to erosion by water. Overgrazing causes poor plant vigor and, as a result, small gullies and rills can form after heavy rains. Separate pastures of cool- and warm-season grasses can provide a long season of grazing. Rotation grazing and proper stocking

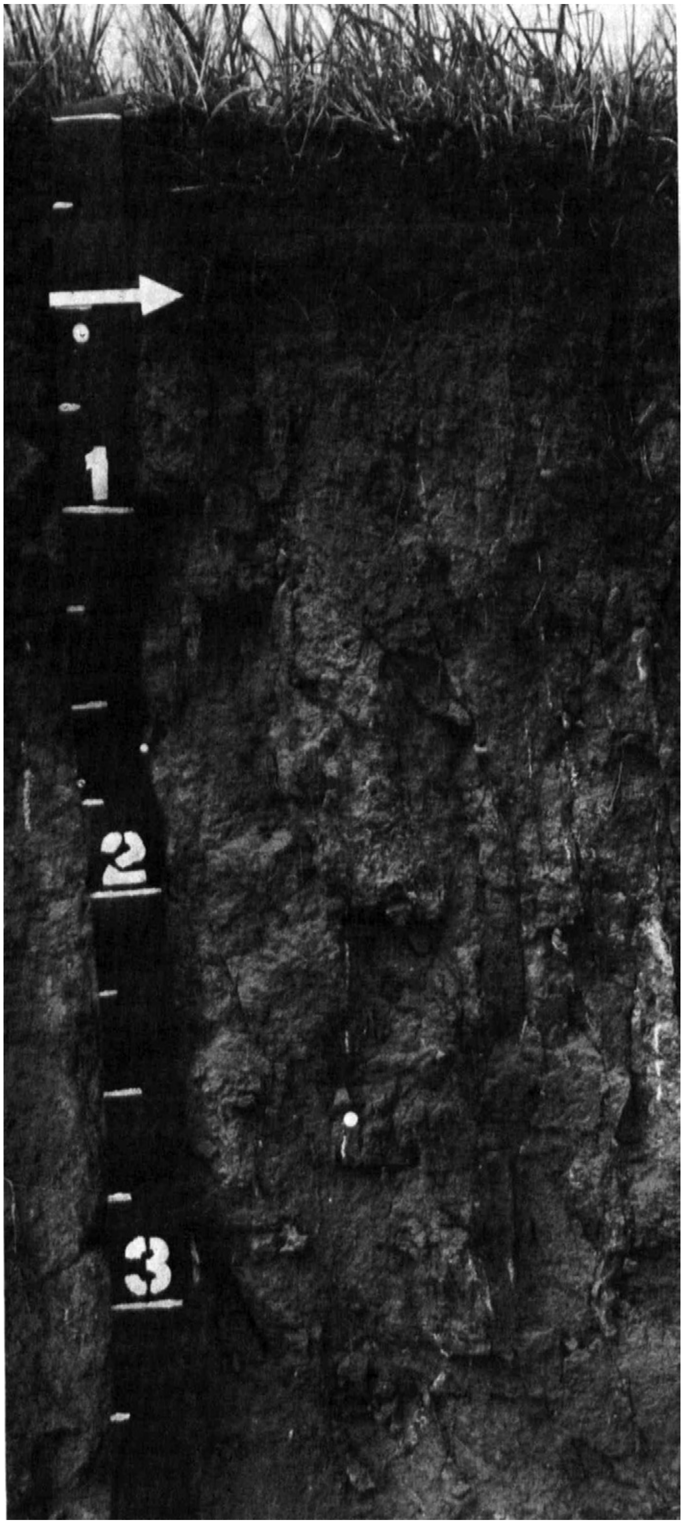

Figure 9.—Profile of Coly silt loam in an area of Coly-Uly silt loams, 6 to 11 percent slopes. The arrow marks the lower boundary of the surface layer. Scale is in feet.

help to maintain the grasses in good condition. Nitrogen fertilizer increases growth and vigor of the grasses.

The soils in this unit are suited to range, which is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses dominated by little bluestem, big bluestem, sideoats grama, and western wheatgrass on the Coly soil and big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass on the Uly soil. If the site is abused by overgrazing, big bluestem, little bluestem, and switchgrass decrease in abundance and sideoats grama, blue grama, tall dropseed, western wheatgrass, and other annual and perennial weeds increase. If overgrazing continues for many years the less desirable plants, such as common pricklypear, increase. Woody plants including buckbrush, eastern redcedar, snowberry, and sumac may invade the site. Brush management and burning may be needed to control woody plants.

The soils in this unit provide fair to good sites for planting trees and shrubs in farmstead and feedlot windbreaks and for recreation and wildlife plantings. Plant trees and shrubs that can tolerate dry conditions and excessive carbonates. Conventional equipment can be used to cultivate between the rows. Annual cover crops can be grown between the rows. Careful use of appropriate herbicides in the row can help control undesirable weeds and grasses. Areas in the row or near small trees can be hoed by hand and roto-tilled. Water erosion is also a problem on these strongly sloping soils. Trees can be planted on the contour. Terraces are also helpful, and use of minimum tillage when controlling weeds will help prevent excessive runoff. Growth may be somewhat slower on the steepest slopes.

The soils in this unit are suited to septic tank absorption fields, but shaping the land and installing the field on the contour are generally necessary for proper operation. Sewage lagoons should be lined or sealed to prevent seepage. Extensive grading is required to modify the slope and shape the lagoon. Dwellings and small commercial buildings should be designed to accommodate the natural slope of the land, or the soil can be graded to an acceptable gradient. Roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for the subgrade or base material to ensure better performance.

The soils in this unit are in capability unit IVe-9, nonirrigated, and IVe-6, irrigated. 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.

CoF2—Coly-Uly silt loams, 11 to 20 percent slopes, eroded. This map unit consists of deep, moderately steep, somewhat excessively drained soils on side slopes of upland drainageways. The soils formed in loess. The Coly soil occupies ridgetops and the steeper, eroded sides of dissected drainageways. The Uly soil is on smooth, plane, or slightly concave upper slopes descending from the high divide and in swales that descend to the bottom of the drainageways. Rills and small gullies are common after rains, and some are still visible after tillage operations. The Coly soil makes up about 65 percent of each individual area, and the Uly soil makes up about 25 percent. Areas of these soils are so mixed in varying, irregular patterns or are so small that it was not practical to separate them in mapping. Individual areas of this unit are commonly long but very irregular in shape because they are parallel to or include upland drainageways. Individual areas range from 5 to 200 acres in size.

Typically, the Coly soil has a surface layer that is light gray, very friable, calcareous silt loam about 6 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of more than 60 inches. Lime is visible in threads and soft, rounded accumulations.

Typically, the Uly soil has a surface layer that is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 15 inches thick. The upper part of the subsoil is dark grayish brown, friable silt loam, and the lower part is grayish brown, friable very fine sandy loam. The upper part of the underlying material is pale brown, very fine sandy loam, and the lower part is very pale brown silt loam to a depth of more than 60 inches. Carbonates are at a depth of 24 inches. Lime is visible in soft, rounded accumulations and thin coatings on cleavage planes.

Included with this unit in mapping are occasionally flooded Hobbs soils in drainageways and outcrops of reddish and grayish brown loess at the base of some side slopes and along the sides of drainageways in the southern and southeastern parts of the county. Also included are some areas with discontinuous fine sandy loam strata in the profile. They are mainly along Sand Creek. These included areas make up about 10 percent of the unit.

Permeability of the Coly and Uly soils is moderate. Available water capacity is high. Runoff is rapid. Organic matter content is low in the Coly soil and moderately low in the Uly soil. The soils in this unit readily release moisture to plants.

Most of the acreage of this unit is farmed. Some areas are in native grasses, and some areas have been reseeded to grass.

The soils in this unit are generally unsuited to cultivated crops. Any removal of grass cover on the steep slopes would quickly result in severe water erosion. Areas used for cultivated crops should be reseeded to permanent native grass cover.

The soils in this unit are suited to range, which is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses dominated by little bluestem, big bluestem, sideoats grama, and western wheatgrass on the Coly soil and big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass on the Uly soil. If a site is abused by overgrazing, severe soil losses by water erosion can occur. Big bluestem, little bluestem, and switchgrass decrease in abundance, and sideoats grama, blue grama, tall dropseed, western wheatgrass, and annual and perennial weeds increase. Woody plants including eastern redcedar, buckbrush, snowberry, and sumac may invade the site. Brush management and burning may be needed to control woody plants. Range seeding is generally needed on eroded cropland to stabilize the soil.

The soils in this unit provide fair sites for planting trees and shrubs in farmstead and feedlot windbreaks and for recreation and wildlife plantings. Potential is fair for survival and growth of suitable species. Steep slopes limit the number of areas that can be planted with machines and increase the water erosion hazard. Trees or shrubs tolerant of dry conditions and limy soils should be planted, and special practices used to cope with the steep side slopes and the occasional flooding in the bottom of the drainageways. Tree rows planted on the contour and permanent plant cover between the rows can prevent erosion and excessive runoff.

Most areas of this unit are not suitable for sanitary facilities because of the steep slopes. A suitable alternate site is needed. Septic tank absorption fields can be installed on slopes of less than 15 percent, but shaping the land and installing the field on the contour are needed for proper operation. Dwellings and small commercial buildings should be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Roads should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for base material to ensure better performance. Cutting and filling is needed to provide a suitable grade for roads and streets.

The soils in this unit are in capability unit VIe-9, nonirrigated. 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.

De—Detroit silt loam, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is on loess uplands. Areas of this soil commonly are on broad flats or in swales adjacent to shallow, somewhat poorly drained depressions. They are irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is firm silty clay loam and silty clay about 38 inches thick. It is dark grayish brown in the upper part and grayish brown and light brownish gray in the lower part. The underlying material is light brownish gray silt loam to a depth of more than 60 inches. In some areas the dark surface layer is less than 20 inches thick. In some areas, lime has been leached to depths greater than 50 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Butler soils in small depressions and small areas of Holdrege soils that commonly are slightly higher in the landscape. Butler soils have more clay in the subsoil, and Holdrege soils have less clay in the subsoil. These included soils make up about 15 percent of the unit.

Permeability of this Detroit soil is slow. Available water capacity is high. The organic matter content is moderate. Runoff is slow. The surface layer is commonly slightly acid.

Most of the acreage of this soil is farmed. Most areas are irrigated, but some are dryfarmed. A few small areas adjacent to large, poorly drained depressions have been reseeded to native grasses for wildlife habitat.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, corn, and grasses and legumes for hay and pasture. Inadequate rainfall for crops during part of the summer is a limitation. Soil blowing is a hazard if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as stubble mulching, chiseling, and discing, can help prevent soil blowing as well as conserve soil moisture. This soil becomes cloddy and hard if tilled when it is too wet. Compaction and a poor seedbed result. In spring, tillage should be delayed until the soil is easy to work, even though this could delay planting. Deep chiseling helps open the soil for water and root penetration, but the benefits are temporary. Returning crop residue and green-manure crops to the soil helps maintain and improve the organic matter content, fertility, and soil tilth and also increase infiltration of water.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, soybeans, and mixed grasses and legumes for hay and pasture. Soil blowing is a hazard if the surface is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residue on the surface, such as chiseling or discing and planting, help prevent soil blowing and reduce moisture evaporation. Gravity systems are the most common method of irrigation, but sprinklers can be used. Timely application and proper distribution of irrigation water are needed for efficient production. Tailwater recovery systems (fig. 10) and proper land leveling can help to prevent waste of water and fertilizer if gravity systems are used. Returning crop residues and livestock manure to the soil helps to maintain organic matter content and increase infiltration of water. Burning crop residue is usually not a good practice.

This soil is suited to introduced grasses and legumes for pasture or hay. These crops can be alternated with others as part of a crop rotation system. Suitable cool-season grasses include smooth brome and orchardgrass, alone or in a mixture with legumes, such as alfalfa. Annuals, such as hybrid sudan, used in rotation can provide warm-season grazing. Separate pastures of cool- and warm-season grasses can be used to provide season-long grazing. Rotation grazing and proper stocking help to maintain the grasses in good condition. Nitrogen fertilizer increases growth and vigor of grasses. Irrigation water can be applied by gravity systems on most areas of this soil.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is good for survival and growth of suitable species. Inadequate rainfall during the growing season is a limitation. Supplemental watering can provide the moisture needed during the dryer periods. Competition from grass and weeds, especially when seedlings are becoming established, is a hazard. Good site preparation, timely cultivation between the rows, and careful use of selected herbicides can help overcome these conditions.

Septic tank absorption fields are not suited to this soil because of the slow permeability. A suitable alternate site is needed. This soil is generally suited to sewage lagoons. Foundations should be strengthened and backfilled with coarse materials to prevent damage by the shrinking and swelling of the soil. Roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material for subgrade or base material can be used to ensure better performance. If used as base material, this soil can be mixed with additives, such as hydrated lime, to help prevent shrinking and swelling.

This soil is in capability unit IIc-1, nonirrigated, and I-2, irrigated. It is in the Silty Lowland range site and windbreak suitability group 3.

Fm—Fillmore silt loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is in depressions on loess uplands. These depressions hold water for 3 days to 2 weeks at a time. Areas are irregular in shape, or long and narrow along the edges of large basins, and range from 5 to 70 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsurface layer is gray, very friable silt loam about 6 inches thick. The subsoil is about 32 inches thick. It is gray, firm silty clay in the upper part and grayish brown, friable silty clay loam in the lower part. The underlying material is light brownish gray, calcareous silt loam to a depth of more than 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Butler soils and very poorly

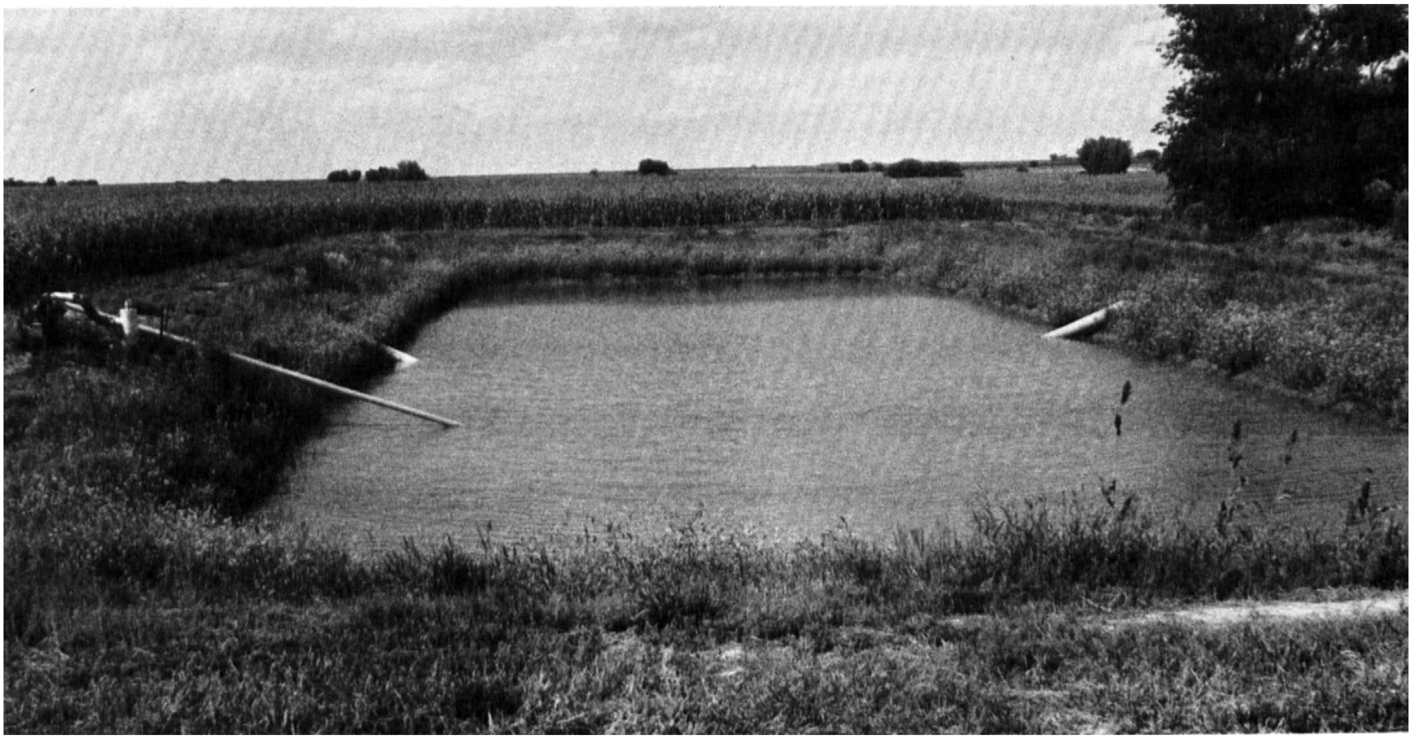

Figure 10.—Tailwater recovery systems help prevent waste of irrigation water. The soil is Detroit silt loam, 0 to 1 percent slopes.

drained Scott soils in the lower parts of small depressions. Also included are areas adjacent to very poorly drained depressions where the plastic clayey subsoil has been exposed by land leveling operations. Very slow intake rates in these areas result in short-term ponding. These included areas make up about 15 percent of the unit.

Permeability of this Fillmore soil is very slow. Available water capacity is high. Runoff is very slow, and areas commonly remain ponded for a few days after rains. This soil has a seasonal high water table that ranges from 6 inches above to a foot below the surface. Surface water is removed either by artificial drainage or evaporation. This soil commonly is very wet in spring and early in summer. It can be droughty late in the growing season because the claypan subsoil releases water slowly to plants. Organic matter content is moderate. The shrink-swell potential in the subsoil is high.

A large part of the acreage of this soil is used for cultivated crops. Part of it supports native grass, most of which has been reseeded in areas used for wildlife habitat or waterfowl production.

If this soil is dryfarmed, it is suited to grain sorghum, wheat, forage crops, and water-tolerant grasses. Crop production, however, is limited. Ponding delays tillage and planting in spring. It occasionally destroys crops after they are planted. Managing this soil for dryfarmed crops is difficult because it commonly occurs within fields that are dominantly well drained, and poor tilth and surface compaction result if these areas are tilled when they are wet. Timely cultivation is difficult, so control of weed competition is difficult. Water diversions and good crop-residue management on surrounding areas can reduce the amount of runoff received from higher areas. Chiseling can temporarily increase water intake.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, and alfalfa. Gravity systems are the most suitable method for irrigating this soil. They require land leveling and grading, however, to remove ponding and provide the proper gradient. Tailwater recovery systems are commonly constructed in this soil because it is commonly at the lower end of irrigation runs in fields of well drained soils. This is best done in the fall to allow freezing and thawing to break up the soil compaction that results from construction. Land grading is also needed to provide adequate surface drainage under sprinkler systems. To prevent further ponding, water should be applied at a rate suited to the low intake rate of this soil.

Conservation tillage practices that keep all or part of the crop residue on the surface, such as till planting or chiseling and discing, are suited to this soil. These reduce the number of necessary tillage operations and help reduce evaporation, reduce puddling and crusting, and improve seedling emergence. Returning crop residue and green-manure crops to the soil increases organic matter content. This improves structure, tilth, fertility, and water intake.

This soil is suited to introduced grasses for pasture. In areas not leveled and drained, grasses most commonly used are switchgrass and reed canarygrass. If drained, such cool-season grasses as smooth brome and orchardgrass are suited. Pasture and hay can be alternated with other crops as part of a crop rotation system. Overgrazing or grazing when the soil is wet would cause compaction and poor tilth. Proper stocking, rotation grazing, and nitrogen fertilizers can increase forage production.

This soil generally provides sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Herbaceous vegetation is abundant and persistent on this soil. Tillage or chemical methods are effective in preparing favorable sites for trees and shrubs. Establishment of seedlings can be a problem in wet years. Till the soil and plant seedlings after the soil has begun to dry. Select only species that can tolerate occasional wetness. Weeds and grasses can be controlled by cultivating between the rows with conventional equipment. Appropriate herbicides can be used in tree rows. Land leveling can improve surface drainage, or a V-ditch can be installed to reduce ponding.

This soil is not suitable for building sites and sanitary facilities because of the ponding and very slow permeability. Alternate sites on suitable soils should be considered. Roads need to be protected from wetness and ponding of water. Constructing roads on suitable, well-compacted material above the water level and providing adequate side ditches and culverts help reduce the ponding damage. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Coarser grained base material can be used to ensure better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help provide the needed surface drainage.

This soil is in capability unit IIIw-2, nonirrigated, and IIIw-2, irrigated. It is in the Clayey Overflow range site and windbreak suitability group 2W.

Gb—Gibbon loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands of the Platte River and Lost Creek. The soil formed in alluvium. Flooding is rare. Areas range from 20 to 400 acres in size.

Typically, the surface layer is gray, calcareous, friable loam about 10 inches thick. The next layer is light brownish gray, calcareous, friable loam about 4 inches thick. The underlying material extends to a depth of 60 inches. The upper part is light gray, mottled, calcareous silt loam; the middle part is light brownish gray, mottled, calcareous fine sandy loam; and the lower part is white sand. In some areas the underlying material is stratified with thin layers of coarser and finer textured material. In places, the surface layer is silt loam, and there are dark buried soils below a depth of 40 inches.

Included with this soil in mapping are small areas of Alda, Lex, and Wann soils. Lex and Alda soils have coarse sand and gravel at a depth of 20 to 40 inches. Wann soils are fine sandy loam throughout. These included soils make up 5 to 10 percent of the unit.

Permeability of this Gibbon soil is moderate. Available water capacity is high. The water intake rate is moderate. Organic matter content is moderate. Tilth is generally good. Depth to the seasonal high water table is about 2 feet in wet years and 3 feet in dry years. The water table is generally highest in spring.

Most of the acreage of this soil is farmed. Most areas are irrigated. A few areas are used for pasture.

If this soil is dryfarmed, it is suited to corn, sorghum, wheat, and alfalfa. Wetness generally delays tillage early in spring, but the water table provides supplemental moisture in the latter part of the growing season. Conservation tillage practices that keep all or part of the crop residue on the surface, such as stubble mulching and chiseling, help to prevent soil blowing, reduce excessive loss of moisture by evaporation, and improve tilth.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses for pasture. Gravity systems are the most common irrigation method, but sprinklers can be used. Tillage is commonly delayed by wetness in the spring of most years. Land grading for irrigation improves the surface drainage and increases the efficiency of the irrigation system. A network of drainage ditches on the Platte River bottom land has helped lower the seasonal high water table. Areas of this soil on Lost Creek bottom land do not have good outlets for drainage systems. In some areas, alfalfa can be damaged by the high water table.

This soil is suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation. Reed canarygrass and creeping foxtail are suited to this somewhat poorly drained soil. Artificial drainage with either V-ditches or perforated tile lowers the seasonal high water table. Cool-season grasses, such as smooth brome or orchardgrass, alone or in a mixture with alfalfa are suited. Separate pastures of warm-season grasses, such as switchgrass or big bluestem, can extend the grazing season. Rotation grazing and proper stocking can help to maintain grasses in good condition. Nitrogen and phosphate fertilizers can increase the growth and vigor of grasses.

This soil generally provides good sites for planting trees and shrubs in windbreaks (fig. 11) and for wildlife and recreation plantings. Select only trees and shrubs

Figure 11.—Young windbreak on Gibbon loam, 0 to 1 percent slopes. Clean tillage and proper herbicides can reduce weed competition.

that can tolerate occasional wetness. Tillage or chemical methods are effective in preparing favorable sites for planting. Weeds and grasses can be controlled by cultivating between rows with conventional equipment. Weeds in the row can be hoed by hand, roto-tilled, or carefully sprayed with an appropriate herbicide.

The hazard of rare flooding should be considered when planning sanitary facilities and building sites. Septic tank absorption fields can be constructed on fill material so that the absorption field is sufficiently above the seasonal high water table. Sewage lagoons should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table. They should be lined or sealed to prevent seepage and diked for protection from flooding. Dwellings and buildings can be constructed on elevated, well-compacted fill material for protection against flooding and wetness caused by the high water table. Any dwellings constructed should not have basements. Constructing roads on suitable, well-compacted fill material above flood level and providing adequate side ditches and culverts help protect roads from wetness and flood damage. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading helps to provide the needed surface drainage.

This soil is in capability unit IIw-4, nonirrigated, and IIw-6, irrigated. It is in the Subirrigated range site and windbreak suitability group 2S.

Gc—Gibbon loam, saline, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands of the Platte River Valley. The soil formed in alluvium. Flooding is rare. Areas are long and narrow and range from 100 to 800 acres in size.

Typically, the surface layer is gray, calcareous, friable loam about 10 inches thick. It is moderately alkaline and moderately saline. The next layer is light brownish gray, mottled, calcareous silt loam about 4 inches thick. The underlying material, to a depth of 60 inches, is light gray, mottled, calcareous silt loam in the upper part and gray, firm silty clay loam in the lower part. There are dark buried horizons in some areas. In places, there is coarse sand below a depth of 48 inches. In some areas there is fine sandy loam and fine sand below a depth of 40 inches.

Included with this soil in mapping are small areas of Alda, Lex, and Wann soils. Alda and Lex soils have coarse sand or gravelly sand between depths of 20 and 40 inches. Wann soils are coarser throughout. These included soils make up about 10 percent of the unit.

Permeability of this Gibbon soil is moderate. Runoff is slow. Available water capacity is high. Organic matter content is moderate. Depth to the seasonal high water table ranges from about 1.5 feet in wet years to about 3 feet in dry years. Soluble salts reduce crop yields in about 40 percent of the mapped areas.

More than half of the acreage of this soil is used for cultivated crops. Most of the farmed areas are irrigated, and corn is the main crop. The rest is planted to introduced grasses for hay and pasture.

If this soil is dryfarmed, it is poorly suited to cultivated crops. Wheat, grain sorghum, and alfalfa produce moderate yields. Slow surface drainage and the seasonal high water table commonly delay spring tillage operations. Crops can be damaged during wet seasons. Crusting on the surface and poor tilth caused by soluble salts accumulated in the surface layer reduce seedling emergence. Crop growth is uneven and yields are reduced, especially during periods of low rainfall. Crops generally respond to applications of commercial fertilizers. Plant nutrients are not well balanced in this soil, and the saline and alkaline conditions commonly cause phosphorus to become unavailable to plants. Returning crop residues and carefully applying feedlot manure to the soil help improve organic matter content. This improves the soil tilth and increases the intake of water.

If this soil is irrigated, it is poorly suited to corn, alfalfa, and soybeans. Water is applied mostly by gravity systems. Land leveling is needed to develop the proper gradient. Sprinkler systems can be used, but some leveling may be necessary to provide adequate surface drainage. Prolonged wetness because of the slow runoff and the high seasonal water table commonly delays tillage and can cause increased concentration of soluble salts in the surface layer. Surface drainage ditches can help lower and stabilize the seasonal high water table. This allows salts to be gradually leached deeper into the soil with the irrigation water. Systematic soil testing can help plan application of both water and fertilizers. Returning crop residues to the soil, applying feedlot manure, and using fertilizers help to improve the organic matter content and fertility.

This soil is suited to introduced grasses that are tolerant of saline soils, such as the cool-season tall wheatgrass or warm-season switchgrass. Smooth brome and alfalfa can tolerate slight salinity if the seedlings can be established. Land leveling and the construction of borders or corrugations are commonly needed to prevent ponding of water and further accumulation of soluble salts and to accomplish even distribution of irrigation water. Grazing when the soil is wet results in damage to the grass stand and causes a rough soil surface, making it difficult to mow for hay. If outlets can be found, artificial drainage with V-ditches or tile can help decrease wetness from the water table. Rotation grazing and proper stocking help maintain grasses in good condition. Nitrogen fertilizer increases growth and vigor of grasses.

This soil is suited to range and native hay. The natural plant community is mostly short- and mid-growing grasses and grasslike plants, western wheatgrass, and various sedges. If a site is abused by overgrazing or poorly timed hay harvesting, it may become dominated by inland saltgrass, foxtail barley, Kentucky bluegrass, sedges, and rushes. When the surface soil is wet, overgrazing can result in surface compaction and the creation of small mounds, making it difficult to graze or harvest for hay. Hay yields are generally low. When the site is revegetated, plants suited to saline-alkali soil conditions should be considered.

This soil provides poor sites for trees and shrub plantings for wildlife habitat. Fair survival and growth rates are possible if species are selected that are tolerant of slight to moderate salinity with a seasonal high water table. Undesirable grasses and weeds can be controlled by cultivation between the rows with conventional equipment. Areas in the rows and close to the trees can be hoed by hand or roto-tilled. Herbicides can also help to control competing vegetation.

The hazard of rare flooding should be considered when planning sanitary facilities and building sites. Septic tank absorption fields can be constructed on fill material so that they are sufficiently above the seasonal high water table. The moderate permeability is a limitation, but this can generally be overcome by increasing the size of the field. Sewage lagoons should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table. Dwellings and buildings can be constructed on elevated, well-compacted fill material for protection against flooding and to overcome wetness caused by the high water table. Roads should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for subgrade or base material to ensure better performance. Damage to roads by frost action can be reduced by providing good surface drainage and using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches can help provide the needed surface drainage.

This soil is in capability unit IVs-1, nonirrigated, and IIIs-1, irrigated. It is in the Saline Subirrigated range site and windbreak suitability group 9S.

Go—Gothenburg loamy sand, 0 to 2 percent slopes. This nearly level, poorly drained or somewhat poorly drained soil is on bottom lands of the Platte River. It is very shallow over coarse sand and gravelly coarse sand. It is frequently flooded, but water usage and flood protection by upstream dams have reduced the frequency and depth of flooding. Willows, cottonwoods, and grasses have become established. Areas of this soil are dissected by small ridges and channels. Areas are long and narrow and range from 5 to 250 acres in size.

Typically, the surface layer is grayish brown, very friable loamy sand about 3 inches thick. The underlying material is light brownish gray, coarse sand in the upper part and light gray, gravelly coarse sand in the lower part. It extends to a depth of more than 60 inches. In some areas, the surface layer is fine sandy loam, loamy fine sand, or sandy loam.

Included with this soil in mapping are small areas of Inavale and Platte soils. These soils have a thicker surface layer, and Inavale soils are sandy throughout. In some areas the sand and gravel are exposed on the surface. These included areas make up about 5 percent of the unit.

Permeability of this Gothenburg soil is rapid in the upper part and very rapid in the lower part. Available water capacity is very low. Runoff is slow. Organic matter content is very low. The seasonal high water table ranges from near the surface in wet years to a depth of about 2 feet in dry years. The surface layer is very dry when streamflow is low and the water table is down.

All of this soil remains in native vegetation and is used as range. Vegetation is native grasses and mixed, scattered trees. The native grasses are mostly big bluestem, little bluestem, and switchgrass.

Areas of this soil have limited suitability for grazing because of the shallow root zone. Overgrazing by livestock would reduce the protective plant cover and cause deterioration of the native plants. Proper grazing, timely deferments of grazing, and a planned grazing system can help maintain and improve the range condition.

This soil is not suited to windbreak plantings, sanitary facilities, or building site development because of flooding and wetness. A suitable alternate site is needed. Fences are commonly damaged by floodwater. In places, sand and gravel are excavated for construction purposes. Constructing roads on suitable, well-compacted fill material and providing adequate side ditches and culverts help protect roads from flood damage and wetness. Pits dug into the water table can create ponds for livestock water and for fish and wildlife habitat.

This soil is in capability unit VIIs-3, nonirrigated. It is in windbreak suitability group 10.

HeB—Hersh fine sandy loam, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on uplands. The soil formed in wind-deposited and -reworked loamy material. Areas range from 10 to 120 acres in size.

Typically, the surface layer is grayish brown, very friable fine sandy loam about 7 inches thick. The subsurface layer also is grayish brown, very friable fine sandy loam about 5 inches thick. The next layer is brown, very friable fine sandy loam about 6 inches thick. The underlying material is light brownish gray fine sandy loam to a depth of more than 60 inches. Some areas have silty material at depths ranging from 2 to 5 feet.

Included with this soil in mapping are small areas of Coly, Kenesaw, Libory, and Valentine soils. Coly and Kenesaw soils are siltier throughout, and Kenesaw soils have a thicker dark surface layer. These soils commonly occur on foot slopes and swales. Libory and Valentine soils have sandier surface layers, and Libory soils have silty and clayey underlying material. These included areas make up 10 to 15 percent of the unit.

Permeability of this Hersh soil is moderately rapid. Available water capacity is moderate. Organic matter content is low. Surface runoff is slow. This soil is easily tilled over a wide range of moisture conditions. Moisture is released readily to plants.

Most of the acreage of this soil is farmed. Most areas are irrigated. A few areas are in native grass.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, and corn. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. This soil is droughty in years with below average rainfall. Conservation tillage practices that keep all or part of the crop residue on the surface, such as stubble mulching and discing, help to prevent soil blowing and water erosion and help to conserve soil moisture. Returning crop residue to the soil helps maintain and improve organic matter content and fertility.

If this soil is irrigated, it is suited to corn, grain sorghum, introduced grasses, and alfalfa. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as no-till planting, discing, and chiseling, help prevent soil blowing and water erosion as well as conserve soil moisture. Sprinklers are generally the most practical method of irrigation. Water application should be light and frequent to reduce leaching of plant nutrients to depths below the plant roots.

This soil is suited to range, which is very effective in controlling soil blowing and water erosion. The natural plant community is dominated by blue grama, little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. If the site is abused by overgrazing, it may become dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is fair for survival and growth of suitable species. Soil blowing can be controlled by maintaining strips of sod or other vegetation between rows. Undesirable weeds and grasses are a concern because they compete for available moisture. They can be controlled by careful cultivation and the use of certain herbicides. Any herbicide applied should be in reduced amounts because of the low organic matter content and the moderately rapid permeability.

This soil is generally suited to septic tank absorption fields, sewage lagoons, dwellings, and roads and streets. Sewage lagoons should be lined or sealed to prevent seepage. The walls or sides of shallow excavations should be temporarily shored to prevent sloughing or caving. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help to provide the needed surface drainage.

This soil is in capability unit IIIe-3, nonirrigated, and IIe-8, irrigated. It is in the Sandy range site and 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 wind-deposited and -reworked loamy material. Areas range from 10 to 100 acres in size.

Typically, the surface layer is pale brown, very friable fine sandy loam about 7 inches thick. The next layer is pale brown, very friable fine sandy loam about 4 inches thick. The underlying material is pale brown fine sandy loam to a depth of more than 60 inches. In a few areas, there is silty underlying material at a depth of 2 to 5 feet.

Included with this soil in mapping are small areas of Coly, Kenesaw, Libory, and Valentine soils. Coly and Kenesaw soils are siltier throughout, and Kenesaw soils have a darker surface layer. Kenesaw soils are lower in the landscape. Libory and Valentine soils have a sandier surface layer, and Libory soils have silt and clayey underlying material. These included soils make up 10 to 15 percent of the unit.

Permeability of this Hersh soil is moderately rapid. Available water capacity is moderate. Organic matter content is low. This soil absorbs moisture easily and releases it readily to plants. Runoff is medium.

Most of the acreage of this soil is farmed. A few areas are irrigated. A few small areas are in native grasses.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, corn, and forage crops. Grasses and alfalfa can be grown for pasture. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. This soil is droughty in years with below average rainfall. Conservation tillage practices that keep all or part of the crop residues on the surface, such as discing and stubble mulching, help prevent soil blowing and water erosion as well as conserve soil moisture. Returning crop residue to the soil will help maintain organic matter content and fertility. Planting trees as field windbreaks will help control soil blowing. Terrace systems can be used to control water erosion on uniform slopes, but are difficult to design for complex, undulating slopes.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, and introduced grasses. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as no-till planting, discing, and chiseling, help prevent soil blowing and water erosion as well as conserve soil moisture. Crops on this soil respond well to irrigation. Sprinklers are generally the most practical method of irrigation. Small, frequent applications of irrigation water are needed because this soil has a moderately high water intake rate, moderately rapid permeability, and moderately low available water capacity. Applying more water than this soil can hold would result in wasting water and leaching plant materials to depths below the root zone of most crops.

This soil is suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Cool-season grasses, such as smooth brome, are suited either alone or in a mixture with a legume, such as alfalfa. Overgrazing would reduce the protective plant cover and cause deterioration of the stands, resulting in severe soil blowing. Rotation grazing and proper stocking can help to maintain the grass in good condition. Nitrogen fertilizer increases growth and vigor of the grasses. Sprinkler irrigation can increase forage production.

This soil is suited to range, which is very effective in controlling soil blowing and water erosion. The natural plant community is dominated by blue grama, little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. If the site is abused by overgrazing, it may become dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds. Range seeding may be needed to stabilize severely eroded cropland.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Tillage or chemical applications can be effective in preparing a favorable site for plantings. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between tree rows. Cultivation should be restricted to tree rows. Herbicides can be applied in the row if the application rate is reduced to that recommended for a sandy soil.

This soil is generally suited to septic tank filter fields and dwellings. Sewage lagoons should be lined or sealed to prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help to provide the needed surface drainage.

This soil is in capability unit IIIe-3, nonirrigated, and IIIe-8, irrigated. It is in the Sandy range site and 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 occurs on side slopes along drainageways and ridges. It formed in wind-deposited and -reworked loamy material. Areas range from 10 to 100 acres in size.

Typically, the surface layer is pale brown, very friable fine sandy loam about 6 inches thick. The underlying material is very pale brown fine sandy loam to a depth of more than 60 inches.

Included with this soil in mapping are small areas of Coly, Kenesaw, and Valentine soils. Coly and Kenesaw soils are siltier throughout, and Kenesaw soils have a darker surface layer. These soils are at lower elevations in the landscape. Valentine soils are sandier throughout. These included soils make up 10 to 15 percent of the unit.

Permeability of this Hersh soil is moderately rapid. Available water capacity is moderate. This soil has a high water intake rate, but runoff is medium because of the slope. Organic matter content is low.

Most of the acreage of this soil is farmed. A few areas are irrigated. Some areas remain in native grass used for range.

If this soil is dryfarmed, it is poorly suited to crops. Alfalfa, wheat, grain sorghum, and annual forage crops are grown. Water erosion and soil blowing are hazards if the surface is not adequately protected by plant cover or crop residue. Close-spaced crops, legumes, and introduced grasses are effective. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as chiseling, discing, and stubble mulching, help prevent soil blowing and water erosion as well as conserve soil moisture. Returning crop residue to the soil helps maintain and improve the organic matter content. Terraces can be constructed to control water erosion where slopes are long and smooth.

If this soil is irrigated, it is poorly suited to cultivated crops. Sprinklers are the only method of irrigation suitable to this soil because of the slope. Close-spaced crops, legumes, and introduced grasses should be grown. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as no-till planting, discing, and chiseling, help prevent soil blowing and water erosion as well as conserve soil moisture. Water should be applied in amounts that will meet crop needs without wasting water by runoff and leaching plant nutrients.

This soil is suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Cool-season grasses, such as smooth brome, are suited either alone or in a mixture with a legume, such as alfalfa. Overgrazing would reduce the protective plant cover and cause deterioration of the stands, resulting in severe soil blowing. Rotation grazing and proper stocking help to maintain the grasses in good condition. Nitrogen fertilizer can increase the growth and vigor of the grasses. Sprinkler irrigation can increase forage production.

This soil is suited to range, which is very effective in controlling soil blowing and water erosion. The natural plant community is dominated by blue grama, little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. If the site is abused by overgrazing, it may become dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is fair for survival and growth of suitable species. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the tree rows. When preparing land for planting, till only the space where the tree row will be. Plant on the contour if possible. Restrict cultivation to the tree row. Herbicides can be applied in the row, at rates recommended for sandy soil. A drip irrigation system can provide consistent moisture and increase the survival and growth of seedlings.

Shaping the land and installing the septic tank absorption field on the contour is generally necessary for proper operation. For sewage lagoons, grading is required to modify the slope and shape the lagoon. They should be lined or sealed to prevent seepage. The walls or sides of shallow excavations should be temporarily shored to prevent sloughing or caving. Dwellings and small commercial buildings should be properly designed to accommodate the slope or the soil graded to an acceptable gradient. Cutting and filling is generally needed to provide a suitable grade for roads and streets.

Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help to provide the needed surface drainage.

This soil is in capability unit IVe-3, nonirrigated, and IVe-8, irrigated. It is in the Sandy range site and windbreak suitability group 5.

Hf—Hobbs silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on bottoms of drainageways in the uplands. It is occasionally flooded. It formed in alluvium. Areas are long and narrow and range from 5 to 30 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The underlying material is stratified grayish brown, pale brown, light brownish gray, and very pale brown silt loam to a depth of more than 60 inches. In some areas, there are thin layers of fine sandy loam and very fine sandy loam material. In places, the surface layer is limy.

Included with this soil in mapping are small areas of Coly, Holdrege, and Uly soils. These soils are at higher elevations in the landscape. Coly soils are on steeper slopes and have lime at shallower depths. Holdrege soils have more clay in the subsoil. Uly soils are not stratified. These included soils make up 5 to 10 percent of the unit.

Permeability of this Hobbs soil is moderate. Available water capacity is high. Runoff is slow. Organic matter content is moderate.

This soil is used for crops, pasture, and range. Some areas of cropland are irrigated. Many areas of this soil are too small or narrow for efficient cultivation.

If this soil is dryfarmed, it is suited to corn, wheat, grain sorghum, and introduced grasses and legumes for hay and pasture. Occasional flooding is a hazard, and runoff can cause intermittent gullies in drainageways. Flooding can be controlled by diverting water with dikes or embankments in some areas. Grassed waterways are commonly needed to carry runoff with minimal soil loss.

If this soil is irrigated, it is suited to corn, alfalfa, and introduced grasses or grass-legume mixtures. It is commonly developed as part of a larger field. This soil is suited to both gravity and sprinkler irrigation. When growing irrigated crops on this soil, it is generally necessary to protect them from flooding and overwashes by controlling the runoff and erosion on surrounding soils. It is necessary to prevent channeling in drainageways during periods of runoff. This can be accomplished by contour farming, terraces, diversions, and tillage practices such as chiseling, discing, and planting that leave all or part of the crop residues on the surface of the soil in surrounding higher areas. Grassed waterways permit runoff without erosion. The use of this soil and surrounding soils for grasses and legumes for pasture is effective in controlling erosion.

This soil is suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited either alone or in a mixture with legumes, such as alfalfa. Deposition of sediment by floodwater may partly cover the grasses and legumes and reduce their vigor and growth. This can be reduced by shaping the land and constructing a properly designed system of drains and diversions. Properly controlled run-in water can substantially increase forage yields. Rotation grazing, timely deferment of grazing, and proper stocking can help to maintain grasses in good condition. Nitrogen fertilizer can increase the growth and vigor of the grasses.

This soil is suited to range and native hay, which is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses and grasslike plants dominated by big bluestem, little bluestem, sideoats grama, switchgrass, western wheatgrass, and various sedges. If the site is abused by overgrazing or poorly timed hay harvesting, it may become dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Woody plants, including snowberry and buckbrush, migrate into the site. Brush management and burning may be needed to control woody plants.

This soil generally provides good sites for planting trees and shrubs in windbreaks and for wildlife and recreation plantings. Tillage or chemical applications are effective in preparing favorable sites for planting. Weeds and grasses can be controlled by cultivation and the careful use of herbicides. Occasional flooding is a hazard, and it is sometimes necessary to divert runoff or design the planting to conform to the natural drainage pattern.

Because of the flooding, this soil is not suited to septic tank absorption fields. A suitable alternate site is needed. Sewage lagoons should be diked for protection from flooding. This soil is not suitable for building sites because of the flooding, and a suitable alternate site is needed. Constructing roads on suitable, well-compacted fill material above the flood level and providing adequate side ditches and culverts can help protect roads from flood damage. Design roads so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for subgrade or base material to ensure better performance. This soil is commonly a good source of topsoil for topdressing less fertile areas.

This soil is in capability unit IIw-3, nonirrigated, and IIw-6, irrigated. It is in the Silty Overflow range site and windbreak suitability group 1.

HgB—Hobbs silt loam, channeled. This deep, nearly level and very gently sloping, well drained soil is on low bottoms along the major creeks and in some large upland drainageways. The soil formed in alluvium. It is frequently flooded, but most water drains away in a few hours. Meandering channels from 1 foot to as much as 10 feet in depth dissect most areas. Channel banks are abrupt, and areas adjacent to banks are commonly uneven. Some areas of these bottoms stay wet during the summer because of irrigation water runoff. Areas are mostly long and narrow and range from 10 to 300 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 9 inches thick. The underlying material is very stratified, grayish brown and dark grayish brown silt loam. At a depth of 42 inches is grayish brown and dark grayish brown, very friable loam that extends to a depth of more than 60 inches. Some areas of this soil have thin layers of very dark grayish brown silt loam and some areas have layers of very fine sandy loam and fine sandy loam below a depth of 40 inches. Lime is below a depth of 50 inches.

Included with this soil in mapping are small areas of adjacent Coly, Holdrege, Hord, and Uly soils. These soils are higher in the landscape than the Hobbs soil. Coly soils, which formed in loess and are on steeper slopes, have lime at shallower depths. Holdrege soils formed in loess and have more clay in the subsoil. Hord soils have a more strongly expressed subsoil and are not stratified. Uly soils formed in loess. These included soils make up 5 to 10 percent of the unit.

Permeability of this Hobbs soil is moderate. Available water capacity is high. Runoff is slow or medium, depending on the slope of the drainageway. Organic matter content is moderate. It is low, however, in areas of recent erosion or siltation.

Most of the acreage of this soil is rangeland.

This soil is unsuited to crops because it is commonly dissected by entrenched channels too deep or steep to be crossed by ordinary farm equipment. Smooth areas along the channels are difficult to cultivate because they are frequently flooded and they receive deposits of sediment and debris during the flooding. They are also subject to streambank erosion. Because of silt deposition, some bottoms are very flat and have poor surface drainage.

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses and grasslike plants dominated by big bluestem, little bluestem, sideoats grama, switchgrass, western wheatgrass, and various sedges. If the site is abused by overgrazing or poorly timed hay harvesting, it may become dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Woody plants, including snowberry and buckbrush, also migrate into the site. Brush management and burning may be needed to control woody plants.

This soil is generally unsuitable for planting trees in windbreaks. Hand planting is commonly the only feasible planting method, and the channeling and flooding cause poor survival rates. Some suitable trees and shrubs can be established for wildlife habitat or other special uses if sites are carefully selected and plantings are given special management.

This soil is not suited to septic tank absorption fields, sewage lagoons, or building sites because of the frequent flooding. An alternate site is needed. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Coarser grained base material can be used to ensure better performance. Constructing roads on suitable, well-compacted fill material above the flood level and providing adequate side ditches and culverts can help protect roads from flood damage.

This soil is in capability unit VIw-7, nonirrigated. It is in the Silty Overflow range site and windbreak suitability group 10.

Ho—Holdrege silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on the loess uplands. Areas range from 10 to 1,000 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 5 inches thick (fig. 12). The subsurface layer is also dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 18 inches thick. The upper part is dark grayish brown and grayish brown silty clay loam. The lower part is light brownish gray silt loam. The underlying material is light gray, calcareous silt loam to a depth of more than 60 inches. In some areas, land leveling operations have exposed the subsoil or underlying material. In some areas, the surface is covered with a thin layer of more recent loess.

Included with this soil in mapping are small areas of Butler, Coly, Detroit, Hord, and Kenesaw soils. Butler soils have more clay in the subsoil. They occupy swales and low flats and are more poorly drained. Coly and Kenesaw soils have less clay in the subsoil. Coly soils are higher in the landscape, and Kenesaw soils are lower in the landscape. Detroit soils have a thicker surface layer and a heavier subsoil. They are lower than the Holdrege soil in the landscape. Hord soils have a thicker dark surface layer and are lower than the Holdrege soil. These included soils make up 5 to 15 percent of the unit.

Permeability of this Holdrege soil is moderate. Available water capacity is high. Runoff is slow. Organic matter content is moderate, and tilth is generally good. Nutrient deficiencies occur where land-leveling operations have removed the surface layer. Water intake rates are reduced where the silty clay loam subsoil is exposed.

Most of the acreage of this soil is farmed. A large part of it is irrigated. The rest is dryfarmed.

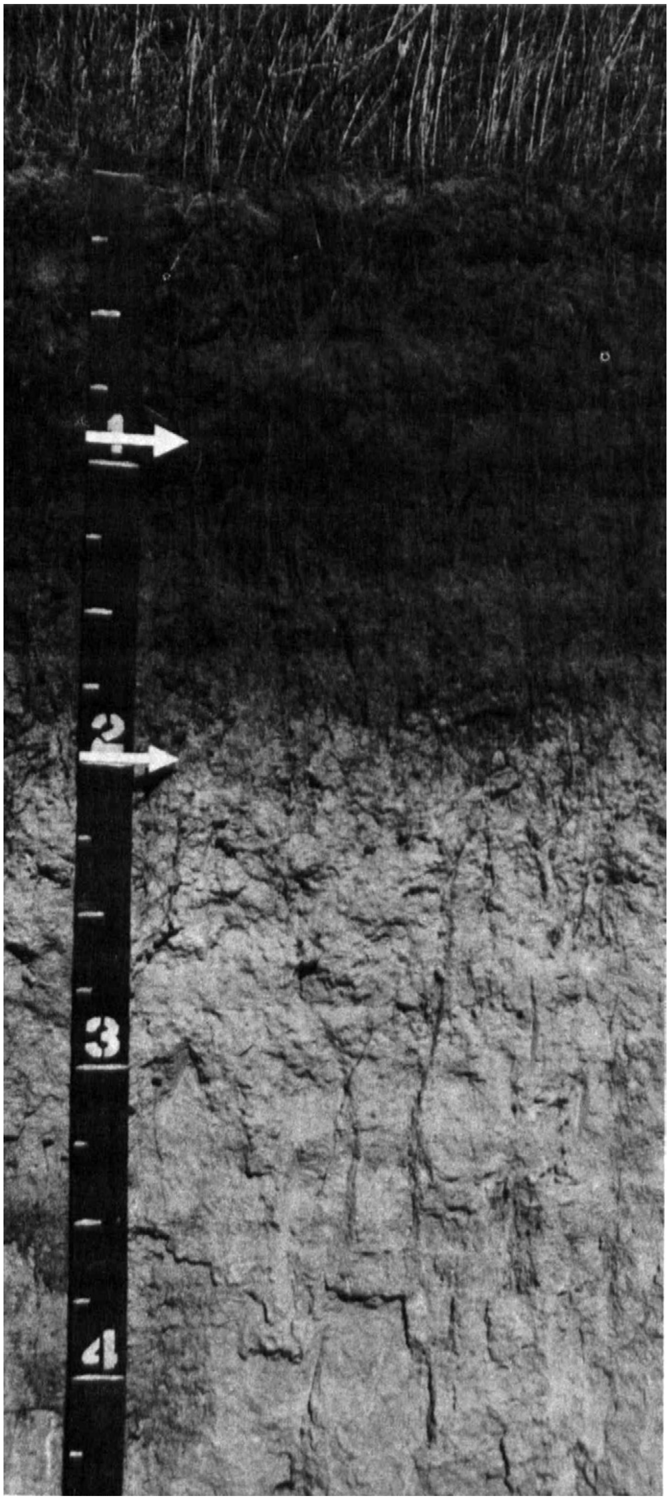

Figure 12.—Profile of Holdrege silt loam, 0 to 1 percent slopes. The upper arrow marks the lower boundary of the surface layer; the lower arrow marks the lower boundary of the subsoil. Scale is in feet.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, oats, and introduced grasses and legumes for hay and pasture. Inadequate moisture at some time during the growing season is a common limitation. Soil blowing is a slight hazard if the soil is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residues on the surface, such as stubble mulching, chiseling, and discing, help prevent soil blowing as well as conserve soil moisture. Returning crop residue to the soil and applying available feedlot manure help maintain and improve organic matter content. This helps to improve the tilth and increase the infiltration of water.

If this soil is irrigated, it is suited to corn, alfalfa, grain sorghum, soybeans, and introduced grasses and legumes for hay and pasture. Conservation tillage practices that leave all or part of the crop residues on the surface, such as chiseling, discing, and planting, help prevent soil blowing. Returning crop residue to the soil helps maintain or improve the organic matter content. This helps maintain tilth, reduces surface soil compaction, and increases water movement into the soil. Burning crop residue is usually not a good practice. Timely application and efficient distribution of irrigation water is an important part of good management. Gravity or sprinkler irrigation systems can be used. This soil is well suited to gravity systems (fig. 13). Some land leveling is commonly needed for the most efficient water distribution. If finer textured subsoil material is exposed by land-leveling cuts, application of feedlot manure and additional crop residues can increase the organic matter content and help to improve the tilth and the water intake rate. Tillage should be avoided when this soil is very wet or very dry.

This soil is suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa. Overgrazing or grazing when this soil is wet would cause compaction and poor tilth. Separate pastures of cool- and warm-season grasses can be used to provide a long season of grazing. Rotation grazing and proper stocking can help to maintain the grasses in good condition. Nitrogen and phosphate fertilizer can increase the growth and vigor of the grasses. Irrigation water can be applied by sprinkler or gravity systems.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is good for survival and growth of suitable species. Tillage or chemical applications are effective in preparing favorable sites for plantings. Supplemental watering can provide needed moisture during periods of insufficient rainfall. Cultivate between rows with conventional equipment. Careful use of appropriate herbicides in the row can also help control

Figure 13.—Gravity irrigation of corn using gated pipe. The soil is Holdrege silt loam, 0 to 1 percent slopes.

undesirable grasses and weeds. Areas in the row can be roto-tilled or hoed by hand.

This soil is generally suited to septic tank absorption fields. Sewage lagoons should be lined or sealed to prevent seepage. Foundations for buildings should be strengthened and backfilled with coarse materials to prevent damage by the shrinking and swelling of the soil. Roads and streets should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for base material to ensure better performance.

This soil is in capability unit IIc-1, nonirrigated, and I-4, irrigated. It is in the Silty range site and windbreak suitability group 3.

HoB—Holdrege silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on loess uplands. Areas range from 15 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 5 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is silty clay loam about 17 inches thick. The upper part is dark grayish brown, the middle part is grayish brown, and the lower part is light brownish gray. The underlying material is light gray, calcareous silt loam to a depth of more than 60 inches. In places, the dark upper layers are more than 20 inches thick. In some areas, land-leveling operations have exposed the subsoil or underlying material. There are a few moderately eroded areas too small to separate in mapping. In some areas, the surface is covered with a thin layer of more recent loess.

Included with this soil in mapping are small areas of Hord, Kenesaw, and Uly soils. Hord and Kenesaw soils have less clay in the subsoil, and Hord soils have dark surface layers more than 20 inches thick. Uly soils have less clay in the subsoil and are generally on steeper side slopes of ridges. These included soils make up 5 to 15 percent of the unit.

Permeability of this Holdrege soil is moderate. Available water capacity is high. Runoff is medium. Organic matter content is moderate. There may be nutrient deficiencies where land-leveling cuts have been made.

Most of the acreage of this soil is farmed under irrigation. The remaining acreage is dryfarmed.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, oats, and introduced grasses and legumes for hay and pasture. Inadequate moisture at some period during the growing season is a common limitation. Soil blowing and water erosion are hazards if the surface is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residues on the soil surface, such as chiseling and stubble mulching, help prevent soil blowing and water erosion as well as conserve soil moisture. Returning crop residue to the soil and applying feedlot manure helps maintain and improve organic matter content and tilth and increases infiltration of water. Terraces and tillage on the contour, along with grassed waterways, are effective in reducing water erosion.

If this soil is irrigated, it is suited to corn, alfalfa, soybeans, and introduced grasses and grass-legume mixtures for hay and pasture. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as chiseling, discing, and planting, help prevent soil blowing and water erosion. Gravity or sprinkler systems can be used on this soil. Timely application and efficient distribution of irrigation water is an important part of good management. Gravity systems can be used if the proper grade can be achieved. Land-leveling operations are commonly needed. Adjusting row direction to reduce grade in the row helps to reduce erosion, increase water intake, and give more uniform distribution. Level benches or parallel terraces constructed to proper grade in the row are possible practices if slopes are uniform. Tailwater recovery systems can be constructed to eliminate waste of water. Special attention should be given to increasing the soil's organic matter content in leveled areas by returning all available crop residues to the soil. Use of feedlot manure can help improve tilth and fertility. Phosphorus and zinc are nutrients commonly deficient in leveled areas. To reduce runoff and erosion, water application rates should be adjusted to the water intake rate of the soil and the crop needs.

This soil is suited to introduced grasses or legumes for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa. Overgrazing or grazing when this soil is wet causes compaction and poor tilth and increases runoff. Separate pastures of cool- and warm-season grasses can provide a long season of grazing. Rotation grazing and proper stocking help to maintain the grasses in good condition. Nitrogen and phosphate fertilizers can increase the growth and vigor of the grasses. Irrigation water can be applied by sprinklers or gravity systems. If a gravity system is used, borders and corrugations improve water distribution.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Tillage or chemical applications are effective in preparing favorable sites for plantings. Cultivate between the rows with conventional equipment. Careful use of appropriate herbicides in the row can help control undesirable weeds and grasses. Limited rainfall during some part of the growing season is a limitation. Irrigation during dry periods can improve the survival and growth rates.

This soil is generally suited to septic tank absorption fields. Sewage lagoons should be lined or sealed to prevent seepage. Grading is required to modify the slope and shape the lagoon. Foundations for buildings should be strengthened and backfilled with coarse materials to prevent damage from shrinking and swelling of the soil. Roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for the subgrade or base material to ensure better performance.

This soil is in capability unit IIe-1, nonirrigated, and IIe-4, irrigated. It is in the Silty range site and windbreak suitability group 3.

HoC—Holdrege silt loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on loess uplands. It is on narrow divides, side slopes, and the sides of intermittent drainageways. Slopes are generally plane and convex. Areas range from 10 to 200 acres in size.

Typically, the surface layer is a dark grayish brown, very friable silt loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part is dark grayish brown, friable silty clay loam; the middle part is grayish brown, firm silty clay loam; and the lower part is light brownish gray, friable silt loam. The underlying material is light brownish gray and light gray, calcareous silt loam to a depth of more than 60 inches. Lime is visible in threads and soft, rounded accumulations.

Included with this soil in mapping are small areas of Coly and Uly soils. They generally occur on the steeper slopes and have lime at shallow depths. They have less clay in the subsoil than does the Holdrege soil. These included soils make up 5 to 15 percent of the unit.

Permeability is moderate. Available water capacity is high. Runoff is medium. Organic matter content is moderately low.

Most of the acreage of this soil is dryfarmed. It generally consists of gently sloping parts of ridges in fields that generally have less slope. Some areas are irrigated, mostly by sprinklers. A few areas along and including upland drainageways remain in native grass and are used for grazing.

If this soil is dryfarmed, it is suited to wheat, grain, and forage sorghums and introduced grasses and legumes for hay and pasture. Oats and rye are also grown. Soil blowing and water erosion are hazards if the surface is not adequately protected by plant cover or crop residue. Insufficient rainfall for crops is a limitation. Conservation tillage practices that leave all or part of the crop residue on the surface, such as stubble mulching, chiseling, and discing, help prevent soil blowing and water erosion. Applying crop residue, green-manure crops, and feedlot manure to the soil helps to maintain and improve the organic matter content and fertility. This also improves tilth and water intake and conserves moisture. The cropping system needs to include close-growing crops in addition to row crops. Terraces and farming on the contour reduce runoff and water erosion. Burning crop residue is usually not a good practice.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, and introduced grasses and grass-legume mixtures for hay and pasture. Irrigation water is best applied by sprinkler systems (fig. 14). This soil needs to be adequately protected from water erosion. Conservation tillage practices such as chiseling and no-till planting help reduce both water erosion and soil blowing. Grassed waterways are needed to carry runoff. Parallel terraces can help reduce runoff and erosion. Irrigation water should be applied at rates adjusted to water intake rates to reduce runoff and waste of water. This soil is poorly suited to gravity irrigation because soil losses would be high and fertilizers would often be washed to lower levels. Grade in the row is generally too steep to prevent erosion or control runoff. If slopes are uniform, contour bench leveling or contour furrow irrigation with terraces can be used to allow gravity irrigation.

Figure 14.—Pivot sprinkler provides good water distribution. The soil is Holdrege silt loam, 3 to 6 percent slopes.

This soil is suited to introduced grasses and legumes. Pasture and hay can be alternated with other crops as part of a crop rotation system. This soil is subject to erosion by water. Overgrazing or poorly timed hay harvesting would cause poor plant vigor and reduce plant cover. As a result, small gullies and rills would form after heavy rains. Proper stocking, pasture rotation, and timely deferment of grazing can help keep the grasses in good condition. Nitrogen fertilizer can increase the growth and vigor of the grasses. Irrigation water is best applied by sprinklers. Gravity systems can be used on the more gentle slopes if borders and corrugations are constructed.

This soil is suited to range, which is very effective in controlling water erosion. The natural plant community is mostly mid and tall grasses dominated by bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass. If the site is abused by overgrazing, the big bluestem, little bluestem, and switchgrass decrease in abundance and sideoats grama, western wheatgrass, and blue grama increase. If overgrazing continues for many years, the less desirable plants increase, especially common pricklypear, buckbrush, and western snowberry.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Tillage or chemical applications are effective in preparing favorable sites for plantings. Supplemental water can provide needed moisture during periods of insufficient rainfall. Trees can be planted on the contour to help control erosion. Weeds can be controlled by cultivating between the rows with conventional equipment. Annual cover crops can be used between the rows. Careful use of appropriate herbicides in the row can help control weeds and undesirable grasses.

This soil is generally suited to septic tank absorption fields. Sewage lagoons should be lined or sealed to prevent seepage. Grading is required to modify the slope and shape the lagoon. Foundations for buildings should be strengthened and backfilled with coarse material to prevent damage by shrinking and swelling of the soil. Roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for subgrade or base material to ensure better performance.

This soil is in capability unit IIIe-1, nonirrigated, and IIIe-4, irrigated. It is in the Silty range site and windbreak suitability group 3.

HoC2—Holdrege silt loam, 3 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on loess uplands. It is on ridgetops, convex side slopes, and short slopes along upland drainageways. Much of the original dark surface layer has been eroded away, and the remaining surface layer material has been mixed by tillage with the upper part of the subsoil. In many areas the surface layer is plastic when wet and cloddy when dry. In some areas the calcareous underlying material is exposed. Rills and small gullies occur after rains in areas that do not have plant cover. Areas of this map unit are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 5 inches thick. The subsoil is about 13 inches thick. It is dark grayish brown, friable silty clay loam in the upper part and light brownish gray, friable silt loam in the lower part. The underlying material is light brownish gray and light gray silt loam to a depth of more than 60 inches. Depth to lime is about 25 inches. Lime is visible in threads and soft, rounded accumulations.

Included with this soil in mapping are small areas of Coly and Uly soils. Coly and Uly soils have less clay throughout, and Coly soils have lime at shallower depths. They generally occur on steeper slopes. These included soils make up 15 percent of the unit.

Permeability of this Holdrege soil is moderate. Available water capacity is high. Runoff is medium. Organic matter content is moderately low.

Most of the acreage of this soil is dryfarmed. Some areas are irrigated, mostly by sprinklers.

If this soil is dryfarmed, it is suited to wheat, grain, and forage sorghums and introduced grasses and legumes for hay and pasture. Water erosion is a severe hazard in cultivated areas because of the slope and high susceptibility to erosion. Soil blowing is also a hazard where there is no plant cover. Inadequate rainfall for crops is a limitation in most years. Conservation tillage practices that leave all or part of the crop residue on the surface, such as minimum tillage with blade sweeps or chiseling and discing, help prevent soil blowing and water erosion. It is essential that available crop residues be returned to this soil to maintain organic matter content. Returning green vegetation to the soil and applying available feedlot manure help increase organic matter content, improve soil tilth, and increase water intake and resistance to erosion. The cropping system should include more close-growing crops than row crops. Terraces and contour farming can reduce runoff and erosion. Burning crop residues is usually not a good practice. This soil is commonly deficient in nitrogen and phosphorus. Phosphorus, which tends to become insoluble and not available to plants in calcareous soils, should be applied each year for immediate crop needs. The rate of application of herbicides should be reduced where the organic matter content is moderately low.

If this soil is irrigated, it is suited to corn, alfalfa, and introduced grasses and legumes for hay and pasture. Sprinklers are the most practical method of irrigation. Conservation tillage practices that leave all or part of the crop residue on the surface, such as minimum tillage with blade sweeps or chiseling and discing, help prevent soil blowing and water erosion. Terraces and contour farming can reduce runoff. The rate of water application should be adjusted close to the soil's water intake rates. This map unit is poorly suited to gravity irrigation because of the difficulty of controlling erosion in the row. Where slopes are uniform, contour bench leveling or contour irrigation with parallel terraces can be used to reduce the slope gradient.

This soil is suited to introduced grasses and legumes. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa. Overgrazing or grazing when this soil is wet would cause compaction and poor tilth. Separate pastures of cool- and warm-season grasses can be used to provide a long season of grazing. Rotation grazing and proper stocking can help to maintain the grasses in good condition. Nitrogen and phosphate fertilizer can increase the growth and vigor of the grasses. Irrigation water can be applied by sprinkler or gravity systems.

This soil is suited to range, which is very effective in controlling water erosion. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass. If the site is abused by overgrazing, the big bluestem, little bluestem, and switchgrass will decrease in abundance and sideoats grama, western wheatgrass, and blue grama will increase. If overgrazing continues for many years, the less desirable plants increase, especially common pricklypear, buckbrush, and western snowberry.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The potential is good for survival and growth of suitable species. Tillage or chemical applications are effective in preparing favorable sites for plantings. Supplemental watering can provide moisture during periods of insufficient rainfall. Weeds can be controlled by cultivation between rows with conventional equipment. Cover crops between rows and planting on the contour in combination with terraces can help prevent erosion and excessive runoff of water. Careful use of herbicides in the row can help control undesirable grasses and weeds.

This soil is generally suited to septic tank absorption fields. Sewage lagoons should be lined or sealed to prevent seepage. Grading is required to modify the slope and shape the lagoon. Foundations for buildings should be strengthened and backfilled with coarse materials to prevent damage by the shrinking and swelling of the soil. Design roads and streets so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for subgrade or base material to ensure better performance.

This soil is in capability unit IIIe-8, nonirrigated, and IIIe-4, irrigated. It is in the Silty range site and windbreak suitability group 3.

Hp—Holdrege silt loam, overblown, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on loess uplands. Areas of this soil are on broad flats or long, smooth slopes. Areas range from 10 to 480 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 10 inches thick. The next layer is grayish brown, very friable silt loam about 6 inches thick. Below this is a dark grayish brown, friable, silt loam, buried surface layer about 9 inches thick and a silty clay loam subsoil about 20 inches thick. The subsoil is dark grayish brown in the upper part, grayish brown in the middle part, and light brownish gray in the lower part. The underlying material is pale brown silt loam to a depth of more than 60 inches. In some areas, the overblown material is thinner or absent.

Included with this soil in mapping are small areas of Butler, Detroit, normal Holdrege, and Kenesaw soils. Butler soils are in small shallow depressions. They have more clay in the subsoil and are somewhat poorly drained. Detroit soils have more clay in the subsoil and are lower in the landscape. Normal Holdrege soils do not have the buried soil and have more clay in the surface layer. Kenesaw soils have less clay in the subsoil. These included soils make up less than 15 percent of the unit.

Permeability of this Holdrege soil is moderate. Available water capacity is high. Runoff is slow. Organic matter content is moderate. The surface layer generally is easily tilled over a wide range of moisture conditions.

Almost all of the acreage of this soil is farmed. Most of it is irrigated. The rest is dryfarmed.

If this soil is dryfarmed, it is suited to corn, grain sorghum, wheat, oats, and introduced grasses and legumes for hay and pasture. Insufficient precipitation is the major limitation, and soil blowing is a hazard if the soil is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residue on the soil surface, such as chiseling, discing, and till planting, help prevent soil blowing and also conserve moisture. Returning crop residue to the soil helps maintain organic matter content, fertility, and tilth.

If this soil is irrigated, it is suited to corn, alfalfa, soybeans, and introduced grasses or grass-legume mixtures for pasture and hay. Soil blowing is a hazard if the soil is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residues on the soil surface, such as discing, chiseling, and till planting, help prevent soil blowing. Burning crop residue is usually not a good practice. Both gravity and sprinkler irrigation systems are suited to this soil. Gravity systems are the most common because proper grades can be obtained with minimal land leveling. Tailwater recovery systems help prevent waste of irrigation runoff and improve the efficiency of the systems.

This soil is suited to introduced grasses and legumes. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa or warm-season grasses such as switchgrass or big bluestem. Separate pastures of cool- and warm-season grasses can be used to provide a long season of grazing. Rotation grazing and proper stocking can help to maintain the grasses in good condition. Nitrogen and phosphate fertilizer can increase the growth and vigor of the grasses. Irrigation water can be applied by gravity systems. Border dikes and corrugations can improve the distribution of the water.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Tillage or chemical applications are effective in preparing favorable sites for planting. Supplemental watering can provide needed moisture during periods of insufficient rainfall. Cultivate between the rows with conventional equipment. Careful use of appropriate herbicides in the row can also help control undesirable weeds and grasses. Areas in the row or near small trees can be hoed by hand or roto-tilled.

This soil is generally suited to septic tank absorption fields. Sewage lagoons should be lined or sealed to prevent seepage. Foundations for buildings should be strengthened and backfilled with coarse materials to prevent damage by the shrinking and swelling of the subsoil. Roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Coarser grained material can be used for subgrade or base material to ensure better performance.

This soil is in capability unit IIc-1, nonirrigated, and I-4, irrigated. It is in the Silty range site and windbreak suitability group 3.

HpB—Holdrege silt loam, overblown, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is on loess uplands. Areas of this soil are mostly on long, smooth slopes. Areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The next layer is light brownish gray, very friable silt loam about 9 inches thick. Below this is a dark grayish brown, very friable, silt loam, buried surface layer about 8 inches thick and a silty clay loam subsoil about 17 inches thick. The subsoil is dark grayish brown in the upper part and light brownish gray in the lower part. The underlying material is light gray silt loam to a depth of more than 60 inches. In some areas, the overblown material is thinner or absent.

Included with this soil in mapping are small areas of Kenesaw soils. Kenesaw soils have less clay in the subsoil. These included soils make up less than 10 percent of the unit.

Permeability of this Holdrege soil is moderate. Available water capacity is high. Runoff is medium. Organic matter content is moderate. The surface soil generally is easily tilled over a wide range of moisture conditions.

Almost all of the acreage of this soil is farmed. Most of it is irrigated. The remaining acreage is dryfarmed.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, oats, and introduced grasses and legumes for hay and pasture. Soil blowing and water erosion are hazards if the soil surface is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residue on the soil surface, such as chiseling and stubble mulching, help control soil blowing and water erosion and conserve moisture. Inadequate moisture at some time during the growing season is a common limitation. Returning crop residue to the soil and applying feedlot manure helps maintain and improve organic matter content and increases infiltration of water. Terraces and tillage on the contour, along with grassed waterways, are practices used to reduce water erosion.

If this soil is irrigated, it is suited to corn, alfalfa, soybeans, and introduced grasses and grass-legume mixtures for hay and pasture. Water erosion and soil blowing are hazards if the soil surface is not protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as chiseling, discing, and no-till planting, help prevent soil blowing and water erosion.

Gravity or sprinkler irrigation systems can be used on this soil. Timely application and even distribution of water is an important part of good management. Gravity systems can be used if proper grade in the row can be achieved. Land leveling is commonly necessary. Adjusting row direction to reduce the grade in the row can reduce erosion, increase water intake, and make more uniform distribution of water possible. Where slopes are uniform, level benches or parallel terraces constructed to proper grade in the row are possible. Tailwater recovery systems can reduce waste of runoff water. In areas that have been leveled, special attention should be given to increasing the organic matter content by returning all crop residues to the soil. Returning feedlot manure can improve the tilth and fertility. Phosphorus and zinc may be deficient in leveled areas. Sprinkler systems require very little land preparation. To reduce runoff, water application rates should be adjusted to the soil's water intake rate and the crop needs.

This soil is suited to introduced grasses and legumes for pasture or hay. These crops can be alternated with others as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa. Annuals such as hybrid sudan, used in rotation, can provide warm-season grazing. Separate pastures of cool- and warm-season grasses can provide season-long grazing. Rotation grazing and proper stocking can help maintain grasses in good condition. Nitrogen fertilizer can increase the growth and vigor of grasses. Irrigation water can be applied by gravity systems on most areas of this soil.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is good for survival and growth of adapted species. Inadequate rainfall during the growing season is a limitation. Supplemental watering can provide needed moisture, especially during the first year after planting. Competition from grasses and weeds is a hazard, especially when seedlings are becoming established. Good site preparation, timely cultivation between the rows, and careful use of selected herbicides help overcome these conditions.

This soil is generally suited to septic tank absorption fields. Sewage lagoons should be lined or sealed to prevent seepage, and grading is usually required to modify the slope and shape the lagoon. Foundations for buildings should be strengthened and backfilled with coarser materials to prevent shrinking and swelling. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Coarser grained base material can be used to ensure better performance.

This soil is in capability unit IIe-1, nonirrigated, and IIe-4, irrigated. It is in the Silty range site and windbreak suitability group 3.

Hr—Hord silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on broad flats or swales on loess uplands. Areas range from 5 to 200 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 6 inches thick. The subsoil is silt loam about 23 inches thick. It is dark grayish brown in the upper part, grayish brown in the middle part, and light gray in the lower part. The underlying material is light gray silt loam to a depth of more than 60 inches. Fine, soft, rounded carbonate accumulations are common below a depth of 43 inches.

Included with this soil in mapping are small areas of Butler, Detroit, Holdrege, and Hobbs soils. Butler soils are in swales or small depressions, are somewhat poorly drained, and have more clay in the subsoil. Detroit soils have more clay in the subsoil. Holdrege soils have a more developed subsoil. Holdrege soils are higher than Hord soils in the landscape. Hobbs soils are stratified and are on flat bottoms of indefinite drainageways. These included soils make up 5 to 15 percent of the unit.

Permeability of this Hord soil is moderate. Available water capacity is high. Runoff is slow. Organic matter content is moderate, and tilth is generally good.

Most of the acreage of this soil is farmed. It is mostly irrigated. The rest is mainly dryfarmed.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, oats, and grasses and legumes for hay and pasture. Inadequate moisture at some time during the growing season is a common limitation. Soil blowing is a slight hazard if the soil is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residue on the surface, such as stubble mulching, chiseling, and discing, help prevent soil blowing as well as conserve moisture. Returning crop residues to the soil and applying available feedlot manure help maintain and improve organic matter content. This helps to maintain tilth and water infiltration.

If this soil is irrigated, it is suited to corn, alfalfa, grain sorghum, soybeans, and introduced grasses and legumes for hay and pasture. Conservation tillage practices that leave all or part of the crop residues on the surface, such as chiseling, discing, and planting, help prevent soil blowing. Returning crop residue helps maintain organic matter content. This improves tilth and infiltration of water. Burning crop residue is usually not a good practice. Gravity or sprinkler irrigation systems can be used. Timely application and efficient distribution of water is an important part of good management. Irrigation tailwater recovery systems can increase the efficiency of gravity systems.

This soil is suited to introduced or domesticated grasses, pasture, or hay. These crops can be alternated with others as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa. Annual forage mixtures, such as the sudan or sorghum-sudan hybrids can be used to provide warm-season grazing. Separate pastures of cool- and warm-season grasses can provide season-long grazing. Overgrazing would cause poor plant vigor and reduce total forage production. Rotation grazing and proper stocking can help maintain grasses in good condition. Nitrogen fertilizer can increase the growth and vigor of grasses. Irrigation helps maintain production during dry periods. Most areas of this soil can be irrigated by gravity systems. Properly constructed borders and corrugations can help to distribute the water effectively.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Tillage or chemical applications are effective in preparing favorable sites for planting. Weeds can be controlled by cultivation between the rows with conventional equipment. Careful use of appropriate herbicides in the row can help control undesirable grasses and weeds. Areas in the row or near small trees can be hoed by hand or roto-tilled. Irrigation can supply the moisture needed during dry seasons.

This soil is generally suited to septic tank absorption fields, dwellings, small commercial buildings, and roads. Sewage lagoons should be lined or sealed to prevent seepage. Local roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained base material can be used to ensure better performance.

This soil is in capability unit IIc-1, nonirrigated, and I-6, irrigated. It is in the Silty Lowland range site and windbreak suitability group 3.

InB—Inavale loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, somewhat excessively drained soil is on bottom lands. The soil formed in alluvium. It is rarely flooded. Areas are generally long and narrow in shape and range from 5 to 100 acres in size.

Typically, the surface layer is grayish brown, loose loamy fine sand about 5 inches thick. The next layer is brown, loose loamy fine sand about 5 inches thick. The underlying material is stratified pale brown, brown, and very pale brown loamy fine sand and fine sand to a depth of more than 60 inches. Thin strata of finer textured material are common. In a few small areas, the surface layer is fine sandy loam or loamy sand.

Included with this soil in mapping are small areas of Boel and Wann soils. These soils are somewhat poorly drained and are at lower elevations. Boel and Wann soils have more clay in the surface layers, and Wann soils are fine sandy loam throughout. These included soils make up 5 percent of the unit.

Permeability of this Inavale soil is rapid. Available water capacity is low. Runoff is slow. Organic matter content is low. This soil releases moisture readily to plants, but tends to lose much of it through deep percolation. The surface layer is very friable and easily tilled over a wide range in moisture conditions. The seasonal high water table is generally below a depth of 6 feet.

Most of the acreage of this soil is farmed. A few areas remain in native grass used for range.

If this soil is dryfarmed, it is poorly suited to grain sorghum, wheat, and alfalfa. Small grain crops and the first cutting of alfalfa generally provide the most dependable yields because they grow in spring when there is the most rainfall. Soil blowing is a hazard if the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residue on the soil surface, such as stubble mulching and light discing, help prevent soil blowing. Stripcropping, grassed field borders, and twin-row windbreaks are conservation practices used to reduce soil blowing.

If this soil is irrigated, it is suited to corn, alfalfa, small grains, and introduced grasses and legumes. Sprinklers are the only suitable method of irrigation. The principal hazard is soil blowing. Light and frequent applications of water are needed because the available water capacity of this soil is low and plant nutrients could be readily leached to depths below the roots of most crops. Maintaining a high amount of crop residue on the surface, stripcropping, using field windbreaks, and no-till planting systems can help to control soil blowing and reduce evaporation losses.

This soil is suited for range, which is effective in controlling soil blowing. The natural plant community is mostly mid and tall grasses dominated by little bluestem, sand bluestem, needleandthread, prairie sandreed, and switchgrass. If the site is abused by overgrazing, little bluestem, sand bluestem, and switchgrass will decrease in abundance and hairy grama, needleandthread, prairie sandreed, and sand dropseed will increase. If overgrazing continues for many years, annual and perennial weeds, including sagewort, ironplant, and ragweed, increase. Eventually pricklypear would invade and small blowouts would develop.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The potential is fair for survival and growth of suitable species. Inadequate moisture and soil blowing are the main limitations. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the rows. Undesirable weeds and grasses, which compete for moisture, can be controlled by careful use of appropriate herbicides. Irrigation can provide supplemental moisture during periods of low rainfall. Cultivation generally should be restricted to the tree rows.

The hazard of rare flooding should be considered when planning sanitary facilities and building sites. This soil readily absorbs effluent from septic tank absorption fields, but it does not adequately filter it. This poor filtering capacity can result in pollution of the water table. Sewage lagoons should be lined or sealed to prevent seepage and diked for protection from flooding. The walls or sides of shallow excavations should be temporarily shored to prevent sloughing or caving. Dwellings and buildings should be constructed on elevated, well-compacted fill material for protection against flooding. Constructing roads on suitable, well-compacted fill material above flood level and providing adequate side ditches and culverts can help protect roads from flood damage.

This soil is in capability unit IVe-5, nonirrigated, and IIIe-11, irrigated. It is in the Sandy Lowland range site and windbreak suitability group 5.

Ke—Kenesaw silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on loess uplands. Areas range from 5 to 200 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 8 inches thick (fig. 15). The subsoil is very friable silt loam about 14 inches thick. It is pale brown in the upper part and light gray in the lower part. The underlying material is light gray, calcareous silt loam to a depth of more than 60 inches. Some small areas have a fine sandy loam surface layer and subsoil. In places the surface layer has been thinned or thickened by land-leveling operations.

Included with this soil in mapping are small areas of Coly, Holdrege, and Rusco soils. Coly soils are higher in the landscape and have a dark surface layer less than 6 inches thick. Holdrege soils have more clay in the subsoil and occur in similar landscape positions. The moderately well drained Rusco soils are at lower elevations in slight depressions. These included soils make up 5 to 10 percent of the unit.

Permeability of this Kenesaw soil is moderate. Available water capacity is high. Runoff is slow. Tilth is generally good, and the soil is generally easily tilled over a wide range of moisture conditions. Organic matter content is moderately low. The water intake rate is moderate.

Most of the acreage of this soil is farmed. Much of it is irrigated. The rest is dryfarmed.

If this soil is dryfarmed, it is suited to corn, grain sorghum, wheat alfalfa, and introduced grasses for pasture and hay. Low precipitation is the major limitation. Soil blowing is a hazard where the surface is not adequately protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the surface, such as stubble mulching, chiseling, and no-till planting, help prevent soil blowing, conserve moisture, and maintain the organic matter content.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. Soil blowing is a hazard if it is not protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residues on the soil surface, such as chiseling or discing and no-till planting, help prevent soil blowing as well as maintain or increase the organic matter content. Both gravity and sprinkler irrigation systems are suited to this soil. Irrigation water should be applied in sufficient amounts for crops, but the rate of application should be adjusted to the water intake rate of the soil. Land leveling is generally needed to improve the surface drainage and increase the efficiency of gravity irrigation systems. Row crops can be grown without rotation if crop residues are returned to the soil and fertility is maintained by use of available feedlot manure and commercial fertilizers.

This soil is suited to introduced grasses for pasture and hay. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as

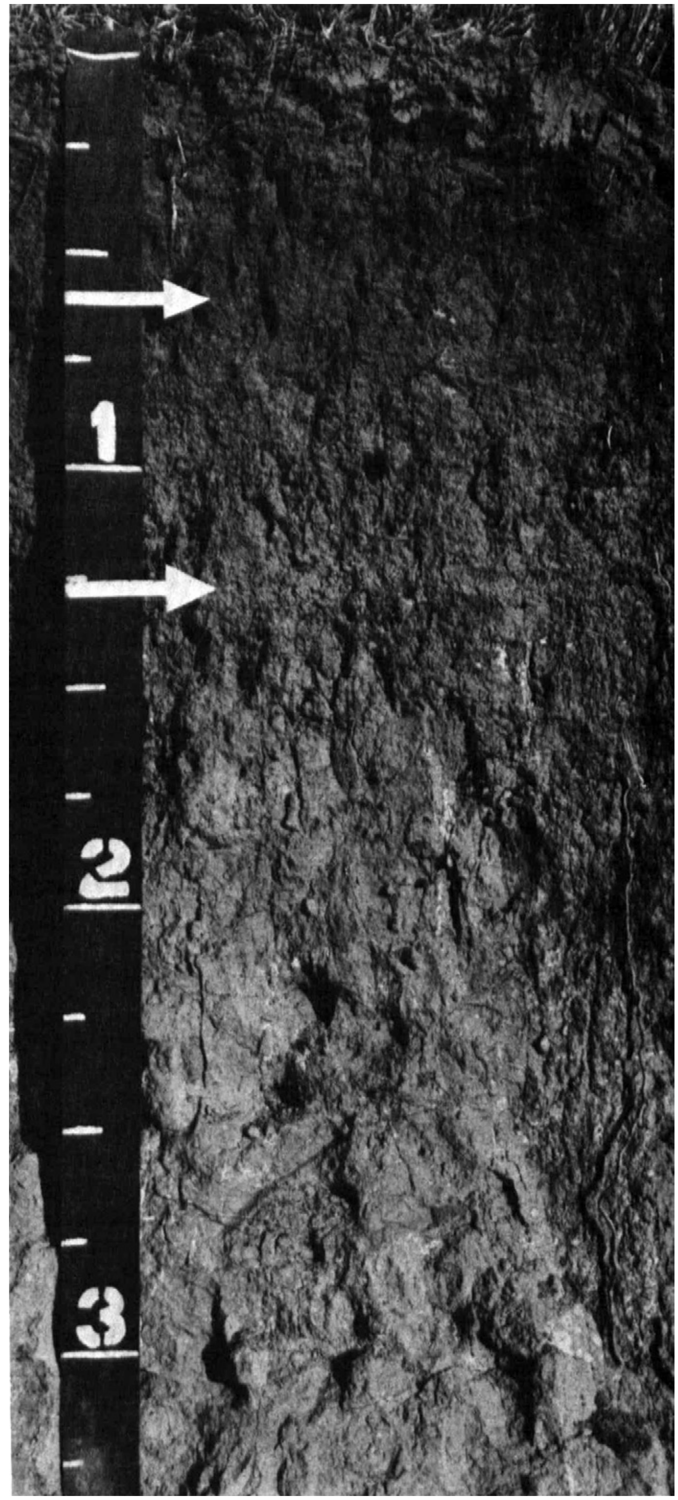

Figure 15.—Profile of Kenesaw silt loam, 0 to 1 percent slopes. The subsoil is between the arrows. Scale is in feet.

alfalfa. Overgrazing would cause poor plant vigor and reduce forage production. Separate pastures of cool- and warm-season grasses can be used to provide a long season of grazing. Rotation grazing and proper stocking can help to maintain the grasses in good condition. Nitrogen and phosphate fertilizer can increase the growth and vigor of the grasses. Irrigation water can be applied by sprinkler or gravity systems.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Survival and growth rates of suitable species are generally good. Tillage or chemical applications are effective in preparing favorable sites for planting. Supplemental watering can provide the moisture needed during periods of insufficient rainfall. Weeds can be controlled by cultivation between the rows with conventional equipment. Careful use of appropriate herbicides and roto-tilling can be used to control weeds and grasses in the row.

This soil is generally suited to septic tank absorption fields and buildings. Sewage lagoons should be sealed or lined to prevent seepage. Local roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for the subgrade to ensure better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help provide the surface drainage needed.

This soil is in capability unit IIc-1, nonirrigated, and I-6, irrigated. It is in the Silty range site and windbreak suitability group 3.

KgB—Kenesaw-Coly silt loams, 1 to 3 percent slopes. This map unit consists of deep, very gently sloping, well drained soils on loess uplands. Slopes are generally smooth and convex, and drainage patterns are usually well defined. Areas of this map unit are 50 to 65 percent Kenesaw soil and 35 to 45 percent Coly soil. The Kenesaw soil is on long, smooth slopes, and the Coly soil is on hummocks, small ridges, or side slopes of shallow drainageways. Areas of these soils are so intricately mixed or so small that it was not practical to separate them in mapping. Areas of this unit range from 10 to 500 acres in size.

Typically, the Kenesaw soil has a surface layer of grayish brown, friable silt loam about 7 inches thick. The subsoil is friable silt loam about 11 inches thick. The upper part is grayish brown, and the lower part is pale brown. The underlying material is light gray silt loam to a depth of more than 60 inches.

Typically, the Coly soil has a surface layer of light brownish gray, friable silt loam about 5 inches thick. The next layer is light gray, friable silt loam about 6 inches thick. The underlying material is very pale brown, calcareous silt loam to a depth of more than 60 inches.

Included with this unit in mapping are small areas of Hersh, Holdrege, and Rusco soils. Hersh soils have more sand throughout than the Kenesaw and Coly soils. Holdrege and Rusco soils have more clay in the subsoil, and Rusco soils are in shallow depressions and are moderately well drained. These included soils make up 5 to 10 percent of the unit.

Permeability of the Kenesaw and Coly soils is moderate. Available water capacity is high. Runoff is moderate. Both the Kenesaw soil and the Coly soil are moderately low in organic matter content.

Most of the acreage of this unit is farmed. Much of it is irrigated. A few areas are in introduced grasses or grass-legume mixtures for hay and pasture.

If these soils are dryfarmed, they are suited to grain sorghum, wheat, and grasses and legumes for hay and pasture. Water erosion and soil blowing are hazards if the surface is not adequately protected by plant cover or crop residue. Low rainfall during mid and late summer is a limitation. Terrace systems and contour farming can be used to reduce runoff and water erosion where there are uniform slopes. Conservation tillage practices that keep all or part of the crop residues on the soil surface, such as stubble mulching, chiseling, and no-till planting, help prevent water erosion and soil blowing. Returning crop residue to the soil and applying feedlot manure helps to improve organic matter content and fertility.

If these soils are irrigated, they are suited to corn, grain sorghum, alfalfa, and introduced grasses and grass-legume mixtures for pasture and hay. Water erosion and soil blowing are hazards if the surface is not adequately protected by plant cover or crop residue. Application of irrigation water and keeping erosion at a minimum are management concerns. Gravity or sprinkler systems can be used. Gravity systems generally require some land-leveling operations to achieve proper grade. Adjusting row direction to the shape of the slope can help reduce the grade in the row. Sprinkler systems require less land preparation than gravity systems. Areas of light-colored soils, exposed by leveling or erosion, respond well to applications of zinc. This soil is commonly low in content of nitrogen and phosphorus. Conservation tillage practices that keep all or most of the crop residues on the soil surface, such as chiseling, discing, and no-till planting, help prevent water erosion and soil blowing. Burning crop residue is usually not a good practice. Returning crop residue to the soil and applying feedlot manure can help improve organic matter content, fertility, and tilth.

These soils are suited to introduced grasses or legumes for pasture or hay. Pasture and hay can be alternated with other crops as part of a crop rotation system. Such cool-season grasses as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes such as alfalfa or warm-season grasses such as switchgrass. These soils are subject to water erosion. Overgrazing causes poor plant vigor, and as a result small gullies and rills form after heavy rains. Rotation grazing and proper stocking can help maintain grasses in good condition. Nitrogen and phosphate fertilizer can increase the growth and vigor of the grasses. Irrigation water can be applied by sprinkler and gravity systems.

These soils provide good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is good for survival and growth of suitable species. Tillage or chemical applications are effective in preparing favorable sites for planting. Weeds can be controlled between rows by cultivation with conventional equipment. Annual cover crops can be used between the rows. Careful use of appropriate herbicides can help control undesirable grasses and weeds in the row.

This unit is suited to septic tank absorption fields and buildings. Sewage lagoons should be lined or sealed to prevent seepage. Roads and streets should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for subgrade or base material to ensure better performance. Damage to roads and streets by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help to provide the surface drainage needed.

This unit is in capability unit IIe-1, nonirrigated, and IIe-6, irrigated. The Kenesaw 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.

Lf—Lex loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands of the Platte River Valley. It is moderately deep over fine sand, coarse sand, or gravelly sand. The soil formed in alluvium. Flooding is rare. Areas range from 20 to 500 acres in size.

Typically, the surface layer is grayish brown, friable loam about 7 inches thick. The subsurface layer is gray, friable loam about 4 inches thick. The next layer is light gray, friable silt loam about 2 inches thick. The underlying material, to a depth of 60 inches, is light gray and light brownish gray, mottled silt loam in the upper part; light gray, mottled fine sand in the middle part; and very pale brown, coarse sand in the lower part. In places, the upper part of the underlying material is fine sandy loam. In a few areas the surface layer is fine sandy loam or clay loam. Land-leveling operations have altered the thickness of the surface layer and the depth to coarse sand and gravelly sand in some areas.

Included with this soil in mapping are small areas of Gibbon, Wann, and Platte soils. Gibbon and Wann soils have sand, coarse sand, and gravelly sand below a depth of 40 inches. Platte soils have coarse sand and gravelly sand at a depth of less than 20 inches. These included soils make up 5 to 15 percent of the unit.

Permeability of this Lex soil is moderate in the upper part and very rapid in the underlying coarse sand. Available water capacity is moderate. Runoff is slow. The organic matter content is moderate. Natural fertility is medium. Depth to the seasonal high water table ranges from 1.5 feet in wet years to 3 feet in dry years.

Almost all of the acreage of this soil is farmed. Much of it is irrigated. The rest is mainly dryfarmed. A few areas remain in native grass.

If this soil is dryfarmed, it is suited to wheat, grain sorghum, and introduced grasses and legumes for hay and pasture. Tillage and planting are commonly delayed by wetness in the spring. Soil blowing is a hazard when the soil is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residues on the surface, such as stubble mulching, chiseling, and no-till planting, help control soil blowing. This soil is droughty late in summer when the water table drops into the underlying sand and gravelly sand where roots do not effectively penetrate. Alfalfa uses water from the water table in spring and early in summer but needs gravity or sprinkler irrigation to maintain growth in mid and late summer.

If this soil is irrigated, it is suited to growing corn, alfalfa, and grain sorghum. The moderate depth of soil over sand and gravelly sand reduces the available water capacity. The amount of water in each application should not be more than the soil will hold. Gravity irrigation systems can be used if the proper grade can be achieved. Both the length of run and the length of time that the water is applied should be shorter than for deep soils to reduce leaching of nutrients into the water table. The length of time between applications should also be less. Land-leveling operations are occasionally necessary but are difficult because substantial cuts can expose underlying sand and gravel. Conservation tillage practices that leave all or part of the crop residues on the surface, such as chiseling, discing, and planting, help prevent soil blowing. Organic matter content should be maintained or increased. This can be done by returning crop residues to the soil and applying available feedlot manure. Sprinklers allow good control of water applications and require very little land preparation. Small depressions should be filled with soil material or drained to prevent ponding and accumulation of soluble salts. The amount of water applied and the length of time of applications should be adjusted to the available water capacity of the soil. Fertilizers can be efficiently applied through the sprinklers.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants dominated by big and little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the site is abused by overgrazing or poorly timed hay harvesting and has been overseeded to introduced grasses or legumes, the site may become dominated by timothy, redtop, foxtail barley, red clover, sedges, and rushes. When the surface soil is wet, overgrazing can cause surface compaction and small mounds, making it difficult to graze or harvest hay.

This soil generally provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Select only species that can tolerate occasional wetness. Establishment of seedlings can be a problem during wet years. Persistent herbaceous vegetation can also be a problem. Weeds and grasses can be controlled by cultivating between the rows with conventional equipment. Till the soil after it has begun to dry. Careful use of appropriate herbicides can help control weeds in the tree rows.

The hazard of rare flooding should be considered when planning sanitary facilities and building sites. Septic tank absorption fields can be constructed on fill material so that the absorption field is above the seasonal high water table. This soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter it. Sewage lagoons should be diked for protection from flooding and lined or sealed to prevent seepage. They also should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table. Dwellings and buildings can be constructed on well-compacted fill material for protection against flooding. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches can help to provide needed surface drainage. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Coarser grained base material can be used to ensure better performance.

This soil is in capability unit IIIw-4, nonirrigated, and IIIw-7, irrigated. It is in the Subirrigated range site and windbreak suitability group 2S.

Lg—Lex loam, saline, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on bottom lands of the Platte River Valley. It is moderately deep over fine sand, coarse sand, or gravelly sand. This soil formed in alluvium. Flooding is rare. Areas are irregular in shape and range from 10 to 40 acres in size.

Typically, the surface layer is gray, calcareous, friable loam about 8 inches thick. It is moderately alkaline and moderately affected by soluble salts. The subsurface layer also is a gray, calcareous, friable loam about 4 inches thick. The next layer is mottled, light brownish gray, friable silt loam about 5 inches thick. The underlying material, to a depth of 60 inches, is mottled, light gray silt loam in the upper part and very pale brown coarse sand in the lower part.

Included with this soil in mapping are small areas of Alda and Lex loam soils that are not excessively saline or alkaline. Also included are small areas of Gibbon, Wann, and Platte soils. Gibbon and Wann soils are deep over coarse sand or gravelly sand, and Platte soils have gravelly sand at a depth of less than 20 inches. These included soils make up as much as 10 percent of the unit.

Permeability of this Lex soil is moderately slow in the upper part and very rapid in the lower part. Available water capacity is moderate. This soil contains enough soluble salts or sodium to adversely affect the growth of most plants. Runoff is slow. Organic matter content is moderate. Depth to the seasonal high water table ranges from about 1.5 feet in wet years to 3 feet in dry years.

Most of the acreage of this soil is farmed, and much of it is irrigated. A small area remains in native and introduced grasses.

If this soil is dryfarmed, it is poorly suited to alfalfa, grain sorghum, and introduced grasses. Rye is sometimes used as a cover crop or for grazing. Plant growth on about 40 percent of each individual area is moderately affected by excessive soluble salts. Small depressions or shallow, poorly defined drainageways are most affected. In dry seasons, the excessive salinity and alkalinity is especially toxic to crops. Soil blowing is a hazard where the soil is bare. Conservation tillage practices that leave all or part of the crop residues on the surface, such as chiseling, discing, and no-till planting, will help prevent soil blowing. Returning all crop residues to the soil and applying feedlot manure help maintain or improve organic matter content and improve tilth. Tillage and planting are commonly delayed in spring by wetness from the water table and slow runoff. Surface drainage should be improved by filling small depressions with soil material because soluble salts are left concentrated on the surface as standing water evaporates. Deep chiseling can temporarily improve internal drainage and permit some leaching of soluble salts. Alfalfa uses water from the water table until later in the season when the water table drops into the underlying sand and gravelly sand, causing growth to stop because of a lack of water. Stands are thin and growth is depressed in saline areas. Crops often respond to phosphate fertilizer, but apply only enough for immediate crop needs because phosphorus commonly forms insoluble compounds in saline and alkaline soils.

If this soil is irrigated, it is suited to corn, alfalfa, grain sorghum, soybeans, and introduced grasses. Tillage operations can be delayed in the spring by wetness from the seasonal high water table. Soil blowing is a hazard during dry periods if the soil is not protected by plant cover or crop residue. Conservation tillage practices that leave all or part of the crop residues on the surface, such as chiseling, discing, and planting, help prevent it. Careful application of irrigation water can help to overcome the droughty and toxic conditions caused by high alkalinity or excessive soluble salts. Land leveling is necessary to provide proper grade and good surface drainage. Care needs to be taken because deep cuts can expose the underlying sand and gravel. Sprinklers can be used, but small depressions and indefinite drains should be removed because soluble salts are left concentrated near the surface where internal drainage is slow and standing water evaporates. Applications of commercial fertilizers should be based on a systematic soil testing program. Salinity and alkalinity trends need to be known because they commonly affect plant nutrient availability.

This soil is poorly suited to introduced grasses for pasture. Pasture and hay can be alternated with other crops as part of a crop rotation system. Tall wheatgrass and switchgrass are suited to this saline soil. Overgrazing or grazing when the soil is wet can cause increased compaction and poor tilth, especially on the areas most affected by salinity. Timely deferment of grazing, rotation grazing, and proper stocking can help to maintain the pasture and soil in good condition. Irrigation water can be applied by sprinkler or gravity systems.

This soil is suited to range and native hay. The natural plant community is mostly short and mid-growing grasses and grasslike plants, western wheatgrass, and various sedges. If the site is abused by overgrazing or poorly timed hay harvesting, it may become dominated by inland saltgrass, foxtail barley, Kentucky bluegrass, sedges, and rushes. When the surface soil is wet, overgrazing can cause surface compaction and small mounds, making it difficult to graze or harvest for hay. Hay yields are generally low.

This soil provides poor sites for planting trees and shrubs in windbreaks. Fair survival and growth rates can be obtained if the planting is limited to species tolerant to moderately saline or alkaline conditions. Competition from weeds and grasses can be controlled between rows by cultivation with conventional equipment. Areas in the row and close to the trees can be hoed by hand or roto-tilled. Appropriate herbicides can be used to control competing vegetation. Establishment of seedlings can be a problem during wet years. Planting should be delayed until the soil is sufficiently dry.

The hazard of rare flooding should be considered when planning sanitary facilities or building sites. Septic tank absorption fields can be constructed on fill material so that the absorption field is sufficiently above the seasonal high water table. This soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter it. This poor filtering capacity can result in pollution of the ground water. Sewage lagoons should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table and diked for protection from flooding. They should also be lined or sealed to prevent seepage. Dwellings and buildings can be constructed on elevated, well-compacted fill material for protection against flooding. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Coarser grained base material can be used to ensure better performance. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help to provide the surface drainage needed.

This soil is in capability unit IVs-1, nonirrigated, and IIIs-7, irrigated. It is in the Saline Subirrigated range site and windbreak suitability group 9S.

LoB—Libory loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, moderately well drained soil is on uplands and stream terraces. The upper part of the soil formed in eolian sands and the lower part in loess and alluvium. Areas range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, very friable, loamy fine sand about 10 inches thick. The subsurface layer is brown, very friable loamy fine sand about 6 inches thick. The underlying material is pale brown loamy fine sand. Light gray, mottled silt loam extends from a depth of 24 inches to more than 60 inches. In some areas the surface layer is fine sandy loam.

Included with this soil in mapping are small areas of Hersh, Kenesaw, Rusco, and Valentine soils. The well drained, loamy Hersh and silty Kenesaw soils are at higher elevations. Rusco soils contain more clay in the upper part and are at lower elevations. The sandy, excessively drained Valentine soils are at higher elevations. These included soils make up 5 to 15 percent of this unit.

Permeability of this Libory soil is rapid in the upper part and moderate in the lower part. Available water capacity is moderate. The water intake rate is high. Organic matter content is moderately low. The surface layer is very friable and easily tilled over a wide range of moisture conditions. The water table is perched at the depth where the texture abruptly changes.

Most of the acreage of this soil is farmed. Many areas are irrigated. The remainder is in range and is grazed or mowed for hay.

If this soil is dryfarmed, it is suited to corn, grain sorghum, wheat, and alfalfa. Close-grown crops are more dependable because they grow most in spring when rainfall is the greatest. The principal hazard is soil blowing. Other concerns in management are conserving moisture, maintaining organic matter content, and maintaining fertility. Conservation tillage practices that leave all or part of the crop residue on the surface, such as stubble mulching and no-till planting, help control soil blowing and conserve moisture. The silty subsoil holds moisture and helps dryfarmed crops to withstand droughty conditions. Returning crop residue to the soil and applying available feedlot manure improves organic matter content and available water capacity.

If this soil is irrigated, it is suited to corn, grain sorghum, and alfalfa. Both gravity and sprinkler irrigation systems are suitable. Generally, some land leveling is needed for gravity irrigation. Soil blowing is a hazard if this soil does not have plant or crop residue cover. Conservation tillage practices that keep all or part of the crop residue on the surface, such as chiseling and light discing or no-till planting, help to control soil blowing and conserve moisture. It is important to maintain and improve organic matter content and fertility by returning crop residue to the soil and applying available feedlot manure along with commercial fertilizers.

This soil is suited to range, which is very effective in controlling soil blowing and water erosion. The natural plant community is dominated by little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. If the site is abused by overgrazing, it may become dominated by blue grama, hairy grama, sand dropseed, prairie sandreed, Scribner panicum, and numerous annual and perennial weeds.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The potential is fair for survival and growth of suitable species. The main limitation is soil blowing. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the rows. Cultivation should be restricted generally to the tree rows. Appropriate herbicides can be applied in the row, or areas in the row can be hoed by hand or roto-tilled. Be careful to apply herbicides at rates recommended for sandy soils.

Septic tank absorption fields can be constructed on fill material so that the field is sufficiently above the seasonal high water table. Care should be taken to be certain that seepage does not pollute the ground water. Sewage lagoons should be lined or sealed to prevent seepage. They should be constructed on fill material so that the bottom of the lagoon is sufficiently above the seasonal high water table. Dwellings and buildings should be constructed on raised, well-compacted fill material to overcome wetness caused by the high water table. Walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing roads on suitable, well-compacted fill material and providing adequate side ditches and culverts help protect roads from wetness.

This soil is in capability unit IIIe-5, nonirrigated, and IIIe-10, irrigated. It is in the Sandy Lowland range site and windbreak suitability group 5.

Ma—Massie silty clay loam, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil is in the lowest parts of large depressional areas on loess uplands. These areas are normally ponded for most of the growing season. Areas of this soil are irregular in shape and range from 10 to 280 acres in size.

Typically, the surface layer is friable silty clay loam about 7 inches thick. It is very dark gray in the upper part and dark gray in the lower part. Below this is a subsurface layer of gray, very friable silt loam about 3 inches thick. The subsoil is more than 55 inches thick. The upper part is dark gray, firm silty clay, the middle part is gray, friable silty clay loam, and the lower part is dark gray and gray, very firm silty clay. A one-half-inch-to one-inch-thick layer of partially decayed plant residue on the surface is common.

Included with this soil in mapping are small areas of Scott soils. They are in slightly higher areas of large depressions that become dry in midsummer. Vegetation on these Scott soils consists of annual grasses and sedges instead of smartweed and cattails. These included soils make up about 10 to 15 percent of the unit.

Permeability of this Massie soil is very slow. Organic matter content is high. Water is ponded on this soil for most of the year, except in years of far-below-normal precipitation. This soil has a seasonal high water table that ranges from about 2 feet above the surface to 1 foot below the surface.

This soil is too wet for cultivated crops or most grasses and trees. Vegetation consists mostly of perennial smartweed, cattails, sedges, and other water-tolerant plants. Some areas have no vegetation. Reed canarygrass and trees such as willow and small cottonwoods are common along the edges of the wet areas. These areas provide food and cover for wetland wildlife. Most large areas of this soil are reserved as waterfowl production areas. Waterfowl commonly stop in these areas during spring migrations, and some ducks nest in the area.

This soil is not suited to septic tank absorption fields, sewage lagoons, and buildings because of the severe ponding. A suitable alternate site is needed. If adequate surface drainage could be accomplished for a building site, foundations would have to be strengthened and backfilled with coarse materials to prevent damage by shrinking and swelling of the soil. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Coarser grained base material can be used to ensure better performance. Constructing roads on suitable, well-compacted fill material above the ponding level and providing adequate side ditches and culverts help protect roads from damage by ponding. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road by grading and constructing adequate side ditches can help provide the surface drainage needed.

This soil is in nonirrigated capability unit VIIIw-7 and windbreak suitability group 10. No range site is assigned.

Pg—Pits, sand and gravel. This map unit consists mostly of pits from which sand and gravel have been removed for commercial uses and for roads. It includes the piles and ridges of waste sand and gravel that border the pits. Some pits are filled with water. Areas of this unit are on bottom lands of the Platte River Valley and range from 10 to 50 acres in size.

In some areas gravel is being pumped from water-filled pits, and these areas are subject to constant changes in shape and size. Also included are old pits that are no longer being used.

Abandoned pit areas are not suitable for cultivation and have little value for range unless vegetation is reestablished. Some of these areas can be developed for recreation, especially fishing, and some provide limited cover for wildlife. Planting native grass and trees on these areas helps control soil blowing. Species selected should be suited to the sandy, droughty conditions and the low fertility.

Most of the gravel pits are privately owned and operated. Sand and gravel extracted from these pits are used mostly for roads and building material.

This unit is in capability unit VIIIs-1, nonirrigated, and windbreak suitability group 10. No range site is assigned.

Pm—Platte loam, 0 to 1 percent slopes. This nearly level, somewhat poorly drained soil is on the bottom lands of the Platte River Valley. It is shallow over coarse sand or gravelly coarse sand. The soil formed in alluvium. Areas of this soil are mostly long and narrow in shape and parallel to the Platte River. Flooding is occasional. Areas range from 10 to 90 acres in size.

Typically, the surface layer is dark gray, friable loam about 6 inches thick (fig. 16). The underlying material is light brownish gray loam. At a depth of 12 inches is white and light gray, coarse sand and gravelly coarse sand to a depth of more than 60 inches. This soil is calcareous above the sand and gravel.

Included with this soil in mapping are small areas of Alda, Gothenburg, Lex, and Wann soils. Alda soils are moderately deep over coarse sand. Gothenburg soils are very shallow over coarse sand and gravelly coarse sand and are lower in the landscape. Lex soils have more clay in the upper layers, are moderately deep over fine sand and coarse sand, and are slightly higher in the landscape. Wann soils are deeper to coarse sand. These included soils make up 10 to 15 percent of the unit.

Permeability of this Platte soil is moderate in the upper part and very rapid in the lower part. Available water capacity is low. Runoff is slow. Organic matter content is moderately low. Depth to the seasonal high water table ranges from about 1 foot in wet years to about 2 feet in dry years. During wet seasons when the river is high, wetness from the water table is a limitation. This soil is very droughty, however, when streamflow is low and especially during the driest season late in summer.

Most of this soil is used as native range. Some small areas are farmed. A few areas are irrigated.

If this soil is dryfarmed, it is poorly suited to crops because of the high water table during wet springs, the occasional flooding, and the shallow root zone. It is

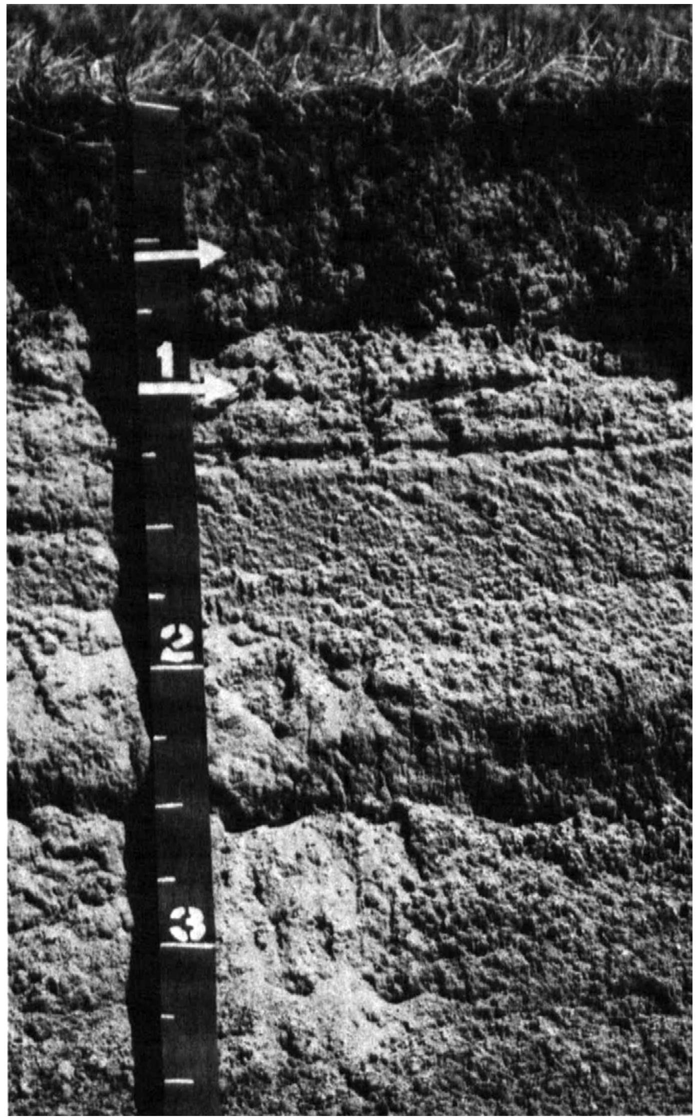

Figure 16.—Profile of Platte loam, 0 to 1 percent slopes. The arrows mark the upper and lower boundaries of the subsoil. Scale is in feet.

droughty for the remainder of the season when the water table drops into the coarse sand and gravelly coarse sand.

If this soil is irrigated, it is unsuited to gravity systems and poorly suited to sprinkler systems because of the high water table during wet springs and the shallow root zone. Digging drainage ditches or installing drainage tile may be necessary to remove the excess water.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid-growing grasses and grasslike plants dominated by big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the site is abused by overgrazing or poorly timed hay harvesting and has been overseeded to introduced grasses or legumes, it may become dominated by timothy, redtop, foxtail barley, red clover, sedges, and rushes. When the surface soil is wet, overgrazing can cause surface compaction and small mounds, making it difficult to graze or harvest hay.

This soil generally provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. Potential is good for survival and growth of suitable species that can tolerate occasional wetness. The problem of establishing seedlings during wet years can be overcome by tilling the soil and planting the seedlings after the soil has begun to dry. Weeds and grasses can be controlled between the rows by cultivating with conventional equipment. Areas near the trees can be hoed by hand or roto-tilled.

This soil is unsuited to sanitary facilities or building sites because of the seasonal high water table and flood hazard. There may be a hazard of polluting the ground water. A suitable alternate site should be selected. This soil is a probable source of sand and gravel for construction purposes. Constructing roads on suitable, well-compacted fill material above flood level and providing adequate side ditches and culverts can help protect roads from flood damage.

This soil is in capability unit IVw-4, nonirrigated, and IVw-13, irrigated. It is in the Subirrigated range site and windbreak suitability group 2S.

Ru—Rusco silt loam, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is in swales and shallow basins on loess uplands. It is occasionally ponded. Areas range from 5 to 50 acres in size.

Typically, the surface layer is gray, friable silt loam about 5 inches thick. The subsurface layer is gray, friable silty clay loam about 4 inches thick. The subsoil is friable silty clay loam about 21 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material is light gray silt loam to a depth of more than 60 inches. In places, the thickness of the surface layer has been altered by land-leveling operations. In some depressions the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Hersh, Coly, and Kenesaw soils. These soils are all slightly higher in elevation and are well drained. They also have less clay than Rusco soils. These included soils make up about 5 percent of the unit.

Permeability of this Rusco soil is moderately slow, and available water capacity is high. Runoff is slow. Tilth is generally good. Organic matter content is moderate. The water intake rate is moderately low. This soil has a seasonal high water table that ranges from about 6 inches above the surface to about 2 feet below the surface.

Most of the acreage of this soil is farmed. Some of it is irrigated. A small acreage is in range.

If this soil is dryfarmed, it is suited to corn and grain sorghum. This soil is occasionally ponded for short periods following heavy rains, and wetness in spring limits the growth of small grain and alfalfa. Drains can be constructed to overcome this hazard. During dry periods, however, the additional moisture from ponding is beneficial because it adds to the available moisture supply for crop use. Soil blowing is a hazard during dry periods. Conservation tillage practices that keep all or part of crop residues on the surface, such as stubble mulching, chiseling, discing, and planting, help prevent loss of moisture and soil blowing.

If this soil is irrigated, it is suited to corn, grain sorghum, alfalfa, soybeans, and introduced grasses. Tillage is occasionally delayed by wetness in spring. Both gravity and sprinkler irrigation systems are suited. For gravity irrigation, most areas need some land leveling and an effective system for diverting or intercepting runoff from higher areas. If this soil is irrigated with a sprinkler system, drainage can help prevent crop losses in low areas. Maximum production can be obtained by using fertilizers, high plant populations, and an efficient irrigation system to control the rate of water application. Conservation tillage practices that leave crop residues on the surface all or part of the time, such as discing, chiseling, and till planting, help prevent soil blowing during dry periods and surface crusting during wet periods. Returning crop residue to the soil is necessary to maintain or increase organic matter content. This improves tilth and increases water intake.

This soil is suited to range and native hay, which are effective in controlling water erosion. The natural plant community is mostly mid-growing and tall grasses and grasslike plants dominated by big bluestem, little bluestem, sideoats grama, switchgrass, western wheatgrass, and various sedges. If the site is abused by overgrazing or poorly timed hay harvesting, it may become dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Woody plants, including snowberry and buckbrush, migrate into the site. Brush management and burning may be needed to control woody plants.

This soil generally provides good sites for trees and shrubs in windbreaks and for recreation and wildlife plantings. Survival and growth rates are good for suitable species that can tolerate occasional wetness. The principal hazard is the ponding of water in the basin areas, and the principal limitation is the vigorous growth of weeds and grasses that grow on this moderately wet soil. Weeds and grasses can be controlled between the rows by cultivation with conventional equipment. Carefully selected herbicides, hand hoeing, or roto-tilling can help control weeds and undesirable grasses in the tree rows.

This soil is not suited to septic tank absorption fields, sewage lagoons, dwellings, and small commercial buildings because of the ponding. A suitable alternate site is needed. Constructing roads on suitable, well-compacted fill material above the ponding level and providing adequate side ditches and culverts can help protect roads from damage by ponding and wetness from the seasonal high water table. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches can help to provide the surface drainage needed.

This soil is in capability unit IIw-3, nonirrigated, and IIw-4, irrigated. It is in the Silty Overflow range site and windbreak suitability group 1.

Sc—Scott silt loam, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil is in depressions on loess uplands. These depressions pond water 7 days to a month at a time. Some areas remain ponded longer. Areas are irregular in shape and range from 10 to 500 acres.

Typically, the surface layer is dark gray, friable silt loam about 4 inches thick. The subsurface layer is gray, friable silt loam about 2 inches thick. The subsoil is about 42 inches thick. It is a dark gray, firm silty clay in the upper part; dark gray, very firm clay in the middle part; and gray, firm silty clay loam in the lower part. The underlying material is light brownish gray silt loam to a depth of more than 60 inches. Where this soil has been cultivated, tillage has mixed the surface layer, the friable, gray subsurface layer, and the upper part of the subsoil. The plow layer in these areas has a high clay content.

Included with this soil in mapping are small areas of Butler, Detroit, and Fillmore soils. They generally are along the edges of depressions around the Scott soil. Butler soils are on flats or in the shallower part of the large depressions. They have a thicker surface layer and are not flooded as long or as often. The Detroit soils are slightly higher in the landscape. They are better drained and have less clay in the subsoil. Fillmore soils are slightly higher than the Scott soil and are poorly drained. These included soils make up about 5 to 10 percent of the unit.

Permeability of this Scott soil is very slow. Runoff is very slow, and water is ponded on the surface after rains. Available water capacity is high, and organic matter is moderate. The subsoil becomes very hard when dry. This soil is ponded during some parts of the year and dry during others, making it difficult to till. The shrink-swell potential is high in the subsoil. The seasonal high water table ranges from about 6 inches above the surface to about 1 foot below the surface.

More than half of the acreage of this soil is farmed. The rest is mainly used for grazing or wildlife habitat.

If this soil is dryfarmed, it is poorly suited to cultivated crops because of poor drainage and poor tilth. Crops are often lost because of ponding after rains. Weed competition is a problem because the surface layer may be saturated and prevent timely cultivation for extended periods. Good seedbeds are difficult to prepare, and poor stands result. Grain sorghum is the crop best suited to dryfarming. Land-leveling operations and cultivation usually mix the surface layer with the heavy subsoil, which adds to the problem of poor tilth. Soil compaction is a problem if the soil is tilled when too wet. The slow water intake rate makes irrigation water management difficult.

Unlike the surrounding soils, this soil will not support high plant populations. This makes management of fields that include this soil and other soils very difficult. Nitrogen losses are high when it is applied in the form of anhydrous ammonia because the high clay content and poor tilth prevent sealing of the applicator knife slot. Fall tillage with minimal spring tillage can improve tilth. Returning crop residues to the soil helps maintain and improve organic matter content and fertility.

This soil generally is unsuited to grazing because of the frequent ponding. Vegetation is usually smartweed and other aquatic plants of little value for livestock feed. If native grasses are seeded, they are not likely to become established or survive because of the very poor drainage and the water ponding for weeks or months during the growing season.

There can be limited success when this soil is used for pasture if grasses that tolerate wetness are seeded. Maintaining the stand and controlling weeds is a problem. Grazing when the soil is wet causes compaction and damage to grasses. Deferring grazing during wet periods may require grazing late in the season when the palatability of the grasses is low.

This soil is generally unsuited to trees and shrubs in windbreaks, unless special practices are used such as land leveling or drainage. Although this soil is poorly suited to most recreation uses in years with above average precipitation in the autumn, some of the areas of the unit are used for hunting of waterfowl.

This soil is not suited to septic tank absorption fields and building sites because of the ponding. A suitable alternate site is needed. Sewage lagoons need to be diked for protection against ponding. Constructing roads on suitable, well-compacted fill material above the ponding level and providing adequate side ditches and culverts help protect roads from damage by ponded water. Damage to roads by frost action can be reduced by providing good surface drainage. Crowning the road and providing adequate side ditches can help provide the surface drainage needed. Roads should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for subgrade or base material to ensure better performance.

This soil is in capability unit IVw-1, nonirrigated, and windbreak suitability group 10. It is not assigned to a range site.

SmB—Simeon sandy loam, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on stream terraces. It formed in sandy and loamy alluvium. Areas range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, very friable sandy loam about 6 inches thick. The next layer is brown, loose sand about 6 inches thick. The underlying material is very pale brown coarse sand to a depth of more than 60 inches.

Included with this soil in mapping are small areas of Alda and Valentine soils. Alda soils have a thicker, dark surface layer and are moderately deep over coarse sand and gravelly sand. They are lower in the landscape. Valentine soils have loamy fine sand or fine sand throughout the profile and are higher in the landscape. These included soils make up about 10 percent of the unit.

Permeability of this Simeon soil is rapid. Available water capacity is low. Runoff is slow. Organic matter content is low. This soil releases moisture readily to plants, but tends to lose most of it through deep percolation. The water intake rate is very high. Root development is mostly restricted to the soil material above the medium and coarse sand.

Over half of the acreage of this soil is cultivated, and it is mostly irrigated. The rest is rangeland used for grazing.

This soil is unsuited to dryfarming because it is very droughty, and soil blowing is a severe hazard. Crops fail rapidly during periods of low precipitation because the available water capacity is low and water drains rapidly from the soil. Unless this soil is irrigated, profitable crop yields can be obtained only during years of above normal and very timely precipitation.

If this soil is irrigated, it is poorly suited to corn and grain sorghum. Sprinklers are the only efficient method of water application on this soil. Pivot sprinklers are most common. The low available water capacity and the hazard of leaching plant nutrients through the rapidly permeable underlying material make frequent, light applications of irrigation water necessary. Most of the commercial fertilizers should be applied with the irrigation water through the sprinkler. Pollution of the ground water by leached fertilizers and pesticides is possible. Soil blowing is a hazard on fields that are not protected by plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residues on the surface, such as chiseling, light discing, and till-planting systems, help control soil blowing and reduce moisture loss by evaporation. All crop residues should be returned to the soil to help maintain or increase organic matter content and improve available water capacity.

This soil is suited to range, which is effective in controlling soil blowing. The natural plant community is mostly blue grama, sand bluestem, little bluestem, needleandthread, prairie sandreed, and sand dropseed. If the site is abused by overgrazing, the sand bluestem, little bluestem, and prairie sandreed will decrease in abundance and blue grama, sand dropseed, and needleandthread will increase. If overgrazing continues for many years, the less desirable plants increase, including sand dropseed, sand paspalum, hairy grama, plains pricklypear, and clubmoss.

This soil generally provides poor sites for planting trees in windbreaks. The potential is poor for survival and growth of suitable species.

This soil readily absorbs the effluent from septic tank absorption fields but does not adequately filter it. This poor filtering capacity may result in pollution of the ground water. Sewage lagoons should be lined or sealed to prevent seepage. Cutbanks of shallow excavations can be temporarily shored to prevent sloughing or caving. This soil generally is suited to use as sites for dwellings, small commercial buildings, roads, and streets.

This soil is in capability unit VIs-4, nonirrigated, and IVs-11, irrigated. It is in the Shallow to Gravel range site and windbreak suitability group 10.

To—Tryon loamy fine sand, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is in valleys and along streams in the sandhills. It is rarely flooded. The soil formed in wind- and water-transported sediments. Areas range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 4 inches thick. The underlying material is grayish brown and pale brown fine sand to a depth of more than 60 inches. Some areas have at the surface a layer of partially decomposed plant residue about 1/2 inch thick.

Included with this soil in mapping are better drained areas of Els and Rusco soils. They occur at slightly higher elevations. These included soils make up 5 to 15 percent of the unit.

Permeability of this Tryon soil is rapid. Available water capacity is moderate. Runoff is very slow. Organic matter content is high. The seasonal high water table ranges from near the surface to a depth of 1.5 feet.

Almost all of the acreage of this soil is rangeland. Some areas were farmed in past years, but these areas have been returned to range because the seasonal high water table has been rising. Areas of this soil are generally good sites for wetland wildlife habitat.

The high water table makes this soil generally unsuited to cultivated crops and introduced grasses and legumes for hay or pasture.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid-growing grasses and grasslike plants dominated by switchgrass, indiangrass, big bluestem, prairie cordgrass, and various sedges. If the site is abused by overgrazing or poorly timed hay harvesting and is overseeded to introduced grasses or legumes, it may become dominated by timothy, redtop, foxtail barley, red clover, sedges, and rushes. When the surface soil is wet, overgrazing can cause surface compaction and small mounds, making it difficult to graze or harvest hay.

This soil generally provides poor sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The potential is good for survival of suitable species. Plant only tree and shrub species tolerant of wetness from a high water table. The herbaceous vegetation that grows on this site is abundant and persistent. Tillage or chemical applications are effective in preparing sites for planting. Weeds and annual grasses between the rows can be controlled by cultivating with conventional equipment. Areas near the trees can be hoed by hand or roto-tilled.

This soil is not suited to septic tank absorption fields or sewage lagoons because of the seasonal high water table. It has a poor filtering capacity that can result in pollution of the ground water. A suitable alternate site is needed. Dwellings and buildings should be constructed on raised, well-compacted fill material to overcome the wetness caused by the high water table. Avoid construction of basements. Constructing roads on suitable, well-compacted fill material and providing adequate side ditches and culverts can help protect roads from flood damage and wetness.

This soil is in capability unit Vw-7, nonirrigated. It is in the Wet Subirrigated range site and windbreak suitability group 2D.

UcF—Uly-Coly silt loams, 11 to 20 percent slopes. This map unit consists of deep, moderately steep, somewhat excessively drained soils on side slopes of upland drainageways. The soils formed in loess. The Uly soil generally is on the long, smooth side slopes descending from high divides to the drainageways. The Coly soil occupies narrow ridgetops and steep parts of the convex side slopes. Small "catsteps" and abrupt, steep slopes are common features on the Coly soil in this unit. The Uly soil makes up about 45 percent of each individual area, and the Coly soil makes up about 40 percent. Areas of these soils were mapped together because they are mixed in such varying irregular patterns or are so small that it was not practical to separate them. Areas of this unit are commonly long but irregular in shape. They range from 10 to 200 acres in size.

Typically, the Uly soil has a surface layer of dark grayish brown, friable silt loam about 9 inches thick. The subsoil is friable silt loam about 18 inches thick. The upper part is dark grayish brown, the middle part is grayish brown, and the lower part is light brownish gray. The underlying material is light gray, calcareous silt loam to a depth of more than 60 inches.

Typically, the Coly soil has a surface layer of grayish brown, very friable silt loam about 4 inches thick. The next layer is light brownish gray, very friable silt loam about 3 inches thick. The underlying material is light gray, very friable silt loam to a depth of more than 60 inches. This soil is calcareous throughout and has fine, soft, rounded lime accumulations in the underlying material.

Included with this unit in mapping are Hobbs soils in the drainageways. These included soils make up about 15 percent of the unit.

Permeability of the Uly and Coly soils is moderate. Runoff is rapid. Available water capacity is high, and both soils readily release water to plants. Organic matter content is moderate in the Uly soil and moderately low in the Coly soil.

Nearly all areas of this unit support native grass and are used for grazing. The soils in these areas are unsuited to cultivated crops because of the steep slopes, and removal of the grass cover would result in severe water erosion.

The soils in this unit are suited to range, which is effective in controlling water erosion. The natural plant community is mostly mid-growing and tall grasses dominated by big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass on the Uly soil and big bluestem, little bluestem, sideoats grama, and blue grama on the Coly soil. If the site is abused by overgrazing, severe soil losses can occur from water erosion. Big bluestem, little bluestem, and switchgrass decrease in abundance, and blue grama, sideoats grama, western wheatgrass, and annual and perennial weeds increase. Pricklypear and soapweed increase in abundance, and woody plants, including buckbrush, snowberry, and sumac, invade the site. Brush management may be needed to control woody plants.

The soils in this unit provide fair sites for planting trees and shrubs in farmstead and feedlot windbreaks and for recreation and wildlife plantings. Field windbreaks are generally not recommended. The potential is fair for survival and growth of suitable species. Steep slopes limit the number of areas that can be planted with machines and cause a severe water erosion hazard. Plant trees and shrubs tolerant of dry conditions and limy soils and use special practices to control erosion on the side slopes and the occasional flooding in the drainageways. Plant tree rows on the contour and maintain permanent plant cover between rows to help prevent erosion and excessive runoff.

Most areas of these soils are not suitable for sanitary facilities because of the steep slopes. A suitable alternate site is needed. Septic tank absorption fields can be installed on slopes of less than 15 percent, but shaping the land and installing the field on the contour is needed for proper operation. Dwellings and small commercial buildings should be designed to accommodate the natural slope of the land, or the soil can be graded to an acceptable gradient. Roads should be designed so that the surface pavement and subbase are thick enough to compensate for the low strength of the soil material. Coarser grained material can be used for base material to ensure better performance. Cutting and filling is needed to provide a suitable grade for roads and streets.

These soils are in capability unit VIe-1, nonirrigated. 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.

UsF—Ustorthents, steep. These deep, somewhat excessively drained soils are on uplands. They occur where the soil material has been excavated and stockpiled during construction of an irrigation canal. The area parallels the canal and is long and narrow. It is about 140 acres in size.

The texture, color, and thickness of the layers of these soils vary. Texture is like that of the area excavated. There is no typical profile, but in one of the more common profiles the surface layer is pale brown silt loam about 2 inches thick. The underlying material is very pale brown silt loam to a depth of more than 60 inches.

Included with this unit in mapping are small areas of Coly silt loam that occur between some of the excavated areas. Also included are moderately well drained Ustorthents on less sloping areas. These included areas make up less than 5 percent of the unit.

Permeability of these Ustorthents is moderate. Runoff is medium or rapid. The organic matter content is low. Available water capacity is moderate.

Most of the acreage of this unit has a sparse to good stand of grasses and weeds. It is used primarily as range for livestock and as wildlife habitat. In most places the grasses have seeded naturally.

This unit is suited to range, which is effective in controlling both water erosion and soil blowing. Overgrazing by livestock would reduce the protective plant cover and cause deterioration of the natural vegetation. Proper grazing and timely deferment of grazing can help maintain or improve the range condition.

This unit is suited to wildlife habitat. Primary use is nesting habitat for pheasants, bobwhite, and, in places, for waterfowl. Small rodents and other mammals use it as a place to burrow for homes and also as escape cover. Predator species, such as coyote, are attracted to the areas by the food source of rodents and game animals. Proper grazing can enhance the area for all wildlife.

This unit is unsuited to cultivation because of its slope, the hazard of water erosion, and the lack of accessibility for large machinery.

This unit is unsuited to planting in windbreaks, primarily because of the slope. In places, it can be used for wildlife planting if the trees are hand planted or if other special approved practices are used.

This unit is generally unsuited to building site development and sanitary facilities primarily because of the steep and very steep slopes. Alternate sites should be selected.

This unit is in capability unit VIIs-8, nonirrigated. Onsite investigation is necessary to properly evaluate the range site. This unit is in windbreak suitability group 10.

VaB—Valentine loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on uplands. The soil formed in eolian sand. Areas range from 10 to 50 acres in size.

Typically, the surface layer is grayish brown, very friable, loamy fine sand about 4 inches thick. The next layer is light brownish gray, loose fine sand about 5 inches thick. The underlying material is pale brown fine sand to a depth of more than 60 inches. In places, the underlying material is loamy fine sand.

Included with this soil in mapping are small areas of Els, Hersh, Libory, and Simeon soils. Els soils are somewhat poorly drained and occur in swale areas. Hersh soils have more clay and are slightly lower in the landscape than the Valentine soil. Libory soils are moderately well drained, have silty underlying layers, and occur in lower areas of the landscape. Simeon soils have coarse sand underlying material and occur in the landscape below the Valentine soil.

Permeability of this Valentine soil is rapid. Available water capacity is low. The water intake rate is very high. Organic matter content is low. The surface layer is very friable, and tilth is fair.

Most of the acreage of this soil is farmed, and much of it is irrigated. The rest is in native grass and used for range.

If this soil is dryfarmed, it is poorly suited to corn, sorghum, and small grains. Soil blowing and drought are hazards. Low fertility is a concern of management. Conservation tillage practices that leave all or part of the crop residue on the surface, such as stubble mulching and no-till planting, are necessary to control soil blowing. Return all crop residues to this soil to help improve the organic matter content and increase the available water capacity. Close-growing crops should be a large part of the crop rotation system on this soil to provide more continuous plant cover.

If this soil is irrigated, it is suited to corn and sorghum. Sprinklers are the only method of irrigation suited to this soil. Low fertility and proper distribution of irrigation water are concerns of management. Leaching of plant nutrients and the low available water capacity of this soil make light and frequent applications of water necessary. Maintaining a large amount of crop residue on the surface and conservation tillage practices that leave all

Figure 17.—Proper location of livestock watering facilities promotes good grazing distribution. Valentine loamy fine sand, 0 to 3 percent slopes, is in foreground.

or part of the crop residues on the surface at all times, such as no-till planting systems, are necessary to control soil blowing. Nitrogen, phosphorus, and trace minerals are commonly deficient. Fertilizers can be applied effectively through the sprinklers.

This soil is suited to range (fig. 17), which is very effective in controlling soil blowing and water erosion. The natural plant community is dominated by blue grama, little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. If the site is abused by overgrazing, it may become dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The potential is fair for survival and growth of suitable species. Tillage or chemical applications are effective in preparing favorable sites for plantings. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the rows. Cultivation should be restricted to the tree rows. Herbicides can be applied in the row, but the rates of application should be reduced on this rapidly permeable soil. Irrigation can provide supplemental water during times of insufficient moisture. Drip irrigation systems are efficient on this soil.

This soil readily absorbs the effluent from septic tank absorption fields, but generally does not adequately filter it. This poor filtering capacity may result in pollution of the ground water. Sewage lagoons should be lined or sealed to prevent seepage. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. This soil is generally suited to dwellings, small buildings, and roads and streets.

This soil is in capability unit IVe-5, nonirrigated, and IVe-11, irrigated. It is in the Sandy range site and windbreak suitability group 5.

VaD—Valentine loamy fine sand, 3 to 9 percent slopes. This deep, gently sloping and strongly sloping, excessively drained soil is on uplands. The soil formed in eolian sand. Areas range from 10 to 500 acres in size.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 6 inches thick. The next layer is brown, loose fine sand about 4 inches thick. The underlying material is very pale brown fine sand to a depth of more than 60 inches. Thin strata that are 2 to 5 percent more clay than is typical are common in the underlying material in many places.

Included with this soil in mapping are small areas of the somewhat poorly drained Boel soils in low areas. Also included are areas of the finer textured Hersh soils, which are on lesser slopes around the edge of Valentine soils. These included soils make up 8 to 15 percent of this unit.

Permeability of this Valentine soil is rapid. Available water capacity is low. The water intake rate is very high. Organic matter content is low. Tilth is fair.

Most of the acreage of this soil is in native grass and used for range, but some areas are farmed and irrigated with pivot sprinklers.

This soil is unsuited to dryfarming because of severe hazards of soil blowing and droughty conditions.

If this soil is irrigated, it is poorly suited to corn, grain sorghum, and alfalfa. Sprinklers are the only efficient method of water distribution. The principal hazard is soil blowing, and this soil has low fertility. Small seedlings of corn and grain sorghum occasionally are cut off or buried by blowing sand. Low fertility and proper distribution of irrigation water are concerns of management. Leaching of plant nutrients and the low available water capacity of this soil make light and frequent applications of water necessary. A large part of fertilizers can be applied through the sprinklers. Keeping the crop residue on the surface and stripcropping help control soil blowing. Conservation tillage practices that leave all or part of the crop residue on the surface, such as no-till planting, are necessary. Light watering with a pivot sprinkler will help prevent loss of the seedling stand if there is crop residue cover.

This soil is suited to range (fig. 18), which is very effective in controlling soil blowing and water erosion. The natural plant community is mostly mid-growing and tall grasses dominated by little bluestem, sand bluestem, prairie sandreed, sand lovegrass, needleandthread, and switchgrass. If the site is abused by overgrazing, little bluestem, sand bluestem, switchgrass, and sand lovegrass will decrease in abundance and the needleandthread, prairie sandreed, blue grama, sand dropseed, sandhill muhly, and other annual and perennial weeds will increase. If overgrazing continues for many years, the less desirable plants increase with very active sand movement and blowouts are possible.

This soil provides fair sites for planting trees and shrubs in farmstead and feedlot windbreaks and for recreation and wildlife plantings. The potential is fair for survival and growth of suitable species. Trees should be planted in a shallow furrow with as little disturbance of the soil as possible. Maintain sod between the tree rows. Areas near the trees or in the tree row can be hoed by hand or treated with herbicides. Irrigation can provide supplemental water during times of insufficient moisture.

This soil readily absorbs the effluent from septic tank absorption fields, but does not adequately filter it. This poor filtering capacity can result in pollution of the ground water. Design absorption fields to maintain a sufficient distance from domestic water supplies. Sewage lagoons should be lined or sealed to prevent seepage, and grading is required to modify the slope and shape the lagoon. The walls or sides of shallow excavations should be temporarily shored during construction to prevent caving. Dwellings and small buildings should be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Cutting and filling is generally needed to provide a suitable grade for roads and streets.

This soil is in capability unit VIe-5, nonirrigated, and IVe-11, irrigated. It is in the Sands range site and windbreak suitability group 7.

VaF—Valentine loamy fine sand, rolling. This deep, moderately steep, excessively drained soil is on uplands. It formed in eolian sand. Areas range from 25 to several hundred acres in size. Slope ranges from 9 to 17 percent.

Typically, the surface layer is grayish brown, very friable loamy fine sand 5 inches thick. The next layer is brown, loose loamy fine sand about 3 inches thick. The underlying material is light yellowish brown fine sand to a depth of more than 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Els soils in swale areas. Also included are areas of the finer textured Hersh soils in less sloping areas. These included soils make up less than 10 percent of the unit.

Permeability of this Valentine soil is rapid. Runoff is slow; most of the moisture is readily absorbed into the soil. Available water capacity is low. Reaction is neutral in the surface layer. Organic matter content is low.

Almost all of the acreage of this soil is rangeland. Some areas are part of fields developed for center-pivot irrigation.

This soil is unsuited to crops because of the hazards of soil blowing and drought. Slope is the main limitation preventing center-pivot irrigation systems from working properly on this soil.

This soil is suited to range, which is very effective in controlling soil blowing and water erosion. The natural plant community is mostly mid-growing and tall grasses dominated by little bluestem, sand bluestem, prairie sandreed, sand lovegrass, needleandthread, and switchgrass. If the site is abused by overgrazing, little bluestem, sand bluestem, switchgrass, and sand lovegrass will decrease in abundance and the

Figure 18.—An area of Valentine loamy fine sand, 3 to 9 percent slopes, is in the foreground. This soil is in the Sands range site.

needleandthread, prairie sandreed, blue grama, sand dropseed, sandhill muhly, and other annual and perennial weeds will increase. If overgrazing continues for many years, the less desirable plants will increase, there will be some sand movement, and blowouts may develop.

This soil provides fair sites for planting trees and shrubs in farmstead and feedlot windbreaks and for recreation and wildlife plantings. The potential is fair for survival and growth of suitable species. Trees should be planted in a shallow furrow with as little disturbance of the soil as possible. Maintain sod between the tree rows. Areas near the trees or in the tree row can be hoed by hand or treated with herbicides. Irrigation can provide supplemental water during times of insufficient moisture.

This soil readily absorbs the effluent from septic tank absorption fields, but does not adequately filter it. Care should be taken to be certain that seepage does not pollute the ground water and domestic water sources. Shaping the land and installing the absorption field on the contour is generally necessary for proper function. Sewage lagoons should be lined or sealed to prevent seepage, and extensive grading is required to modify the slope and the shape of the lagoon. The walls or sides of shallow excavations can be temporarily shored to prevent cutbanks from sloughing or caving. Dwellings and small commercial buildings should be properly designed to accommodate the slope, or the soil can be graded to an acceptable gradient. Cutting and filling is generally needed to provide a suitable grade for roads and streets.

This soil is in capability unit VIe-5, nonirrigated. It is in the Sands range site and windbreak suitability group 7.

VbD—Valentine-Els loamy fine sands, 0 to 9 percent slopes. This map unit consists of deep, nearly level to strongly sloping, excessively drained and somewhat poorly drained soils on uplands. They formed in eolian sand. The Valentine soil is on hummocks or knolls, and the Els soil is in the swales or valleys between the knolls. Areas of this map unit are about 65 percent Valentine soil and 25 percent Els soil. Areas of these soils are so intricately mixed or so small in size that it was not practical to separate them in mapping. Areas of the unit range from 10 to 100 acres in size.

Typically, the Valentine soil has a surface layer of grayish brown, loose loamy fine sand about 5 inches thick. The next layer is grayish brown, loose loamy fine sand about 8 inches thick. The underlying material is light yellowish brown fine sand to a depth of more than 60 inches.

Typically, the Els soil has a surface layer of dark grayish brown, very friable loamy fine sand about 6 inches thick. The next layer is grayish brown, loose loamy fine sand about 4 inches thick. The underlying material is grayish brown and pale brown fine sand that has yellowish brown and strong brown mottles to a depth of more than 60 inches.

Included with this unit in mapping are small areas of Libory and Tryon soils. Libory soils have silty underlying material and are moderately well drained. Tryon soils are the lowest soils in the landscape and are more poorly drained than the Els soil. These included soils make up about 10 percent of the unit.

Permeability of the Valentine and Els soils is rapid. Available water capacity is low. Organic matter content is low. Runoff is slow. Depth to the seasonal high water table in the Els soil ranges from 1.5 feet in wet years to 3.0 feet in dry years.

Most of the acreage of this unit remains in native grass and is used as range. Part of it is irrigated and farmed.

The soils in this unit are unsuited to dryfarming because soil blowing is a severe hazard. The Valentine soil is very droughty because of the rapid permeability. Unless irrigated, these soils should be kept in permanent vegetation.

If these soils are irrigated, they are suited to corn, grain sorghum, and grasses and legumes for hay and pasture. Soil blowing is a severe hazard. Conservation tillage practices that leave all or part of the crop residue on the surface at planting time, such as no-till planting systems, are necessary to control soil blowing. These also help to reduce evaporation and maintain and improve organic matter content. Sprinklers are the only efficient method of irrigation on these soils. Light, frequent applications of water are necessary because of the low available water capacity, the rapid permeability, and the hazard of leaching plant nutrients to a depth below the roots of most crops. Fertilizers can be applied to crops through sprinklers with irrigation water.

The soils in this unit are suited to introduced grasses and legumes for hay and pasture. This use is effective in controlling soil blowing. Establishment can be difficult, and plant cover or crop residue on the surface is helpful. Timely application of irrigation water is necessary. Overgrazing by livestock or improper mowing heights can cause damage to grasses and legumes and reduce production and protective plant cover. Proper stocking and pasture rotation can help keep the pasture in good condition.

The soils in this unit are suited to range, which is effective in controlling soil blowing and water erosion. The natural plant community on the Valentine soil is mostly mid-growing and tall grasses dominated by little bluestem, sand bluestem, prairie sandreed, sand lovegrass, needleandthread, and switchgrass. If the site is overgrazed, little bluestem, sand bluestem, switchgrass, and sand lovegrass will decrease in abundance, and needleandthread, prairie sandreed, blue grama, sand dropseed, sandhill muhly, and other annual weeds and perennial grasses will increase. If overgrazing continues over many years, less desirable plants increase and active sand movement and blowouts are possible.

The Els soil has a natural plant community of mostly tall and mid-growing grasses and grasslike plants dominated by big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the site is abused by overgrazing and has been overseeded to introduced grasses or legumes, it may become dominated by timothy, redtop, foxtail barley, red clover, sedges, and rushes. Grazing when the surface layer is wet can cause surface compaction and small mounds, making it difficult to graze or harvest for hay.

The Valentine soil is suited to growing trees and shrubs in farmstead and feedlot windbreaks if species tolerant of sandy and droughty conditions are planted. The soil is loose, and trees should be planted in shallow furrows. Tillage between the rows should be avoided. Damage to young seedlings from soil blowing is a hazard, and strips of sod or other vegetation should be maintained between the rows. Drip irrigation systems help to overcome the droughty conditions and increase tree growth, especially as the seedlings are becoming established. The Els soil provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The potential is good for survival of species that can tolerate occasional wetness from a moderately high water table. Establishment of seedlings can be a problem in wet years, and special practices in planting may be needed. The herbaceous vegetation that grows on these sites is abundant and persistent. Weeds and grasses can be controlled between the rows by cultivating with conventional equipment, and herbicides can be used in the rows. Providing drainage, planting trees on fill material, or planting around the edge of wet areas can help overcome the wetness limitation.

The Valentine soil readily absorbs the effluent from septic tank absorption fields but does not adequately filter it. Pollution of the ground water can result from this poor filtering capacity. On the Els soil, septic tank absorption fields can be constructed on suitable fill material sufficiently above the seasonal high water table. Care should be taken to be certain that seepage does not pollute the ground water. Sewage lagoons should be lined or sealed to prevent seepage. Sewage lagoons on the Els soil should be constructed on fill material sufficiently above the seasonal high water table. The walls or sides of shallow excavations in this unit can be temporarily shored to prevent sloughing or caving.

The Valentine soil is suited to dwellings and other building sites. The Els soil requires construction of buildings on well-compacted fill material to overcome the wetness caused by the high water table. The Valentine soil is generally suited to roads and streets, but cutting and filling is needed to provide a suitable grade in some areas. On the Els soil, roads should be constructed on suitable, well-compacted fill material. Providing adequate side ditches and culverts helps to protect roads from wetness.

The soils in this unit are in capability unit VIe-5, nonirrigated, and IVe-11, irrigated. The Valentine soil is in the Sands range site and windbreak suitability group 7. The Els soil is in the Subirrigated range site and windbreak suitability group 2S.

Wa—Wann fine sandy loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands. The soil formed in alluvium. Flooding is rare. Areas commonly are parallel to the Platte River Valley and range from 20 to 300 acres in size.

Typically, the surface layer is grayish brown, very friable, calcareous fine sandy loam about 9 inches thick. The next layer is grayish brown, very friable, calcareous, fine sandy loam about 5 inches thick. The upper part of the underlying material is light brownish gray, mottled fine sandy loam about 19 inches thick. The middle part is light gray, mottled fine sandy loam about 9 inches thick. The lower part is light gray, mottled loam. Light gray, mottled coarse sand extends from a depth of 48 inches to more than 60 inches. This soil is calcareous throughout. In some places, the carbonate accumulation is in a finer textured layer just above the underlying coarse sand. Thickness of the surface layer varies because of land-leveling operations for irrigation.

Included with this soil in mapping are small areas of Alda, Boel, Gibbon, and Platte soils. Alda soils are moderately deep over gravelly sand and are slightly lower in the landscape than the Wann soil. Boel soils have more sand throughout. Gibbon soils contain more clay throughout and are at lower elevations. Platte soils are shallow over gravelly sand. These included soils make up 8 to 15 percent of the unit.

Permeability of the Wann soil is moderately rapid. Available water capacity is moderate. The water intake rate is moderately high. Runoff is slow. Organic matter content is moderately low. The surface layer is friable and easily tilled over a fairly wide range in moisture conditions. Depth to the seasonal high water table ranges from about 1.5 feet in most wet years to about 3.5 feet in most dry years. Tilth is good.

Almost all of the acreage of this soil is farmed, and most of it is irrigated. A few areas are dryfarmed, and a few small areas are planted to introduced grasses for pasture and hay.

If this soil is dryfarmed, it is suited to corn, grain sorghum, small grains, alfalfa, and introduced grasses. The principal limitation is soil wetness, which commonly delays tillage early in spring. Soil blowing is a hazard if the soil is without plant cover or crop residue. Conservation tillage practices that keep all or part of the crop residue on the soil surface, such as chisel and plant or till-plant systems, help prevent soil blowing and conserve moisture. Returning available crop residue to the soil is important in maintaining or improving the organic matter content.

If this soil is irrigated, it is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. Irrigation can be by either gravity or sprinkler methods. Generally, some land leveling is needed for gravity irrigation. Tillage is somewhat delayed in the spring of most years. Light and frequent applications of water and fertilizer are necessary because these soils have a moderate available water capacity. Conservation tillage practices that keep all or part of the crop residue on the surface, such as disc-plant or chisel-plant systems, help maintain good tilth and control soil blowing.

This soil is suited to production of introduced grasses for hay and pasture if species tolerant of the high water table are grown. This use is effective in controlling soil blowing. Overgrazing by livestock, poorly timed hay harvesting, or improper mowing heights would reduce the protective plant cover and cause deterioration of plants. In addition, when the soil is wet, overgrazing can cause surface compaction and small mounds, making it difficult to graze or harvest hay. Proper stocking, timely mowing, and restricted use during wet periods help maintain the pasture in good condition.

This soil generally provides good sites for planting trees and shrubs in windbreaks and for recreation and wildlife plantings. The potential is good for survival of suitable species. Select only those species that can tolerate occasional wetness. Weeds and grasses compete for moisture late in summer when the water table is the lowest. Tillage or chemical applications are effective in preparing favorable sites for planting. Weeds and grasses can be controlled between the rows by cultivating with conventional equipment. Herbicides can be used in the tree rows. Areas near the trees can be hoed by hand or roto-tilled.

The hazard of rare flooding should be considered when planning sanitary facilities and building sites. Septic tank absorption fields can be constructed on fill material sufficiently above the seasonal high water table. Sewage lagoons should be constructed on fill material sufficiently above the seasonal high water table and should be lined or sealed to prevent seepage. They should be diked for protection against flooding. Dwellings or buildings should be constructed on raised, well-compacted fill material to overcome the wetness caused by the high water table and for protection against flooding. Damage to roads by frost action can be reduced by providing good surface drainage and by using a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches can help to provide the surface drainage needed.

This soil is in capability unit IIw-6, nonirrigated, and IIw-8, irrigated. It is in the Subirrigated range site and windbreak suitability group 2S.

Prime Farmland

The best land for farming is called 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 satisfying the Nation's short- and long-range needs for food and fiber. Because the amount of this high-quality farmland is limited, it should be used with wisdom and foresight.

Detailed information on the criteria for prime farmland is available from the local staff of the Soil Conservation Service. In general, however, prime farmland is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops where it is treated and managed with acceptable farming methods. Given minimal inputs of energy and economic resources, prime farmland produces higher yields and causes less damage to the environment than farming other kinds of land.

Prime farmland may now be cropland, pasture, woodland, or anything other than urban and built-up land or water areas. There is approximately 5,000 acres in Kearney County that would be prime farmland if it were not urban or built-up land. Prime farmland must either be used for producing food or fiber or be available for these uses.

The soils that make up prime farmland usually have an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity is suitable. These soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope gradient is mostly less than 6 percent.

Some soils that have limitations—such as a high water table, flooding, or inadequate rainfall—may qualify as prime farmland if these limitations are overcome by measures such as drainage, flood control, or irrigation. Onsite evaluation is necessary to see if these measures are effective.

Nearly 69.8 percent of Kearney County, or about 227,140 acres, is prime farmland. A recent trend in land use in some parts of the county has been the conversion of some of this prime farmland to industrial and urban uses. Such loss of prime farmland to other uses increases the agricultural use of less suitable soils, which are generally more erodible, droughty, difficult to cultivate, and less productive.

The detailed soil map units that make up the prime farmland in Kearney County are listed in table 5. Any corrective measures needed are indicated in parentheses. This table, however, is not a recommendation for a particular land use.

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 behavior 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 and windbreaks; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation 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 bedrock, 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.

Crops and Pasture

William E. Reinsch, conservation agronomist, Soil Conservation Service, 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, including some not commonly grown in the survey area, 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.

Cropland makes up 81 percent of Kearney County, or 264,700 acres. Nearly two-thirds of this cropland is irrigated.

Dryland Management

Good management practices on nonirrigated, or dryland, soils are those that reduce runoff and the risk of erosion, conserve moisture, and improve tilth. Many of the soils in Kearney County are suitable for crop production. In places, however, the hazard of erosion is severe and should be reduced or corrected by suitable conservation practices.

Terraces, contour farming, grassed waterways, and conservation tillage systems that keep crop residue on the surface help to reduce water erosion, increase water intake rates, reduce water runoff, and improve moisture availability for crops. Keeping crop residue on the surface or growing a protective plant cover reduces sealing and crusting of the soil during and after heavy rains. In winter, plant stubble catches drifting snow, which provides additional moisture.

Soil blowing is a major hazard on the Libory, Hersh, and Valentine soils that are farmed. Practices that control soil blowing are crop-residue management and conservation tillage. The overall hazard of erosion can be reduced if the more productive soils are used for row crops and the steeper, more erodible soils are used for close-grown crops, such as small grain, alfalfa, or grasses for hay and pasture. Proper land use alone can reduce the hazard of erosion in many areas.

In Kearney County, insufficient rainfall is a common limitation for crop production. Water erosion and soil blowing are active on most of the soils. A cropping system and management practices that control erosion should be planned to fit the soils in each field.

The sequence of crops grown on a field in combination with the practices needed for the management and conservation of the soil is known as a resource management system. In dryfarming, the management practices and cropping sequence should preserve tilth and fertility, maintain plant cover that protects the soil from erosion, and control weeds, insects, and diseases. Cropland resource management systems vary according to the soils on which they are used. For example, a resource management system for Hersh fine sandy loam, 3 to 6 percent slopes, should include crop-residue management and a conservation tillage system for row crops. On Holdrege silt loam, 3 to 6 percent slopes, however, terraces, contour farming, and crop-residue management are needed when row crops are grown in the crop rotation to control water erosion and soil blowing and still maintain the fertility and tilth of the soil.

The best management practices for cultivated fields of soils in capability class IIc-1, such as Kenesaw silt loam, 0 to 1 percent slopes, are proper use of crop residue, addition of fertilizers or feedlot manure, and good agronomic practices. On class IVe-5 soils, such as Valentine loamy fine sand, 0 to 3 percent slopes, the best practices are those that allow crop residue to remain on the soil over winter and a conservation tillage system that leaves 3,000 pounds per acre of corn or sorghum residue or 1,500 pounds of small grain residue on the surface after planting the crops. This can reduce water erosion and soil blowing to an acceptable level.

Seedbeds should be prepared to control weeds and encourage plant growth. Excessive tillage, however, breaks down the granular structure in the surface layer that is needed for good soil tilth. The number of steps in the tillage process should be limited to those that are essential. Various conservation tillage practices can be used in Kearney County. The no-till, till-plant, and disc or chisel and plant are practices well suited to row crops. Grasses can be established by drilling into a cover of stubble without further seedbed preparation.

All soils used for cultivated crops or for pasture should be tested to determine their need for additional nutrients. In dryfarming, the kind and amount of fertilizer applied should be based on soil tests and on the moisture content of the soil at the time the fertilizer is applied. If the subsoil is dry or rainfall has been below normal, the amount of nitrogen fertilizer applied should be slightly less than the amount normally recommended. Nitrogen fertilizer improves nonlegume crops on all soils. Phosphorus and zinc are needed on the more eroded soils and in areas cut for construction of terraces or diversions. Dryfarmed soils require smaller amounts of fertilizer than irrigated soils because the plant population is generally lower.

Some soils in Kearney County, such as Boel and Wann soils, are somewhat poorly drained because of a moderately high water table. Open drainage ditches and underground tile systems can be used to lower the water table if suitable outlets at lower elevations can be located. Where the water table cannot be lowered sufficiently for good crop growth, crops can be planted that are tolerant of wet conditions.

Herbicides can be used to control weeds, but care should be taken to apply the correct kind of herbicide at the proper rate, according to soil conditions. The colloidal clay and humus fraction of the soil is responsible for most of the chemical activity of the soil. As a result, crop damage from herbicides is more likely to occur on areas of coarse and moderately coarse soils that are low in colloidal clay and on eroded areas where the organic matter content is low. On these areas the application rate of herbicides should be correspondingly lower. Application methods should be in accordance with the manufacturer's instructions. Keeping field boundaries on the contour helps provide for uniformity of soils in a field, which lessens the danger of damage from herbicides by making more precise applications possible.

Irrigation Management

According to the Soil Conservation Service Resource Inventory, 66 percent of all cropland in Kearney County was irrigated in 1979. Corn was grown on over 86 percent of the irrigated cropland, and smaller acreages were in alfalfa and soybeans.

Both furrow and sprinkler methods are suited to corn and other row crops. Alfalfa can be irrigated by border, contour ditch, corrugation, or sprinkler methods.

The cropping sequence on soils that are well suited to irrigation consists mostly of row crops. A rotation from corn to soybeans and alfalfa and grass helps to control the plant diseases and insects that become common if the same crop is grown year after year. Valentine loamy fine sand, when used for cultivated crops, is vulnerable to soil blowing in Kearney County. Where this soil is irrigated, the soil blowing can be controlled by leaving a minimum of 3,000 pounds per acre of standing cornstalks 16 inches tall or 5,000 pounds flat until the spring crop is planted. Conservation practices such as conservation tillage and crop-residue use will leave a protective cover of crop residue on the soil surface after the crop is planted. These practices help to conserve the supply of irrigation water by reducing evaporation, increasing the intake of rainfall, reducing water runoff, and controlling water erosion and soil blowing.

If a sprinkler irrigation method is used, water should be applied at a rate no greater than the soil can absorb so that runoff does not occur. Sprinklers can be used on the more sloping soils as well as on the nearly level ones. Some coarse textured soils, such as Valentine loamy fine sand, 3 to 9 percent slopes, are better suited to sprinkler irrigation when conservation practices are applied that protect the soil from soil blowing. Because the application rate can be controlled, sprinklers have special use in conservation, for example, to establish grass stands, to check soil blowing, and to improve the seed germination of most crops. In summer, much water is lost through evaporation and is applied unevenly by some sprinklers because of wind drift. Watering at night when wind velocities and temperatures are lower will reduce evaporation and improve distribution.

There are three general kinds of sprinkler systems. One kind is placed at a location and left there until a specified amount of water is applied. Another kind is a moving system that revolves on a central pivot. A third kind uses volume guns, which are single, large sprinklers that are constantly moved while applying water.

Because the soil can hold only a limited amount of water, irrigation water or precipitation is needed at regular intervals to maintain soil moisture. The application interval varies according to the crop, the soil, and the amount of moisture in the soil. The water should be applied no faster than the soil can absorb it.

Irrigated silt loam soils in Kearney County hold about 2 inches of available water per foot of soil depth. A soil that is 4 feet deep and planted to a crop that sends its roots to a depth of 4 feet can hold about 8 inches of available water for the crop.

For maximum efficiency, irrigation should be started when about half of the stored water has been used by the plants. If a soil holds 8 inches of available water in the root zone, irrigation should be started when about 4 inches has been removed by the crop. An irrigation system should be planned to replace water at a rate that will provide a stable water supply for the crop. A tailwater recovery pit can be installed at the end of a furrow-irrigated field to catch runoff of excess irrigation water. The water can then be pumped to the upper end of the field and used again. This practice increases the efficiency of surface irrigation systems and helps to conserve the supply of ground water. Acceptable irrigation management controls water erosion and soil blowing, reduces water runoff and deep percolation, and provides uniform water distribution across the field.

Irrigated soils generally produce higher yields than dryfarmed soils. Consequently, greater amounts of plant nutrients, particularly nitrogen and phosphorus, are removed in harvested crops. Returning all crop residues to the soil and adding feedlot manure and commercial fertilizer help to maintain the level of plant nutrients in the soil. Most grain crops in Kearney County respond to nitrogen fertilizer. Soils that have been disturbed during land-leveling operations, particularly where the surface layer has been removed, respond to applications of fertilizers high in phosphorus, zinc, and iron. The kinds and amounts of fertilizer to apply for specific crops should be determined by soil tests.

To help plan irrigation systems, the soils in Kearney County that are suited to irrigation have been assigned to irrigated design groups. These design groups are described in the Nebraska Irrigation Guide (*4*). The Arabic number in the capability unit for the irrigated soil indicates the design group to which the soil belongs. Assistance in planning and designing an irrigation system is available from the local office of the Soil Conservation Service or Extension Service.

Pasture and Hayland Management

Areas that are in hay or pasture should be managed for maximum production. Once the pasture is established, the grasses should be kept productive. A planned system of grazing that meets the needs of the plants and promotes uniform utilization of forage is important if high returns are expected. Most forage plants are a good source of minerals, vitamins, proteins, and other nutrients. A well-managed pasture can provide a balanced diet for livestock throughout the growing season.

A mixture of suitable grasses and legumes can be grown on many kinds of soils, and with proper management can return a fair profit. Grasses and legumes are compatible with grain crops in crop rotation systems and have beneficial effects on soil building. Grasses and legumes are well suited to conservation cropping systems because they improve tilth, add organic matter, and reduce erosion.

Grasses and legumes that are used for pasture and hayland, either irrigated or nonirrigated, require additional plant nutrients to obtain maximum vigor and growth. The kinds and amounts of fertilizer applied should be determined by soil tests.

The most commonly grown grasses for irrigated pastures are smooth brome and orchardgrass. Other grasses and legumes that are suited to irrigation in Kearney County are intermediate wheatgrass, meadow brome, and creeping foxtail. Irrigated pasture in Kearney County can produce 750 to 900 pounds of beef per acre under a high level of management. Cropland can be converted to irrigated pasture to reduce erosion.

Grasses that have potential for nonirrigated pasture are smooth brome, intermediate wheatgrass, and meadow brome. Some native, warm-season grasses, when planted as a single species on nonirrigated land, are compatible with cool-season pastures to extend forage quality during the grazing season. 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 months for grazing animals.

Legumes that have potential for irrigated or nonirrigated pastures are alfalfa, birdsfoot trefoil, and cicer milkvetch.

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 capability classification is also shown for each unit.

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, barnyard 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 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 under both nonirrigated and irrigated conditions. Crops that require special management are excluded. 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 grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider 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, for woodland, 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 limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or 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 or IIIe-1.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Rangeland

Peter N. Jensen, range conservationist, Soil Conservation Service, helped prepare this section.

Rangeland makes up approximately 15 percent of the total agricultural land in Kearney County. It is scattered throughout the county with the greatest concentration in the sandhills and on the sandy upland soils bordering the Platte River bottom lands. The soil associations dominantly used for grazing or native hay are Valentine and Simeon. The average size of the livestock farms in Kearney County is about 640 acres.

The raising of livestock, mainly cow and calf herds, with calves sold in the fall as feeders, is the second largest agricultural enterprise in the county. The rangeland is generally grazed late in spring to early in fall. The livestock graze corn or grain sorghum (milo) aftermath in fall and early in winter. They are fed hay (alfalfa or native), silage, or both for the remainder of the winter.

The Kearney County rangeland has been depleted by overuse. Approximately 90 percent of the rangeland is producing less than half its potential in kinds and amounts of native plants. This is largely the result of overstocking and poor livestock distribution.

The main objective of range management should be to maintain the range in good to excellent condition. Range management practices that maintain or improve range conditions are economical and are needed on all rangeland that is grazed. These practices include (1) proper grazing use that leaves adequate plant cover to maintain or improve plant vigor, (2) deferred grazing or resting the key management plants periodically during the carbohydrate storage phase, and (3) a planned grazing system in which the pastures are alternately grazed and rested in a planned sequence. Livestock can be distributed better and more uniform grazing obtained in a pasture by properly locating fences; by developing livestock watering facilities, such as wells and stock ponds (dugouts); and by moving salt to areas where grazing is desired.

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 7 shows, for each soil, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. Only those soils that support rangeland vegetation suitable for grazing are listed. Explanation of the column headings in table 7 follows.

A *range site* is a distinctive kind of rangeland that when in excellent or climax condition 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 established 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.

Most of the rangeland in Kearney County is in Sandy, Sands, Shallow to Gravel, Silty, and Limy Upland range sites. The remainder of the sites are classified Wet Subirrigated, Subirrigated, Silty Overflow, Sandy Lowland, Silty Lowland, and Clayey. Interpretations for each range site in the county are given in the Technical Guide at the local office of the Soil Conservation Service, where technical help with range management or improvement programs can be obtained.

Potential annual 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.

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. It does not have a specific meaning that pertains to the present plant community in a given use.

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, reduction 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.

On certain Sandy and Sands range sites the production on denuded rangeland and abandoned cropland (nonirrigated or irrigated) can be improved by planting the area to a mixture of suitable native grasses. After establishment, production can be maintained by proper grazing or hay management practices. Unstabilized sandy blowouts may have to be enclosed with a fence, shaped, seeded, and mulched to protect adjacent grasses from sand blowing or deposition.

Native Woodland

Keith A. Ticknor, forester, Soil Conservation Service, helped prepare this section.

Very little native woodland is found in Kearney County. There is a narrow band of trees along the channel of the Platte River. Eastern cottonwood makes up a high percentage of these trees. Also included are black willow, green ash, red mulberry, boxelder, Russian-olive, dogwood, and eastern redcedar.

Sporadic clumps or bands of trees also occur in some of the upland drainageways. The most common trees and shrubs in these areas are eastern cottonwood, black willow, red mulberry, boxelder, honeylocust, green ash, Siberian elm, eastern redcedar, American plum, and common chokecherry.

The bottomland soils along the river and in drainageways have good potential for production of sawtimber, firewood, Christmas trees, and other wood products, but these soils are being used as cropland and are unlikely to be converted to woodland. Odd areas and small, difficult-to-farm areas are good sites to consider for wood crops.

Windbreaks and Environmental Plantings

Keith A. Ticknor, forester, Soil Conservation Service, helped prepare this section.

Most farmsteads and ranch headquarters in Kearney County have trees around them that have been planted at various times by the individual landowners. Siberian elm and eastern redcedar are the most common species of trees in these windbreaks, especially in the older windbreaks. Russian-olive, honeylocust, hackberry, Russian mulberry, eastern cottonwood, green ash, ponderosa pine, and lilac have also been planted.

Tree planting around farmsteads is a continuing process because old trees pass maturity and deteriorate, some trees are lost to insect and disease attacks, other trees are destroyed by storms, and new windbreaks are needed for expanding farmsteads.

Field windbreaks, or shelterbelts, are numerous in Kearney County, especially on the bottom lands of the Alda-Wann-Boel soil association. In addition, there are still a few hedge (osageorange) rows along fences or property lines in the county.

Many of the field windbreaks consist of eight to ten rows of trees and shrubs. Common species in these windbreaks are eastern redcedar, eastern cottonwood, Siberian elm, honeylocust, green ash, hackberry, Russian-olive, ponderosa pine, Russian mulberry, American plum, and Siberian peashrub. Many of these field windbreaks have reached maturity, and they are deteriorating. Renovation practices of thinning, removal, and replanting are needed to maintain the value and effectiveness of these windbreaks.

In order for windbreaks to fulfill their intended purpose, the trees or shrubs selected must be suited to the soil in the area to be planted. Matching the proper trees with the soil type is the first step toward ensuring survival and a maximum rate of growth in the windbreak. Permeability, available water capacity, fertility, soil texture, soil depth, and drainage are soil characteristics that greatly affect the rate of growth of trees and shrubs in windbreaks.

Trees and shrubs are somewhat difficult to establish in Kearney County because of the dry conditions and the competition from other vegetation. Preparing the site properly before planting and controlling weed and grass competition after planting are important in the establishment and management of windbreaks. Supplemental watering is necessary during establishment.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well-prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 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. 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 nursery.

Recreation

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

There are three major public outdoor recreation developments in Kearney County. These include the Kearney County State Recreation Area, which contains 163 acres of land and 23 acres of water. This facility offers camping, swimming, boating, fishing, hiking, and cross-country skiing. It also has snowmobile trails, a playground, and historical sites of interest. The Fort

Kearney State Historical Park, with a total of 39 acres, has a museum and historical items of interest. The Northeast Sacramento Wildlife Management Area has 40 acres open to hunting during the regular seasons. Hiking, birdwatching, and photography are optional activities.

Many wetlands, both in public and private ownership, are available for hunting with permission. Game found in these wetland areas include ducks, geese, deer, rabbits, pheasants, and quail. Private farm ponds provide limited fishing for bass, bluegill, and catfish. The Platte River provides some fishing.

Private outdoor recreation facilities in Kearney County include a historical village at Minden, with motel, camping and picnicking areas, and restaurant facilities. Two golf courses are available, and there is a field sports area at a gun club.

Dove, quail, pheasant, and deer hunting are possible, with permission, on some private lands during regular seasons.

Technical assistance is available for designing installations to improve the habitat for wildlife, as well as the facilities for recreation. The Soil Conservation Service has an office in Minden and can provide this assistance, or the staff there can direct you to an appropriate agency for assistance.

The soils of the survey area are rated in table 9 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 sewerlines. 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 recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, 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 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

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 have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing 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 or stones or boulders 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 free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan 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 and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Wildlife habitat in Kearney County varies with the soil, topography, slope, and drainage pattern. The northern part of the county is bordered by the Platte River, which provides woodland habitat along its banks as well as openland habitat on the bottom land. Wildlife here includes whitetail deer, ring-necked pheasant, bobwhite, squirrel, cottontail, jack rabbit, opossum, muskrat, mink, beaver, raccoon, hawks, owls, eagles, and many songbirds.

The southern two-thirds of the county is predominantly farmland with silty upland soils in the Holdrege, Kenesaw, and Coly series. Wetlands occur in depressions that do not have a defined drainage pattern.

Figure 19.—Large rainwater basin used as waterfowl habitat. The soil in the ponded area is Massie silty clay loam, 0 to 1 percent slopes.

Many of these wetlands are public property managed by the Nebraska Game and Parks Commission and the Fish and Wildlife Service of the U.S. Department of the Interior.

Wetlands are especially valuable as wildlife habitat (fig. 19). They provide resting and feeding places for migrating waterfowl and shore birds in both spring and fall. They provide the water areas needed by broods of ducks that are hatched in nearby nesting areas. They also provide areas for waterfowl hunters to take some of the ducks and geese that migrate through from the northern nesting grounds during the hunting season.

Deer, pheasants, and quail use for cover and water the wetlands and surrounding lands in close proximity to crop fields. Wetlands also attract mink, muskrat, raccoon, opossum, coyote, fox, hawks, owls, and eagles.

Wetlands provide another benefit by storing floodwater and feeding it slowly back into the adjacent subsoil and streams. Government cost-sharing programs have been available for preserving and enhancing these valuable wetlands.

The sandhills area of the county is presently in native rangeland, but with irrigation much of the area is being converted to cropland. There is no woody cover in these areas, with the exception of the fence lines, roadsides, farmstead shelterbelts, and natural drainage areas.

Wildlife use the areas of natural cover to travel between the Platte River and the "rainwater basin" area. Center-pivot irrigation corners provide other opportunities to develop wildlife areas. Grasses or woody cover plantings can be established in these corners. Grasses or low-growing shrubs can be planted around irrigation reuse pits. Pheasants, deer, and other wildlife use these pits as a source of water.

There is little habitat diversity in Kearney County, except along the Platte River and the wetland areas in the "rainwater basins." Extensive cropland fields and the high market value of land make it difficult for landowners to set areas aside specifically for wildlife. Practices that could be carried out to benefit wildlife include leaving corn or grain stubble for winter cover; practicing better grassland management; planting trees and shrubs around farmsteads; pumping irrigation reuse pits full of water in the fall or early in spring; contour stripcropping for increased diversity and edge effect; leaving roadsides unmowed or unburned for nesting; improving the areas in farmsteads by planting flowering or fruit-producing trees, shrubs, and vines; planting one row or multiple rows of trees and shrubs as field windbreaks for erosion control; and leaving a row or two of corn or milo for winter food for wildlife near natural or planted cover.

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 10, 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, surface stoniness, and flood hazard. 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, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, 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, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, 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, the available water capacity, and wetness. Examples of these plants are oak, poplar, green ash, honeylocust, apple, hawthorn, dogwood, hickory, eastern cottonwood, and common chokecherry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are sumac, autumn-olive, and wildplum.

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, fir, cedar, and 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 mountainmahogany, bitterbrush, snowberry, and big sagebrush.

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, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, 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 depth to bedrock, wetness, surface stoniness, 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. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, skunk, and red fox.

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, woodcock, thrushes, woodpeckers, squirrels, red fox, coyote, raccoon, deer, and opossum.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, 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, meadowlark, and lark bunting.

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 need to 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, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, 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 (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) 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 11 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 the depth to bedrock, a cemented pan, or a very firm dense layer; stone 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 the 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, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 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. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, 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, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and the 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 12 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 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

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 or fractured bedrock 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 12 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, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of 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, bedrock, and cemented pans can cause construction problems, and large stones 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 needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type 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 type 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 large stones or excessive 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 bedrock, a cemented pan, or 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 13 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 or 6 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 or 6 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 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 large stones, 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, low shrink-swell potential, few cobbles and stones, 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 moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. 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, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They 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. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, 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), the thickness of suitable material, and the content of rock fragments. Kinds of rock, 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 is up to 12 percent silty 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. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

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 rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, 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, stones, 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, stones, or soluble salts; have slopes of more than 15 percent; or have a seasonal 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 14 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 and for embankments, dikes, and levees. 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 and the depth to fractured bedrock or other permeable material. 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 stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

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 bedrock, to a cemented pan, or to other 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 potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, 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, sodium, or sulfur. 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 construction of a system is affected by large stones and depth to bedrock or to a cemented pan. 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 reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind 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. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, 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 18.

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 characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 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 or 6 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. "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 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, SP-SM.

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. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

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.

Physical and Chemical Properties

Table 16 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, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving 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 1/3 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.

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 wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse 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 sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, 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 wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, 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 of 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 17 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 not protected by vegetation are assigned to one of four groups. They are grouped according to the intake 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, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 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, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once 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;

November-May, for example, means that flooding can occur during the period November through May.

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 17 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 17.

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 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 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are 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); Specific gravity TC/100 (AASHTO). The group index number that is part of the AASHTO classification was computed by using 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 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten 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 Ustoll (*Ust*, meaning intermittently dry, 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 Haplustoll (*Hapl*, meaning minimal horizonation, plus *ustoll*, the suborder of the Mollisols that have a ustic 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 Haplustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly 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 coarse-silty, mixed, mesic Typic Haplustolls.

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 substratum 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 similar soils and 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."

Alda Series

The Alda series consists of somewhat poorly drained soils on bottom lands. The soils are moderately deep over coarse sand or gravelly sand. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part. The soils formed in loamy alluvium over coarse sand or gravelly sand. Slopes ranges from 0 to 1 percent.

Alda soils are similar to Lex and Wann soils and are commonly adjacent to Boel, Gibbon, Lex, Platte, Simeon, and Wann soils in the landscape. Lex soils have more clay in the upper part. Wann soils do not have coarse sand and gravel above a depth of 40 inches. Boel and Gibbon soils do not have coarse sand and gravel above a depth of 40 inches, and Gibbon soils have more clay throughout. Platte soils are 10 to 20 inches deep over coarse sand or gravelly sand and are generally slightly lower in relative elevation. These soils are on landscapes similar to those of the Alda soils.

Typical pedon of Alda loam, 0 to 1 percent slopes, 3,500 feet north and 300 feet west of the southeast corner of sec. 22, T. 8 N., R. 16 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

A—6 to 12 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure parting to weak fine granular; soft, friable; strong effervescence; moderately alkaline; clear wavy boundary.

AC—12 to 16 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable; few pebbles; few fine soft masses of calcium carbonate; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—16 to 24 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; few gravel pebbles; few fine soft masses of calcium carbonate; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—24 to 30 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; few gravel pebbles; few fine soft masses of calcium carbonate; violent effervescence; moderately alkaline; clear wavy boundary.

2C1—30 to 46 inches; light gray (10YR 7/2) coarse sand, light yellowish brown (10YR 6/4) moist; few medium distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; about 5 percent gravel by volume; neutral; gradual wavy boundary.

2C2—46 to 60 inches; very pale brown (10YR 7/3) coarse sand, light yellowish brown (10YR 6/4) moist; many coarse distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; about 5 percent gravel by volume; neutral.

Thickness of the mollic epipedon ranges from 10 to 18 inches. Depth to coarse sand or gravelly sand ranges from 20 to 40 inches. These soils are typically calcareous at the surface, but depth to carbonates can range from 0 to 10 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It typically is loam but includes very fine sandy loam. Reaction ranges from mildly alkaline to moderately alkaline. Some profiles have no AC horizon. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 1 through 3. Reaction ranges from mildly to moderately alkaline. The 2C horizon is coarse sand and 3 to 15 percent gravel.

Boel Series

The Boel series consists of deep, somewhat poorly drained, rapidly permeable soils formed in alluvium on bottom lands. Slope ranges from 0 to 1 percent.

Boel soils are commonly adjacent to Alda, Inavale, Lex, Platte, and Wann soils. Alda and Lex soils have coarse sand or gravelly sand at a depth of 20 to 40 inches, and Lex soils have more clay in the transitional layer. Inavale soils are somewhat excessively drained. These soils are on similar landscapes. Platte soils are at lower elevations and have coarse sand or gravelly sand at a depth of 10 to 20 inches. Wann soils have less sand throughout and are on similar landscapes.

Typical pedon of Boel fine sandy loam, 0 to 1 percent slopes, 900 feet south and 100 feet east of the northwest corner of sec. 28, T. 8 N., R. 14 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

A—8 to 11 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/1 moist); moderate fine granular structure; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

AC—11 to 17 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; weak fine subangular blocky structure; slightly hard, very friable; few fine soft masses of calcium carbonate; violent effervescence; moderately alkaline; gradual smooth boundary.

C1—17 to 32 inches; light brownish gray (10YR 6/2) fine sand, grayish brown (10YR 5/2) moist; common medium distinct brown (7.5YR 5/4 moist) mottles; single grain; loose; few fine soft masses of calcium carbonate; violent effervescence; moderately alkaline; gradual smooth boundary.

C2—32 to 54 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; many medium distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; mildly alkaline; gradual smooth boundary.

C3—54 to 60 inches; very pale brown (10YR 7/3) loamy fine sand, brown (10YR 5/3) moist; many medium distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; mildly alkaline.

The solum ranges from 10 to 20 inches thick. The mollic epipedon ranges from 7 to 15 inches in thickness. Free carbonates are typically in the A horizon, but commonly not in the lower, coarse textured horizons.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. Reaction is mildly or moderately alkaline. The C horizon has hue of 10YR and 2.5Y, value of 6 through 8 (5 through 7 moist), and chroma of 2 or 3. Reaction ranges from neutral to moderately alkaline. The lower part of the C horizon is loamy fine sand, fine sand, or coarse sand.

Butler Series

The Butler series consists of deep, somewhat poorly drained, slowly permeable soils formed in loess. The soils are on flat or slightly concave uplands and terraces. Slope ranges from 0 to 1 percent.

Butler soils are commonly adjacent to Detroit, Fillmore, Holdrege, Massie, and Scott soils in the landscape. Detroit and Holdrege soils have less clay in the subsoil and occur higher in the landscape than Butler soils. They are also well and moderately well drained. Fillmore soils are lower in the landscape and are poorly drained. Scott and Massie soils are very poorly drained soils in bottoms of upland depressions.

Typical pedon of Butler silt loam, 0 to 1 percent slopes, 200 feet south and 500 feet east of the northwest corner of sec. 28, T. 5 N., R. 16 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; slightly sticky; medium acid; clear smooth boundary.

A—6 to 12 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky; slightly acid; clear smooth boundary.

Bt1—12 to 21 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate medium blocky; very hard, very firm, very sticky; slightly acid; gradual smooth boundary.

Bt2—21 to 31 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to strong medium angular blocky; very hard, very firm, very sticky; neutral; gradual smooth boundary.

Bt3—31 to 35 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; few medium distinct dark grayish brown (10YR 4/2 moist) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; very hard, very firm, very sticky; neutral; gradual smooth boundary.

BC—35 to 41 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; few fine prominent strong brown (7.5YR 5/6) mottles; weak medium and fine subangular blocky structure; slightly hard, firm, sticky; neutral; gradual smooth boundary.

C1—41 to 48 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; few fine prominent strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable; slightly sticky; slight effervescence; mildly alkaline; gradual smooth boundary.

C2—48 to 60 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; common medium prominent strong brown (7.5YR 5/6) mottles; massive; slightly hard, friable, slightly sticky; slight effervescence; mildly alkaline.

Thickness of the solum ranges from 38 to 46 inches. The mollic epipedon commonly extends nearly through the Bt horizon. Depth to free carbonates ranges from 26 to 50 inches.

The A horizon has value of 4 (2 or 3 moist) and chroma of 1 or 2. Reaction ranges from medium acid through neutral. The Bt horizon has hue of 10YR or 2.5Y, value of 3 or 4 (2 or 3 moist), and chroma of 1 or 2. It is dominantly silty clay, ranging from 45 to 50 percent clay. Reaction is slightly acid or neutral. The BC horizon is commonly silty clay loam and intermediate in color between the Bt and C horizons. There are few to common mottles. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 or 5 moist), and chroma of 2. Reaction ranges from neutral through moderately alkaline.

Coly Series

The Coly series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. The soils formed in loess. Slope ranges from 1 to 20 percent.

Coly soils are commonly adjacent to Hobbs, Holdrege, and Uly soils. Hobbs soils are stratified, have carbonates deeper in the profile, and occur on bottom lands. Holdrege soils contain more clay in the subsoil and are higher than Coly soils in the landscape. Uly soils occupy smoother and longer slopes, commonly swales between ridges and plane or concave side slopes of upland drainageways. They have a mollic epipedon.

Typical pedon of Coly silt loam from an area of Coly-Uly silt loams, 6 to 11 percent slopes, eroded, 1,550 feet north and 530 feet east of the southwest corner of sec. 19. T. 5 N., R. 13 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

C—5 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable; common films and threads of accumulations of calcium carbonate; strong effervescence; moderately alkaline.

Thickness of the solum ranges from 4 to 10 inches. The thickness of the A horizon ranges from 3 to 6 inches. Typically, free carbonates are at the surface but range to a depth of 8 inches.

The A horizon has value of 5 through 7 (3 or 4 moist) and chroma of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (4 through 6 moist), and chroma of 2 or 3.

The Coly soil that occurs as part of the map units Coly-Kenesaw silt loams, 0 to 3 percent slopes, and Kenesaw-Coly silt loams, 1 to 3 percent slopes, contains less clay than is definitive for the series. This difference, however, does not significantly affect the use or behavior of the soil.

Detroit Series

The Detroit series consists of deep, moderately well drained, slowly permeable soils on uplands. The soils formed in loess. Slope ranges from 0 to 1 percent.

Detroit soils are commonly adjacent to Butler, Fillmore, Holdrege, Hord, Massie, and Scott soils. Butler soils are somewhat poorly drained and lower in the landscape. Fillmore soils are in shallow depressions and are poorly drained. Hord soils contain less clay in the subsoil and are in similar landscape positions. Holdrege soils are commonly slightly higher in the landscape. They have less clay in the subsoil and have a mollic epipedon less than 20 inches thick. Massie and Scott soils are very poorly drained and are in depressions.

Typical pedon of Detroit silt loam, 0 to 1 percent slopes, 500 feet west and 100 feet south of northeast corner, sec. 20, T. 6 N., R. 15 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, friable; slightly acid; abrupt smooth boundary.

A—6 to 16 inches; very dark grayish brown (10YR 3/2) silt loam; very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

BA—16 to 25 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm; neutral; gradual smooth boundary.

Bt1—25 to 33 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; very hard, firm; neutral; thin clay films on faces of peds; gradual smooth boundary.

Bt2—33 to 38 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; strong medium subangular blocky structure; very hard, firm; neutral; thin clay films on faces of peds; gradual smooth boundary.

BC—38 to 54 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm; few very fine masses of lime; neutral; gradual smooth boundary.

C—54 to 60 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; slight effervescence; mildly alkaline.

The thickness of the solum ranges from 31 to 60 inches. The mollic epipedon ranges from 20 to 50 inches in thickness and commonly includes most of the Bt horizon. Depth to free carbonates ranges from 39 to 50 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 or less. It is silt loam or silty clay loam. It is slightly acid or neutral. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is silty clay loam or silty clay. It is neutral. The C horizon has hue of 10YR or 2.5Y, value of 4 through 6 (3 through 5 moist), and chroma of 2 or 3. It is silt loam and mildly alkaline. Some pedons have distinct mottles below a depth of 40 inches.

Els Series

The Els series consists of deep, somewhat poorly drained, rapidly permeable soils formed in eolian sands in enclosed valleys or swales in the sandhills. Slope ranges from 0 to 3 percent.

Els soils are commonly adjacent to Libory, Tryon, and Valentine soils. Libory soils are moderately well drained and have silty underlying materials. They are higher than Els soils in the landscape. Tryon soils are poorly drained and occur lower in the landscape. Valentine soils are above Els in the landscape and are excessively drained.

Typical pedon of Els loamy fine sand in an area of Valentine-Els loamy fine sands, 0 to 9 percent slopes, 200 feet west and 300 feet south of the northeast corner of sec. 5, T. 7 N., R. 15 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; neutral; gradual smooth boundary.

AC—6 to 10 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure crushes to single grain; soft, loose; neutral; gradual smooth boundary.

C1—10 to 29 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; few distinct faint yellowish brown (10YR 5/6 moist) mottles; single grain; loose; neutral; gradual smooth boundary.

C2—29 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; common medium distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; mildly alkaline.

Thickness of the solum ranges from 10 to 14 inches. Reaction is neutral or mildly alkaline.

The A horizon has value of 4 (3 moist) and chroma of 2. The AC horizon has value of 5 (4 moist) and chroma of 2. It is loamy fine sand or fine sand. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. Few to common yellowish brown (10YR 5/6 moist) to strong brown (7.5YR 5/6 moist) mottles are present.

Fillmore Series

The Fillmore series consists of deep, poorly drained, very slowly permeable soils in depressions on loess uplands. Slope ranges from 0 to 1 percent.

Fillmore soils are commonly adjacent to Butler, Detroit, Holdrege, Massie, and Scott soils. Butler soils are somewhat poorly drained. They are at slightly higher elevations on broad flat areas. Detroit and Holdrege soils have less clay in the subsoil. Detroit soils are moderately well drained, and Holdrege soils are well drained. These soils are higher in the landscape. Massie and Scott soils are very poorly drained. They are in the lowest parts of depressions and remain ponded longer than the Fillmore soils.

Typical pedon of Fillmore silt loam, 0 to 1 percent slopes, 60 feet east and 2,300 feet south of the northwest corner, sec. 4, T. 5 N., R. 15 W.

Ap1—0 to 6 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable; slightly acid; abrupt smooth boundary.

Ap2—6 to 12 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak thin platy structure parting to weak medium granular; slightly hard, very friable; slightly acid; abrupt smooth boundary.

Bt1—12 to 23 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; strong medium angular blocky structure; very hard, firm; neutral; clear smooth boundary.

Bt2—23 to 35 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; strong medium subangular blocky structure; very hard, firm; neutral; clear wavy boundary.

BC—35 to 44 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable; slight effervescence; mildly alkaline; gradual wavy boundary.

C—44 to 60 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; soft rounded calcium carbonate accumulations; violent effervescence; moderately alkaline.

Thickness of the solum ranges from 36 to more than 60 inches. The mollic epipedon commonly extends into the Bt horizon. Depth to carbonates ranges from 36 to more than 60 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1. It is dominantly silt loam, but includes silty clay loam. It is slightly acid or medium acid. An E horizon is present in some pedons. The Bt horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 or 2. It is silty clay and ranges from 40 to 55 percent clay. Reaction is neutral or mildly alkaline. The C horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2. Reaction is mildly alkaline or moderately alkaline.

Gibbon Series

The Gibbon series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. The soils formed in calcareous alluvium. Slope ranges from 0 to 1 percent.

In Kearney County, these soils are taxadjuncts to the series because they do not have the mottles or low chroma immediately below the mollic epipedon that are definitive for the Gibbon series. This difference, however, does not alter the usefulness or behavior of the soil.

Gibbon soils are commonly adjacent to Alda, Inavale, Lex, Platte, and Wann soils on Platte River Valley bottom lands. Alda soils contain less clay in the subsoil and have coarse sand within a depth of 20 to 40 inches. Inavale soils are sandy throughout and are excessively drained. Lex soils have coarse sand or gravelly sand between depths of 20 and 40 inches. Platte soils have coarse sand and gravel at a depth of 10 to 20 inches. Wann soils contain less clay and silt in the subsoil. These soils are on similar landscapes.

Typical pedon of Gibbon loam, 0 to 1 percent slopes, 3,400 feet north and 1,350 feet west of southeast corner of sec. 23, T. 8 N., R. 15 W.

Ap—0 to 10 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

AC—10 to 14 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, friable; violent effervescence; moderately alkaline; clear smooth boundary.

Ck—14 to 33 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; few fine distinct dark yellowish brown (10YR 4/4 moist) mottles; weak coarse prismatic structure; hard, friable; common fine concretions of calcium carbonate;

violent effervescence; moderately alkaline; clear wavy boundary.

C1—33 to 37 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; few fine faint yellowish brown (10YR 5/4 moist) mottles; massive; hard, friable; slight effervescence; moderately alkaline; gradual smooth boundary.

C2—37 to 50 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; few medium distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; hard, friable; mildly alkaline; abrupt smooth boundary.

2C—50 to 60 inches; white (2.5Y 8/2) sand; light brownish gray (2.5Y 6/2) moist; many medium, prominent yellowish brown (10YR 5/8) mottles; single grain; loose; neutral.

Thickness of the solum ranges from 12 to 16 inches. Thickness of the mollic epipedon ranges from 7 to 12 inches. Free carbonates are typically at the surface.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. Reaction is mildly alkaline or moderately alkaline. Texture is dominantly loam, but ranges to silt loam and silty clay loam. The AC horizon has value of 5 or 6 and chroma of 1 or 2. Texture is loam or silt loam. The C horizon has hue of 10YR or 2.5Y, value of 6 through 8 (4 through 6 moist), and chroma of 2. Most pedons have few to many, distinct mottles with hue of 7.5YR through 10YR, value of 5, and chroma of 4 through 6 moist. Reaction is mildly or moderately alkaline. Texture is silt loam, silty clay loam, or fine sandy loam.

Gothenburg Series

The Gothenburg series consists of poorly drained or somewhat poorly drained soils on bottom lands. The soils are very shallow over coarse sand and gravelly coarse sand. Permeability is rapid over very rapid. The soils formed in alluvium over coarse sand or gravelly coarse sand. Slope ranges from 0 to 2 percent.

Gothenburg soils are next to the river and slightly lower in the landscape than the adjacent Inavale, Platte, and Wann soils. Inavale soils do not have the gravelly coarse sand or coarse sand and are somewhat excessively drained. Platte soils have a thicker A horizon and are deeper over sand and gravel. Wann soils contain more clay throughout and are deep over coarse sand and gravel.

Typical pedon of Gothenburg loamy sand, 0 to 2 percent slopes, 1,000 feet north and 2,300 feet west of the southeast corner of sec. 16, T. 8 N., R. 16 W.

A—0 to 3 inches; grayish brown (10YR 5/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear wavy boundary.

2C1—3 to 8 inches; light brownish gray (10YR 6/2) coarse sand, grayish brown (10YR 5/2) moist; single grain; loose; 3 percent gravel by volume; neutral; abrupt wavy boundary.

2C2—8 to 60 inches; light gray (10YR 7/2) gravelly coarse sand, pale brown (10YR 6/3) moist; common medium prominent strong brown (7.5YR 5/6 moist) mottles; single grain; loose; many coarse gravel, 30 percent by volume; neutral.

The thickness of the solum corresponds to the thickness of the A horizon. It is 2 or 3 inches.

The A horizon has value of 4 or 5 (3 moist). It is dominantly loamy sand, but contains loam, fine sandy loam, and sandy loam. The depth to the 2C horizon is typically about 3 inches, but ranges from 2 to 3 inches. Texture is coarse sand or gravelly coarse sand.

Hersh Series

The Hersh series consists of deep, well drained, moderately rapidly permeable soils on uplands. The soils formed in wind-deposited and -reworked loamy material. Slope ranges from 0 to 11 percent.

Hersh soils are commonly adjacent to Coly, Kenesaw, Libory, Rusco, and Valentine soils in the landscape. Coly and Kenesaw soils are siltier throughout. In addition, Kenesaw soils have a mollic epipedon and occur lower in the landscape. Libory soils are moderately well drained, have sand over loess, and occur lower in the landscape. Rusco soils are moderately well drained, occur in shallow basins and swales, and contain more clay throughout. Valentine soils have more sand throughout and are on nearly level to rolling sandhills.

Typical pedon of Hersh fine sandy loam, 3 to 6 percent slopes, 2,000 feet north and 2,550 feet east of southwest corner of sec. 36, T. 8 N., R. 13 W.

Ap—0 to 7 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

AC—7 to 11 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable; slightly acid; clear wavy boundary.

C—11 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; very friable; neutral.

Thickness of the solum ranges from 6 to 18 inches. Depth to free carbonates is typically more than 60 inches.

The A horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is dominantly fine sandy loam, but ranges to very fine sandy loam or loamy fine sand. Reaction is slightly acid or neutral. The AC horizon has value of 6 (4 or 5 moist) and chroma of 2 or 3. The C horizon has value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. Reaction is neutral or mildly alkaline.

Hobbs Series

The Hobbs series consists of deep, well drained, moderately permeable soils on bottoms along major creeks and in some drainageways in the uplands. The soils formed in alluvial material derived mostly from soils on loess-mantled uplands. Slope ranges from 0 to 3 percent.

Hobbs soils are commonly adjacent to Coly, Holdrege, Hord, and Uly soils. These soils are on uplands. Coly soils have a thinner dark surface layer and commonly have free carbonates near the surface. Holdrege, Hord, and Uly soils have a mollic epipedon and are higher in the landscape. These soils are not stratified.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes, 900 feet west and 1,000 feet north of the southeast corner of sec. 4, T. 6 N., R. 13 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, very friable; neutral; abrupt smooth boundary.

C1—6 to 9 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; massive with common bedding planes; slightly hard, friable; neutral; clear smooth boundary.

C2—9 to 27 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive with common bedding planes; hard, friable; neutral; clear smooth boundary.

C3—27 to 34 inches; light brownish gray (10YR 6/2) silt loam with grayish brown (10YR 5/2) materials in wormcasts and old root channels; dark grayish brown (10YR 4/2) moist; massive with common bedding planes; slightly hard, friable; neutral; gradual smooth boundary.

C4—34 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; neutral.

With depth, there is an irregular decrease in organic matter content. Stratification of color and texture is commonly present throughout the pedon.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. Reaction is neutral or mildly alkaline. The C horizon has value of 4 through 7 (3 through 6 moist) and chroma of 1 through 3. It has strata of higher or lower values. Reaction is neutral to mildly alkaline. Fine strata of sandy or clayey materials are in some pedons.

Holdrege Series

The Holdrege series consists of deep, well drained, moderately permeable soils on uplands. The soils formed in silty, calcareous loess. Slope ranges from 0 to 6 percent.

Holdrege soils are commonly adjacent to Butler, Detroit, Fillmore, Hord, Kenesaw, Massie, and Scott soils. Butler soils are somewhat poorly drained, have more clay in the subsoil, and are lower in the landscape. Detroit soils are commonly at slightly lower elevations, have a mollic epipedon more than 20 inches thick, and have more clay in the subsoil. Fillmore soils occur in shallow areas of depressions. They are poorly drained. Hobbs soils are on bottom lands and are stratified throughout. Hord and Kenesaw soils do not have an argillic horizon, and Kenesaw soils contain less clay throughout. Hord soils have a mollic epipedon more than 20 inches thick. These soils are lower in the landscape than Holdrege soils. Massie and Scott soils have more clay in the subsoil, are in the bottoms of depressions, and are very poorly drained.

Typical pedon of Holdrege silt loam, 0 to 1 percent slopes, 1,900 feet west and 1,950 feet north of southeast corner of sec. 23, T. 6 N., R. 15 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; hard, friable; neutral; abrupt smooth boundary.

A—5 to 13 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to moderate fine granular; hard, friable; neutral; clear smooth boundary.

Bt1—13 to 18 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, friable; neutral; clear smooth boundary.

Bt2—18 to 25 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to strong, medium and fine subangular blocky structure; hard, firm; shiny ped faces; neutral; gradual wavy boundary.

BC—25 to 31 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; moderate medium and fine subangular blocky structure; hard, friable; neutral; gradual wavy boundary.

C—31 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; hard, friable; a few fine iron stains and gray mottles (not associated with present water table); slight effervescence; mildly alkaline.

Thickness of the solum ranges from 20 to 38 inches, and the depth to free carbonates ranges from 24 to 38 inches. Thickness of the mollic epipedon ranges from 8 to 20 inches. It commonly includes the upper part of the Bt horizon. An overblown phase is recognized.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. It is dominantly silt loam, but ranges to silty clay loam. Reaction is medium acid through neutral. The Bt horizon has value of 4 through 7 (3 through 5 moist) and chroma of 2 or 3. It is silty clay loam and averages between 28 and 35 percent clay. Reaction is neutral or mildly alkaline. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 to 4.

In map unit HoC2, the solum is less than 20 inches thick, but this difference does not alter the usefulness or behavior of the soil.

Hord Series

The Hord series consists of deep, well drained, moderately permeable soils on uplands. The soils formed in loess. Slope ranges from 0 to 1 percent.

Hord soils are commonly adjacent to Butler, Detroit, Hobbs, and Holdrege soils. Butler soils are somewhat poorly drained, are on low flats or in shallow depressions, and contain more clay in the subsoil. Detroit soils contain more clay in the subsoil and occur on similar landscapes. Hobbs soils are stratified and occur on bottom lands. Holdrege soils have a more developed subsoil and occur above the Hord soils in the landscape.

Typical pedon of Hord silt loam, 0 to 1 percent slopes, 110 feet west and 1,100 feet south of the northeast corner of sec. 23, T. 5 N., R. 13 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; slightly hard; friable; slightly acid; abrupt smooth boundary.

A—7 to 13 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

Bw1—13 to 21 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

Bw2—21 to 28 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable; neutral; clear wavy boundary.

BC—28 to 36 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak fine subangular structure; hard, friable; neutral; clear wavy boundary.

C1—36 to 43 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; mildly alkaline; clear wavy boundary.

C2—43 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; strong effervescence; fine soft rounded calcium carbonate accumulations; moderately alkaline.

Thickness of the solum ranges from 24 to 40 inches. Thickness of the mollic epipedon ranges from 20 to 30 inches. Depth to free carbonates ranges from 40 to 46 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly silt loam, but includes very fine sandy loam and silty clay loam. Reaction is slightly acid or neutral. The Bw horizon has value of 4 or 5 (2 through 4 moist) and chroma of 2. It is silt loam or silty clay loam. Reaction is neutral or mildly alkaline. The BC horizon has value of 6 or 7 (5 moist) and chroma of 2. It is silt loam or silty clay loam. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3. It is dominantly silt loam but includes silty clay loam. Reaction is mildly alkaline or moderately alkaline.

Inavale Series

The Inavale series consists of deep, somewhat excessively drained, rapidly permeable soils on bottom lands. The soils formed in alluvium. Slope ranges from 0 to 3 percent.

Inavale soils are adjacent to Alda, Boel, Lex, and Wann soils in the Platte River Valley and the Coly, Hersh, and Valentine soils on Sand Creek. Alda and Lex soils contain more clay in the upper part of the control section, have gravelly sand between depths of 20 and 40 inches, and are somewhat poorly drained. Boel soils are somewhat poorly drained. Wann soils have a mollic epipedon, have more clay in the control section, and are somewhat poorly drained. Coly, Hersh, and Valentine soils are on steeper side slopes. Coly and Hersh soils contain more clay in the control section. Valentine soils are not stratified.

Typical pedon of Inavale loamy fine sand, 0 to 3 percent slopes, 2,150 feet east and 3,000 feet south of the northwest corner of sec. 10, T. 6 N., R. 13 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose; neutral; clear smooth boundary.

AC—5 to 10 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose; neutral; clear wavy boundary.

C1—10 to 22 inches; pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; single grain; loose; thin strata of sandy loam and loam material; mildly alkaline; abrupt wavy boundary.

C2—22 to 25 inches; brown (10YR 5/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose; thin strata of sandy loam and loam material; mildly alkaline; abrupt wavy boundary.

C3—25 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose; mildly alkaline.

Thickness of the solum ranges from 8 to 13 inches. Typically, there are no carbonates above a depth of 60 inches.

The A horizon has value of 4 or 5 (3 through 5 moist) and chroma of 2. Reaction is neutral or mildly alkaline. The AC and C horizons have value of 5 through 7 (4 through 6 moist) and chroma of 2 or 3. The control section commonly is loamy fine sand in the upper part and loamy sand, fine sand, or sand in the lower part. It typically is stratified with finer textures.

Kenesaw Series

The Kenesaw series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slope ranges from 0 to 3 percent.

Kenesaw soils are adjacent to Coly, Hersh, Holdrege, Libory, and Rusco soils. Coly and Hersh soils do not have a mollic epipedon. Hersh soils contain more sand throughout. They occur higher in the landscape than Kenesaw soils. Holdrege soils have more clay in the subsoil and are higher than Kenesaw soils in the landscape. Libory soils are sandy in the upper part and silty in the lower part. They are slightly higher in the landscape. They are moderately well drained. Rusco soils are moderately well drained and have more clay in the subsoil. They occur in swales and shallow basins.

Typical pedon of Kenesaw silt loam, 0 to 1 percent slopes, 100 feet north and 2,200 feet west of the southeast corner of sec. 16, T. 7 N., R. 14 W.

Ap—0 to 8 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.

Bw—8 to 14 inches; pale brown (10YR 6/3) silt loam; brown (10YR 5/3) moist; moderate coarse prismatic structure parting to moderate, fine subangular blocky; slightly hard, very friable; neutral; abrupt smooth boundary.

BC—14 to 22 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; few fine distinct yellowish brown (10YR 5/6 moist) mottles (not related to present water table); moderate coarse prismatic structure; slightly hard, very friable; neutral; gradual smooth boundary.

C—22 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common fine distinct yellowish brown (10YR 5/6 moist) mottles (not related to present water table); weak coarse prismatic structure; slightly hard, very friable; slight effervescence; mildly alkaline.

Thickness of the solum ranges from 12 to 25 inches. Depth to carbonates ranges from 15 to 36 inches.

The A horizon has value of 4 or 5 (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. It is typically silt loam ranging to loam. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 or 5 moist), and chroma of 2 or 3.

Lex Series

The Lex series consists of somewhat poorly drained soils on bottom lands. The soils are moderately deep over coarse sand and gravelly sand. Permeability is moderate or moderately slow over very rapid. Slope ranges from 0 to 1 percent.

In Kearney County, these soils are taxadjuncts to the series because they do not have the mottles or low chroma immediately below the mollic epipedon that are definitive for the Lex series. This difference, however, does not alter the usefulness or behavior of the soil.

Lex soils are similar to Alda soils and commonly adjacent to Alda, Boel, Gibbon, Platte, and Wann soils. Alda soils have less clay in the upper material. Boel soils are deep and contain more sand throughout. Gibbon soils contain more clay throughout. These soils are on similar landscapes. Platte soils are at slightly lower elevations, and the depth over sand and gravelly sand is less than 20 inches. Wann soils are deeper over coarse sand, contain less clay in the upper part of the control section, and are on similar landscapes.

Typical pedon of Lex loam, 0 to 1 percent slopes, 1,650 feet south and 2,425 feet west of northeast corner of sec. 25, T. 8 N., R. 15 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

A—7 to 11 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; moderate medium and fine subangular blocky structure; hard, friable; slight effervescence; moderately alkaline; clear smooth boundary.

AC—11 to 13 inches; light gray (2.5Y 7/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; hard, friable; slight effervescence; mildly alkaline; clear smooth boundary.

C1—13 to 17 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; few fine distinct strong brown (7.5YR 5/6 moist) mottles; massive; hard, friable; mildly alkaline; clear wavy boundary.

C2—17 to 24 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; few fine faint yellowish brown (10YR 5/4 moist) mottles;

massive; hard, friable; mildly alkaline; abrupt wavy boundary.

2C3—24 to 30 inches; light gray (2.5Y 7/2) fine sand, grayish brown (2.5Y 5/2) moist; common medium distinct yellowish brown (10YR 5/4 moist) mottles; single grain; loose; mildly alkaline; abrupt smooth boundary.

2C4—30 to 60 inches; very pale brown (10YR 7/3) coarse sand, pale brown (10YR 6/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 12 to 17 inches. Thickness of the mollic epipedon is 10 to 12 inches. Depth to sand or gravelly sand ranges from 20 to 33 inches.

The A horizon has value of 4 or 5 (3 moist) and chroma of 1 or 2. Mottles with value of 6 or 7 (4 or 5 moist) are in the lower part of some pedons. The A horizon is loam or silt loam and typically calcareous at the surface. Reaction is mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y or 10YR, value of 5 through 7 (4 or 5 moist), and chroma of 2 or 3 and has common mottles. It is loam, fine sandy loam, or silt loam. Reaction is mildly alkaline or moderately alkaline. The 2C horizon is stratified fine sand, coarse sand, or gravelly sand.

Libory Series

The Libory series consists of deep, moderately well drained soils on uplands and stream terraces. Permeability is rapid over moderate. The upper part of the profile formed in eolian sands, and the lower part formed in loess, alluvium, or a combination of both. Slope ranges from 0 to 3 percent.

Libory soils are adjacent to Els, Hersh, Kenesaw, Rusco, and Tryon soils. Els soils are somewhat poorly drained, are sandy throughout, and occur lower in the landscape. Kenesaw soils are silty throughout, are well drained, and occur above Libory soils. Hersh soils are well drained and are fine sandy loam throughout. They occur above Libory soils. Rusco soils have more clay in the subsoil, are moderately well drained, and occur in slight depressions. Tryon soils are at lower elevations and are poorly drained.

Typical pedon of Libory loamy fine sand, 0 to 3 percent slopes, 2,550 feet north and 65 feet west of the southeast corner of sec. 7, T. 7 N., R. 16 W.

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

A—10 to 16 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

C1—16 to 24 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; single grain; loose; neutral; abrupt smooth boundary.

2C2—24 to 60 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; common medium prominent yellowish brown (10YR 5/6 moist) mottles; massive; slightly hard, friable; strong effervescence; mildly alkaline.

The mollic epipedon ranges from 10 to 14 inches thick.

The A horizon has value of 3 through 5 (2 through 4 moist) and chroma of 1 through 3. It typically is loamy fine sand, ranging to fine sand. The C horizon typically is loamy fine sand, ranging to fine sand and loamy sand. It has value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. Depth to the 2C horizon ranges from 20 to 30 inches. The 2C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 2 or 3. It is typically silt loam, ranging to very fine sandy loam. Reaction is neutral or mildly alkaline.

Massie Series

The Massie series consists of deep, very poorly drained, very slowly permeable soils that formed in alluvium derived from loess. The soils are in the lowest parts of upland depressions and are usually ponded during the growing season. Slope ranges from 0 to 1 percent.

Massie soils are commonly adjacent to Butler, Detroit, Fillmore, Holdrege, and Scott soils. Butler soils are somewhat poorly drained and are slightly higher in the landscape on flats or in shallow parts of depressions. Detroit soils are moderately well drained. Holdrege soils are well drained and are higher than Massie soils in the landscape. Fillmore soils are in shallow parts of depressions and are poorly drained. Scott soils have a thinner solum and are ponded for shorter durations than Massie soils.

Typical pedon of Massie silty clay loam, 0 to 1 percent slopes, 50 feet morth and 900 feet west of the southeast corner, sec. 3, T. 5 N., R. 15 W.

A1—0 to 3 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate medium granular structure; hard, friable; medium acid; clear smooth boundary.

A2—3 to 7 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine platy structure parting to moderate medium granular; hard, friable; slightly acid; abrupt wavy boundary.

E—7 to 10 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; weak fine platy structure parting to weak medium granular; slightly hard, very friable; slightly acid; abrupt wavy boundary.

Bt1—10 to 18 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; few fine distinct yellowish brown (10YR 5/6 moist) mottles; moderate medium prismatic structure parting to strong medium subangular blocky; hard, firm; few fine root channels commonly containing partially decayed roots; neutral; clear wavy boundary.

Bt2—18 to 30 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; common medium and fine distinct gray (10YR 5/1 moist) mottles; moderate fine platy structure parting to strong medium granular; hard, friable; few coarse old root channels; neutral; clear wavy boundary.

Bt3—30 to 54 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; strong medium prismatic structure parting to strong coarse angular blocky; very hard, very firm; shiny surfaces on faces of peds; neutral; gradual wavy boundary.

BC—54 to 65 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; strong medium angular blocky structure; very hard, very firm; shiny surfaces on faces of peds; neutral.

Thickness of the solum ranges from 53 to more than 65 inches. Depth to free carbonates is more than 65 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1. It is silty clay loam. It is slightly acid through strongly acid. The E horizon has value of 5 or 6 (4 moist) and chroma of 1. Brown and dark brown mottles are in some pedons. It is slightly acid or medium acid. The Bt horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. Medium and fine yellowish brown and brown mottles are common. Texture is silty clay or silty clay loam ranging from 35 to 55 percent clay . It is medium acid through neutral. The BC horizon has value of 5 (3 or 4 moist) and chroma of 1 or 2. It is silty clay loam or silty clay. It is slightly acid or neutral.

Platte Series

The Platte series consists of somewhat poorly drained soils on bottom lands. The soils are shallow over coarse sand or gravelly coarse sand. Permeability is moderate over very rapid. They formed in loamy alluvium over coarse sand or gravelly coarse sand. Slope ranges from 0 to 1 percent.

Platte soils are commonly adjacent to Alda, Boel, Gothenburg, Lex, and Wann soils. Alda soils are moderately deep over sand and gravelly sand and are slightly higher in the landscape. Boel soils are sandy throughout and are higher in the landscape. Gothenburg soils are very shallow over sand and gravelly coarse sand and are lower in elevation. Lex soils are moderately deep over sand and gravel. They are slightly higher in the landscape. Wann soils contain more clay throughout and are slightly higher in the landscape.

Typical pedon of Platte loam, 0 to 1 percent slopes, 4,700 feet north and 100 feet east of the southwest corner of sec. 24, T. 8 N., R. 15 W.

A—0 to 6 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, friable; violent effervescence; mildly alkaline; clear smooth boundary.

C1—6 to 12 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; few fine distinct yellowish brown (10YR 5/6 moist) mottles; moderate fine subangular blocky structure; slightly hard, friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

2C2—12 to 18 inches; white (10YR 8/2) coarse sand, light gray (10YR 7/2) moist; common medium distinct yellowish brown (10YR 5/6 moist) mottles; single grain; loose; mildly alkaline; abrupt smooth boundary.

2C3—18 to 60 inches; light gray (10YR 7/2) gravelly coarse sand, light brownish gray (10YR 6/2) moist; single grain; loose; estimated 30 percent by volume gravel; mildly alkaline.

Depth to coarse sand or gravelly coarse sand ranges from 10 to 20 inches. Thickness of the solum corresponds to the thickness of the A horizon and ranges from 5 to 12 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is typically loam, but includes fine sandy loam. The C horizon has hue of 2.5Y or 10YR, value of 6 through 8 (4 through 6 moist), and chroma of 1 through 3. It is typically loam, but includes very fine sandy loam and loamy sand. The A and C horizons are dominantly calcareous, and reaction ranges from mildly alkaline to moderately alkaline. The 2C horizon is commonly stratified and ranges from coarse sand to gravelly coarse sand.

Rusco Series

The Rusco series consists of deep, moderately well drained, moderately slowly permeable soils in shallow basins and swales on uplands. These soils formed in recently deposited loess. Slope ranges from 0 to 1 percent.

Rusco soils are commonly adjacent to Coly, Hersh, Kenesaw, Libory, and Tryon soils. These soils have less clay in the upper part than Rusco soils. Coly, Hersh, and Kenesaw soils are well drained. Coly, Hersh, Kenesaw, and Libory soils are at slightly higher elevations. Libory soils have a sandy surface layer. Tryon soils are poorly drained and at lower elevations.

Typical pedon of Rusco silt loam, 0 to 1 percent slopes, 75 feet south and 1,700 feet east of the northwest corner of sec. 26, T. 7 N., R. 14 W.

Ap1—0 to 5 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky fragments; friable, slightly sticky; slightly acid; abrupt smooth boundary.

Ap2—5 to 9 inches; gray (10YR 5/1) silty clay loam; very dark gray (10YR 3/1) moist; moderate medium angular blocky fragments; friable; slightly sticky; neutral; abrupt smooth boundary.

Bt1—9 to 12 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; sticky and plastic; clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—12 to 26 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common medium faint olive brown (2.5Y 4/4 moist) and few fine distinct dark yellowish brown (10YR 4/4 moist) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; friable, sticky and plastic; clay films on faces of peds; neutral; gradual wavy boundary.

BC—26 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common medium faint olive brown (2.5Y 4/4 moist) mottles; weak medium subangular blocky structure; friable; slightly sticky; clay films; neutral; gradual wavy boundary.

C—30 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common medium distinct light olive brown (2.5Y 5/4 moist) and few medium prominent strong brown (7.5YR 5/6 moist) mottles; massive; friable; slightly plastic; mildly alkaline.

The thickness of the solum ranges from 19 to 38 inches. The mollic epipedon ranges from 7 to 18 inches in thickness. The depth to free carbonates ranges from 30 inches to more than 60 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. Reaction is slightly acid or neutral. It typically is silt loam and silty clay loam. The Bt horizon has value of 4 through 6 (3 through 5 moist) and chroma of 1 through 3. The darker colors occur in the upper part. Most pedons have mottles in the lower part. The C horizon has hue of 10YR or 2.5Y, value of 5 through 7 (4 through 6 moist), and chroma of 1 through 3.

Scott Series

The Scott series consists of deep, very poorly drained, very slowly permeable soils in depressions on loess uplands. Slope ranges from 0 to 1 percent.

Scott soils are commonly adjacent to Butler, Detroit, Fillmore, Holdrege, and Massie soils. Butler soils have a thicker A horizon and are somewhat poorly drained. They are in shallower depressions or in shallower parts of a depression and are ponded for shorter periods. Detroit and Holdrege soils are on uplands around the depressions. They do not have E horizons and are better drained. Fillmore soils are poorly drained and occur higher than Scott soils in the landscape. Massie soils are in the lowest areas of depressions and are ponded for longer periods. They have a thicker solum.

Typical pedon of Scott silt loam, 0 to 1 percent slopes, 1,100 feet north and 150 feet west of the southeast corner of sec. 16, T. 5 N., R. 16 W.

A—0 to 4 inches; dark gray (10YR 4/1) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

E—4 to 6 inches; gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; weak medium platy structure parting to weak fine platy; hard, friable; slightly acid; abrupt smooth boundary.

Bt1—6 to 9 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium and fine angular blocky structure; very hard, firm; shiny surfaces on some peds; tops of peds are coated with material from the E horizon; neutral; clear smooth boundary.

Bt2—9 to 20 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, very firm; neutral; gradual wavy boundary.

Bt3—20 to 36 inches; dark gray (10YR 4/1) clay, very dark brown (10YR 2/2) moist; moderate medium angular blocky structure; very hard, very firm; slightly acid; gradual wavy boundary.

BC—36 to 48 inches; gray (10YR 5/1) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm; neutral; gradual wavy boundary.

C—48 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; slight effervescence; neutral.

Thickness of the solum ranges from 34 to 56 inches. Depth to free carbonates ranges from 34 to more than 60 inches. Many pedons do not have an albic horizon because of mixing by tillage. These soils, when dry, have cracks 2 to 3 inches wide and up to 15 to 20 inches deep.

The A horizon has value of 4 or 5 (2 moist) and chroma of 1 or 2. It is commonly silt loam, but some areas are silty clay loam. It is slightly acid to neutral. The E horizon has value of 5 (4 moist) and chroma of 1. The Bt horizon is silty clay or clay. It has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The BC horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. The C horizon has value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. It is neutral or mildly alkaline.

Simeon Series

The Simeon series consists of deep, excessively drained, rapidly permeable soils on stream terraces. The soils formed in sandy and loamy alluvium. Slope ranges from 0 to 3 percent.

Simeon soils are commonly adjacent to Alda, Boel, Valentine, and Wann soils. Alda soils have a mollic epipedon, are moderately deep over sand and gravel, and are in lower positions in the landscape. Boel soils are somewhat poorly drained, have a mollic epipedon, and are lower in the landscape. Valentine soils are less than 35 percent medium sand and less than 10 percent coarse or very coarse sand and occur higher than Simeon soils in the landscape. Wann soils are somewhat poorly drained, are calcareous, have more clay in the control section, and occur in the lower part of the landscape.

Typical pedon of Simeon sandy loam, 0 to 3 percent slopes, 230 feet north and 1,800 feet west of the southeast corner of sec. 30, T. 8 N., R. 14 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; about 3 percent gravel; slightly acid; abrupt smooth boundary.

AC—6 to 12 inches; brown (10YR 5/3) sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose; about 5 percent gravel; slightly acid; gradual wavy boundary.

C—12 to 60 inches; very pale brown (10YR 7/3) coarse sand, pale brown (10YR 6/3) moist; single grain; loose; about 5 percent gravel; neutral.

Thickness of the solum ranges from 7 to 20 inches. Reaction ranges from slightly acid to neutral throughout the profile. There are no free carbonates in the profile.

The A horizon has value of 3 through 6 (2 through 5 moist) and chroma of 1 or 2. The C horizon has value of 6 through 8 (5 through 7 moist) and chroma of 2 to 4. It ranges from sand to coarse sand with 2 to 15 percent gravel.

Tryon Series

The Tryon series consists of deep, poorly drained, rapidly permeable soils formed in wind- and water-transported sediments. These soils are in valleys and along streams in the sandhills. Slope ranges from 0 to 1 percent.

Tryon soils are commonly adjacent to Els, Libory, Rusco, and Valentine soils. Els soils are somewhat poorly drained and occur above Tryon soils in the landscape. Libory and Rusco soils are slightly higher in elevation, are moderately well drained, and have more clay. Valentine soils are higher in the landscape and are excessively drained.

Typical pedon of Tryon loamy fine sand, 0 to 1 percent slopes, 100 feet west and 700 feet north of the southeast corner of sec. 34, T. 8 N., R. 16 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; few fine distinct yellowish brown (10YR 5/6 moist) mottles; weak fine granular structure; soft, very friable; mildly alkaline; clear smooth boundary.

C1—4 to 7 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; few fine distinct dark brown (7.5YR 4/4 moist) mottles; single grain; soft, very friable; mildly alkaline; clear smooth boundary.

C2—7 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 4/3) moist; common fine prominent yellowish red (5YR 4/6 moist) mottles; single grain; loose; mildly alkaline.

Thickness of the solum ranges from 3 to 5 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The AC horizon, where present, has hue of 2.5Y or 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 2. The C horizon has hue of 2.5Y or 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 1 through 3.

Uly Series

The Uly series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. The soils formed in loess. Slope ranges from 6 to 20 percent.

Uly soils are commonly adjacent to Coly, Hobbs, and Holdrege soils. Coly soils are on steeper slopes or narrow ridgetops. They do not have a mollic epipedon. Hobbs soils are stratified and are on occasionally and frequently flooded bottoms of upland drainageways. Holdrege soils have more clay in the subsoil and are nearly level to gently sloping.

Typical pedon of Uly silt loam in an area of Uly-Coly silt loams, 11 to 20 percent slopes, 1,850 feet east and 750 feet north of the southwest corner of sec. 22, T. 5 N., R. 14 W.

A—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

Bw1—9 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

Bw2—14 to 21 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

BC—21 to 27 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, friable; slight effervescence; neutral; gradual smooth boundary.
C—27 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; few films and threads of calcium carbonates; strong effervescence; mildly alkaline.

Thickness of the solum ranges from 20 to 35 inches. Thickness of the mollic epipedon ranges from 8 to 16 inches. Depth to free calcium carbonates ranges from 20 to 35 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 2. Reaction is neutral or mildly alkaline. The Bw horizon has value of 4 through 7 (3 through 6 moist) and chroma of 2 or 3. The upper part of the Bw horizon commonly has mollic colors. Reaction is neutral or mildly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 2. In places, carbonates are visible in threads, in coatings on ped faces, or in soft rounded accumulations.

Valentine Series

The Valentine series consists of deep, excessively drained, rapidly permeable soils on uplands. The soils formed in eolian sand. Slope ranges from 0 to 17 percent.

Valentine soils are commonly adjacent to Els, Hersh, Inavale, Simeon, and Tryon soils. Els soils are somewhat poorly drained and occur in swales and valleys. Hersh soils contain more silt and clay throughout. Inavale soils are stratified and occur on bottom lands. Simeon soils contain more medium and coarse sand and gravel and occur lower than the Valentine soils on stream terraces. Tryon soils are poorly drained and occur in valleys or along streams.

Typical pedon of Valentine loamy fine sand, rolling, 2,850 feet east and 300 feet north of the southwest corner of sec. 5, T. 7 N., R. 14 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; very friable, very soft; neutral; clear smooth boundary.
AC—5 to 8 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 4/3) moist; weak coarse prismatic structure; loose; neutral; clear smooth boundary.
C—8 to 60 inches; light yellowish brown (10YR 6/4) fine sand, yellowish brown (10YR 5/4) moist; single grain; loose; neutral.

Thickness of the solum ranges from 5 to 17 inches. The thickness of the surface layer ranges from 3 to 9 inches.

The A horizon has value of 4 through 6 (3 through 5 moist) and chroma of 2. Reaction ranges from medium acid through neutral. Some areas have profiles that do not have an AC horizon. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 through 4, dry or moist. Texture is dominantly fine sand, but is loamy fine sand in some areas.

Wann Series

The Wann series consists of deep, somewhat poorly drained, moderately rapidly permeable soils on bottom lands. The soils formed in alluvium. Slope ranges from 0 to 1 percent.

Wann soils are similar to Alda soils and are commonly adjacent to Alda, Boel, Gothenburg, Lex, and Platte soils. Alda soils have coarse sand between depths of 20 and 40 inches. Boel soils are sandier throughout. Alda and Boel soils are on similar landscapes. Gothenburg soils have coarse sand and gravelly coarse sand at a depth less than 10 inches. They are lower in the landscape. Lex soils have coarse sand between depths of 20 and 40 inches, have more clay in the upper part of the control section, and are on similar landscapes. Platte soils have coarse sand and gravelly coarse sand between depths of 10 and 20 inches. They are lower in the landscape.

Typical pedon of Wann fine sandy loam, 0 to 1 percent slopes, 450 feet south and 1,100 feet east of the northwest corner of sec. 17, T. 8 N., R. 13 W.

Ap—0 to 9 inches; grayish brown (10YR 5/2) fine sandy loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.
AC—9 to 14 inches; grayish brown (10YR 5/2) fine sandy loam; very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine granular; slightly hard, very friable; violent effervescence; mildly alkaline; clear smooth boundary.
C1—14 to 33 inches; light brownish gray (10YR 6/2) fine sandy loam; dark grayish brown (10YR 4/2) moist; common fine distinct brown (7.5YR 5/4 moist) mottles; massive; slightly hard, very friable; violent effervescence; moderately alkaline; clear smooth boundary.
C2—33 to 42 inches; light gray (10YR 7/1) fine sandy loam, grayish brown (2.5Y 5/2) moist; common fine distinct brown (7.5YR 5/4 moist) mottles; massive; hard, friable; common soft masses of calcium carbonate; violent effervescence; moderately alkaline; clear smooth boundary.
C3—42 to 48 inches; light gray (2.5Y 7/2) loam; grayish brown (2.5Y 5/2) moist; common fine distinct brown (7.5YR 5/4 moist) mottles; massive; slightly hard,

very friable; carbonates visible in soft rounded accumulations; strong effervescence; mildly alkaline; abrupt smooth boundary.

2C4—48 to 60 inches; light gray (2.5Y 7/2) coarse sand, light brownish gray (2.5Y 6/2) moist; common fine distinct yellowish brown (10YR 5/4 moist) mottles; single grain; loose; slight effervescence; mildly alkaline.

Thickness of the solum ranges from 10 to 20 inches and is the same as the thickness of the mollic epipedon. Depth to free carbonates ranges from the surface to 10 inches. Reaction is mildly or moderately alkaline.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The AC horizon has value of 5 or 6 (3 or 4 moist) and chroma of 2 or 3. Some pedons do not have an AC horizon. The C horizon has value of 5 through 7 (4 through 6 moist) and chroma of 1 or 2. It is fine sandy loam or loam. Coarse sand or gravelly coarse sand is common at a depth below 48 inches.

Formation of the Soils

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geological activity. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the *parent material*, (2) the *climate* under which the soil material has accumulated and existed since accumulation, (3) the *plant and animal life* on and in the soil, (4) the *relief* or lay of the land, and (5) the length of *time* the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and in extreme cases determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be long or short, but some time is always required for differentiation of soil horizons. Usually a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent Material

Parent material is the unconsolidated mineral material in which a soil forms. It affects the chemical and mineralogical composition of the soil. In Kearney County, the soils formed in loess, eolian deposits, and alluvium.

Loess, or wind-deposited silt, is the parent material of all of the soils in the county except those in the stream valleys and the Platte River Valley. Most of this material is Peoria Loess, a friable, massive, light gray or pale brown, calcareous silt loam. It contains a few lime concretions. Detroit, Holdrege, Uly, and Coly soils formed in this material. In the northern part of the county there is a mantle of Bignell Loess. This mantle is several feet thick immediately south of the sandhills area, but thins rapidly to the south. Bignell Loess is also light gray silt loam, but contains more very fine sand than does Peoria Loess. Material of the Loveland Formation is reddish brown and silty and is assumed to be of loessial origin. It underlies the Peoria Loess and is observed as small outcrops on roadcuts or along the base of side slopes of drainageways in the map unit Coly-Uly silt loams, 11 to 20 percent slopes, eroded. This material is exposed in drainageways in the southeastern part of the county adjoining Franklin and Adams County.

Eolian material is wind deposited. The largest area of eolian material is south of and bordering the terraces of the Platte River Valley. This material consists of loose fine sandy loam and loamy fine sand. It ranges from a few feet to several feet thick over the underlying loess. Eolian sand occurs as undulating topography. Soils formed in this material are moderately low in organic matter content and natural fertility. Hersh and Valentine soils formed in this material.

Alluvium is a heterogeneous mixture of soil material that was deposited by water. It is on flood plains of present streams. Except in the Platte River Valley, the alluvium consists of materials washed from the loess-mantled uplands. Hobbs soils formed in this material. The alluvium along the Platte River includes sand and gravel from outside the area. Soils formed in this material are the Alda, Boel, Lex, Platte, and Gothenburg soils.

Climate

Climate influences the formation of soils both directly and indirectly. It affects the weathering and reworking of parent material through rainfall, temperature, and wind. It affects the soils indirectly through the amount and kind of vegetation and animal life sustained.

In Kearney County, the average annual precipitation is about 24 inches. Water movement has been sufficient to leach free lime from the surface layer into the subsoil and, in some of the soils, into the upper part of the underlying material. In a few soils, water has also moved clay particles from the surface layer downward into the subsoil. This is especially evident in depressional areas where ponding has increased the water movement into and through the soil and a claypan type of subsoil has formed. Where slopes are steep, however, erosion has prevented the development of a thick surface layer. On low bottom lands, soil characteristics are influenced by excessive runoff of precipitation or snowmelt from higher ground, which results in flooding and deposition of sediment.

Temperature changes influence soil formation. Hot weather in the summer and abundant soil moisture speeds chemical weathering. Alternate wetting, freezing, thawing, and drying aids in the development of granular structure in the surface layer.

Northwest winds have influenced the distribution of both eolian material and loess. In winter, snow accumulates on southeast-facing slopes, resulting in additional moisture. This, in turn, causes deeper leaching and an added amount of organic matter from the increase in plant growth. Wind also causes soil blowing, resulting in thinner surface layers.

Plants and Animals

Plants and animals on and in the soil are active in forming the soils in Kearney County.

Prairie grasses provided the organic matter that has accumulated in the soils of Kearney County. This organic matter darkened the surface layer and parts of the subsoil. The largest amount of organic matter is generally near the surface. The amount generally decreases gradually with depth. The Holdrege soils, for example, have a fairly large amount of organic matter in the surface layer. They are dark grayish brown to a depth of 14 inches. Beneath this the color grades from grayish brown to pale brown and light gray as the organic matter content decreases.

In contrast to the Holdrege soils are the Fillmore and Scott soils that formed in depressions. The additional moisture helps produce more of the tall grasses and, consequently, more organic matter. As a result, soils on moist sites have rich organic layers that are thicker and darker than soils on upland areas where the water moves off the soil more rapidly.

Animals help to mix the darkened organic layers with the mineral-rich material below. Rodent burrows filled with soil material of a contrasting color are evidence of animal activity in the soil. Worms and burrowing insects also mix the soil material, improve granulation, and increase the availability of plant nutrients.

Micro-organisms are an important factor in soil development. They aid in the decomposition of organic matter into nutrients that can be used by growing plants. Some bacteria perform specific processes, such as utilizing nitrogen gas from the atmosphere or transforming ammonium nitrogen into nitrate nitrogen.

Human civilization is a major influence in soil formation. It has an immediate effect on both the rate and the direction of the process. Management of soils for increased production and the introduction of drainage, irrigation, and soil-conserving practices have changed the soil-water-erosion relationship that existed for several thousand years. Removing the grass cover exposes the fertile surface layers to erosion. Drainage increases chemical activity and weathering in the poorly drained soils. Irrigation and summer fallow practices increase the moisture supply in the soil, and this results in increased chemical weathering and greater water movement through the soil. Soil conservation practices are efforts to reestablish equilibrium through resource management systems.

Relief

Relief, or lay of the land, is an important factor in the formation of the soils in Kearney County.

Steepness, shape, length, and direction of slope affect the runoff, erosion, and the amount of moisture available for soil development. For example, moderately steep and steep Coly soils have a thin surface layer. This is the result of the combined effects of excessive runoff, erosion, insufficient moisture for vegetation to produce a large amount of organic matter, and insufficient moisture for soil development processes to develop the subsoil layers.

On nearly level to gently sloping areas, water tends to infiltrate into the soil instead of running off, and a moderately thick to thick surface layer develops. Holdrege and Detroit soils formed in such areas. The increased soil moisture has stimulated development in the subsoil of these soils by leaching carbonates and clay particles out of the surface layer and into a lower horizon.

The shape of the slope is often important in soil development. The upper part of steep slopes is commonly convex. Water is shed rapidly, and only a limited amount enters the soil. Soils that have a thin surface layer and no subsoil development, such as the Coly soils, formed in these areas. Where the slopes are plane or concave, a thicker surface layer and subsoil formed.

Shape of slope has also affected soil formation on nearly level areas in Kearney County. Depressions on the uplands receive additional moisture from surrounding areas. This additional moisture has contributed to the development of an E horizon (leached layer) directly above a claypan type subsoil. Fillmore, Scott, and Massie soils formed in these depressions.

On bottom lands the water table is closest to the surface where the relative elevation is lowest. Where the soil profile is saturated, many physical and chemical reactions are altered. Downward movement of water is restricted. Anaerobic activity becomes dominant because there is insufficient oxygen for bacteria to grow, and these soils tend to be colder than soils with aerobic conditions.

Bottom lands, because of their relatively low position, commonly receive additional sediment from flooding. This usually prevents normal soil development because each period of flooding and deposition provides new soil parent material and starts another cycle of soil development. An example of this is in the stratified Hobbs soil.

Time

Once a land surface is reasonably stabilized, several thousand years is required for the development of a mature soil. Less well developed soils form in a few decades or centuries. Mature soils commonly have a dark surface layer, a clay-enriched subsoil, and a horizon where calcium carbonate has accumulated. Soils such as Holdrege, Detroit, and Butler soils are considered mature soils in Kearney County. They are approaching an equilibrium with their environment.

Some soils in Kearney County are kept immature by deposition of soil material, erosion, or insufficient moisture for soil development to progress very rapidly. Soils on bottom lands that are frequently subjected to flooding and deposition of soil materials have little time for uninterrupted soil development and are considered young. Some Coly soils are on steep slopes where runoff is rapid. This limits the amount of moisture available for soil development and erodes the surface layer nearly as fast as development occurs. Coly soils formed in material that is the same age as the material in which Holdrege soils 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.

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—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 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.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

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-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 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 constructing terraces, diversions, and other water-control measures 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.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—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.

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 soil material over bedrock. In this soil survey, the classes of soil depth are (1) *deep,* more than 40 inches; (2) *moderately deep,* 20 to 40 inches; (3) *shallow,* 10 to 20 inches; and (4) *very shallow,* 0 to 10 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.

Dryfarming. Production of crops that require some tillage in a subhumid or semiarid region, without irrigation. May involve use of periods of fallow, during which time enough moisture accumulates in the soil to allow production of a cultivated crop.

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 the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excessive silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excessive water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

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.

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, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

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.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

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.

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 of mineral soil 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, a plowed surface horizon, most of which was originally part of another horizon.

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) 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, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

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 capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

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—

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.

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.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mollic epipedon. A thick, dark surface layer that is high in organic matter and saturated with bases. It is one of six diagnostic surface horizons, or epipedons, used in the classification of soils. The mollic epipedon has good tilth (structure) and in warm climates is moist 3 months or more of most years. Most soils that have a mollic epipedon developed under prairie vegetation and are fertile.

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 the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, 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. Plant and animal residue in the soil in various stages of decomposition.

Organic matter, soil. The organic part of the soil. It includes plant and animal residues at various stages of decomposition, cells and tissues of soil organisms, and other organic substances synthesized in the soil. It is commonly considered as those organic materials that accompany the soil material when it is put through a 2-millimeter sieve. In this soil survey, the ratings for organic matter content are *moderate,* 2.0 to 4.0 percent; *moderately low,* 1.0 to 2.0 percent; *low,* 0.5 to 1.0 percent; and *very low,* less than 0.5 percent.

Parent material. The unconsolidated organic and mineral material in which soil forms.

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.

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.

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.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

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.

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 degree of acidity or alkalinity is expressed as—

	pH
Moderately 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.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

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.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, the soils are described in terms that indicate their range in slope gradient—

Nearly level	0 to 1 percent or 0 to 2 percent
Nearly level to very gently sloping	0 to 3 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 6 percent
Gently sloping and strongly sloping	3 to 9 percent
Strongly sloping	6 to 11 percent
Moderately steep	9 to 20 percent
Steep	more than 20 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into 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 of separates recognized in the United States are as follows:

	Millimeters
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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

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 soil. The A, E, AB, and EB horizons. 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."

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.

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.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Based on data recorded in the period 1951-79 at Minden, Nebraska]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
	°F	°F	°F	°F	°F		In	In	In		In
January----	34.4	12.1	23.3	64	-15	0	0.38	0.09	0.61	2	5.4
February---	42.0	18.2	30.1	74	-10	17	.75	.16	1.21	2	5.3
March------	50.3	25.6	38.0	83	-3	43	1.57	.37	2.52	4	6.5
April------	64.3	37.9	51.1	88	17	113	2.16	.96	3.17	5	1.0
May--------	74.2	49.0	61.6	94	28	367	3.81	1.42	5.79	7	.0
June-------	84.4	58.9	71.7	102	40	651	4.49	1.58	6.90	7	.0
July-------	89.6	64.3	77.0	104	50	837	3.15	1.59	4.50	6	.0
August-----	87.9	62.3	75.1	102	48	778	3.03	.95	4.71	5	.0
September--	79.1	52.4	65.8	98	32	474	2.60	.87	4.02	5	.0
October----	68.6	40.8	54.7	90	21	193	1.28	.29	2.05	3	.1
November---	50.8	26.4	38.6	75	3	0	.63	---	1.13	2	1.9
December---	39.6	17.4	28.5	68	-11	0	.48	.09	.78	2	4.4
Year-----	63.8	38.8	51.3	104	-16	3,473	24.33	18.14	30.08	50	24.6

* 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° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Based on data recorded in the period 1951-79 at Minden, 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--	April 23	May 4	May 17
2 years in 10 later than--	April 18	April 29	May 12
5 years in 10 later than--	April 8	April 19	May 3
First freezing temperature in fall:			
1 year in 10 earlier than--	October 15	October 5	September 23
2 years in 10 earlier than--	October 20	October 10	September 28
5 years in 10 earlier than--	October 29	October 20	October 8

TABLE 3.--GROWING SEASON

[Based on data recorded in the period 1951-79 at Minden, Nebraska]

Probability	Length of growing season if daily minimum temperature is-- Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	182	163	137
8 years in 10	190	170	144
5 years in 10	204	183	158
2 years in 10	217	197	172
1 year in 10	225	204	179

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ad	Alda loam, 0 to 1 percent slopes	7,540	2.3
Bo	Boel fine sandy loam, 0 to 1 percent slopes	2,930	0.9
Bu	Butler silt loam, 0 to 1 percent slopes	12,580	3.8
CaC	Coly silt loam, 3 to 6 percent slopes	8,850	2.7
CaD	Coly silt loam, 6 to 11 percent slopes	1,640	0.5
CaF	Coly silt loam, 11 to 20 percent slopes	1,960	0.6
CkB	Coly-Kenesaw silt loams, 0 to 3 percent slopes	25,870	7.9
CoD2	Coly-Uly silt loams, 6 to 11 percent slopes, eroded	3,940	1.2
CoF2	Coly-Uly silt loams, 11 to 20 percent slopes, eroded	560	0.2
De	Detroit silt loam, 0 to 1 percent slopes	21,340	6.5
Fm	Fillmore silt loam, 0 to 1 percent slopes	1,100	0.3
Gb	Gibbon loam, 0 to 1 percent slopes	1,030	0.3
Gc	Gibbon loam, saline, 0 to 1 percent slopes	990	0.3
Go	Gothenburg loamy sand, 0 to 2 percent slopes	1,590	0.5
HeB	Hersh fine sandy loam, 0 to 3 percent slopes	2,460	0.8
HeC	Hersh fine sandy loam, 3 to 6 percent slopes	2,490	0.8
HeD	Hersh fine sandy loam, 6 to 11 percent slopes	950	0.3
Hf	Hobbs silt loam, 0 to 2 percent slopes	1,640	0.5
HgB	Hobbs silt loam, channeled	1,150	0.4
Ho	Holdrege silt loam, 0 to 1 percent slopes	80,530	24.6
HoB	Holdrege silt loam, 1 to 3 percent slopes	21,410	6.5
HoC	Holdrege silt loam, 3 to 6 percent slopes	800	0.2
HoC2	Holdrege silt loam, 3 to 6 percent slopes, eroded	4,460	1.4
Hp	Holdrege silt loam, overblown, 0 to 1 percent slopes	11,030	3.4
HpB	Holdrege silt loam, overblown, 1 to 3 percent slopes	890	0.3
Hr	Hord silt loam, 0 to 1 percent slopes	3,930	1.2
InB	Inavale loamy fine sand, 0 to 3 percent slopes	2,060	0.6
Ke	Kenesaw silt loam, 0 to 1 percent slopes	28,670	8.7
KgB	Kenesaw-Coly silt loams, 1 to 3 percent slopes	3,610	1.1
Lf	Lex loam, 0 to 1 percent slopes	1,080	0.3
Lg	Lex loam, saline, 0 to 1 percent slopes	360	0.1
LoB	Libory loamy fine sand, 0 to 3 percent slopes	3,280	1.0
Ma	Massie silty clay loam, 0 to 1 percent slopes	980	0.3
Pg	Pits, sand and gravel	100	*
Pm	Platte loam, 0 to 1 percent slopes	1,970	0.6
Ru	Rusco silt loam, 0 to 1 percent slopes	1,640	0.5
Sc	Scott silt loam, 0 to 1 percent slopes	2,070	0.6
SmB	Simeon sandy loam, 0 to 3 percent slopes	9,180	2.8
To	Tryon loamy fine sand, 0 to 1 percent slopes	990	0.3
UcF	Uly-Coly silt loams, 11 to 20 percent slopes	2,290	0.7
UF	Ustorthents, steep	200	0.1
VaB	Valentine loamy fine sand, 0 to 3 percent slopes	4,690	1.4
VaD	Valentine loamy fine sand, 3 to 9 percent slopes	9,460	2.9
VaF	Valentine loamy fine sand, rolling	18,540	5.7
VbD	Valentine-Els loamy fine sands, 0 to 9 percent slopes	6,840	2.1
Wa	Wann fine sandy loam, 0 to 1 percent slopes	5,640	1.7
	Water areas smaller than 40 acres	370	0.1
	Total	327,680	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 parenthesis]

Map symbol	Soil name
Bu	Butler silt loam, 0 to 1 percent slopes (where drained)
CkB	Coly-Kenesaw silt loams, 0 to 3 percent slopes
De	Detroit silt loam, 0 to 1 percent slopes
Gb	Gibbon loam, 0 to 1 percent slopes (where drained)
HeB	Hersh fine sandy loam, 0 to 3 percent slopes
HeC	Hersh fine sandy loam, 3 to 6 percent slopes
Hf	Hobbs silt loam, 0 to 2 percent slopes
Ho	Holdrege silt loam, 0 to 1 percent slopes
HoB	Holdrege silt loam, 1 to 3 percent slopes
HoC	Holdrege silt loam, 3 to 6 percent slopes
HoC2	Holdrege silt loam, 3 to 6 percent slopes, eroded
Hp	Holdrege silt loam, overblown, 0 to 1 percent slopes
HpB	Holdrege silt loam, overblown, 1 to 3 percent slopes
Hr	Hord silt loam, 0 to 1 percent slopes
Ke	Kenesaw silt loam, 0 to 1 percent slopes
KgB	Kenesaw-Coly silt loams, 1 to 3 percent slopes
Lf	Lex loam, 0 to 1 percent slopes (where drained)
Ru	Rusco silt loam, 0 to 1 percent slopes
Wa	Wann fine sandy loam, 0 to 1 percent slopes

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

[N columns are for nonirrigated soils; 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		Winter wheat	Grain sorghum		Alfalfa hay	
	N	I	N	I	N	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Ton	Ton
Ad------------------ Alda	IIIw	IIIw	60	125	30	65	110	3.0	5.0
Bo------------------ Boel	IIIw	IIIw	35	110	23	40	90	2.8	4.0
Bu------------------ Butler	IIw	IIw	45	135	34	62	110	2.4	5.0
CaC----------------- Coly	IIIe	IIIe	27	110	27	30	95	1.7	5.0
CaD----------------- Coly	IVe	IVe	25	90	25	27	90	1.3	3.5
CaF----------------- Coly	VIe	---	---	---	---	---	---	---	---
CkB----------------- Coly-Kenesaw	IIe	IIe	39	130	38	50	115	3.0	5.8
CoD2---------------- Coly-Uly	IVe	IVe	18	---	24	25	80	1.5	3.0
CoF2---------------- Coly-Uly	VIe	---	---	---	---	---	---	---	---
De------------------ Detroit	IIc	I	52	150	45	65	125	3.0	6.0
Fm------------------ Fillmore	IIIw	IIIw	40	100	22	50	110	1.8	---
Gb------------------ Gibbon	IIw	IIw	70	135	32	70	115	3.5	5.8
Gc------------------ Gibbon	IVs	IIIs	35	90	20	40	90	1.9	3.5
Go------------------ Gothenburg	VIIs	---	---	---	---	---	---	---	---
HeB----------------- Hersh	IIIe	IIe	35	120	25	37	95	1.8	5.0

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability		Corn		Winter wheat	Grain sorghum		Alfalfa hay	
	N	I	N	I	N	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Ton	Ton
HeC------------------ Hersh	IIIe	IIIe	31	120	23	33	85	1.5	4.2
HeD------------------ Hersh	IVe	IVe	26	90	18	20	75	1.0	3.5
Hf------------------- Hobbs	IIw	IIw	68	140	40	72	120	4.0	6.0
HgB------------------ Hobbs	VIw	---	---	---	---	---	---	---	---
Ho------------------- Holdrege	IIc	I	50	150	45	55	125	2.6	6.5
HoB------------------ Holdrege	IIe	IIe	42	140	42	50	120	2.4	6.2
HoC------------------ Holdrege	IIIe	IIIe	32	120	35	45	100	2.3	5.4
HoC2----------------- Holdrege	IIIe	IIIe	27	110	28	35	95	1.7	5.2
Hp------------------- Holdrege	IIc	I	55	150	45	55	125	2.6	6.5
HpB------------------ Holdrege	IIe	IIe	42	140	42	50	120	2.4	6.2
Hr------------------- Hord	IIc	I	55	150	43	65	125	3.0	6.5
InB------------------ Inavale	IVe	IIIe	25	100	19	30	80	1.5	5.0
Ke------------------- Kenesaw	IIc	I	50	135	45	55	120	2.3	6.1
KgB------------------ Kenesaw-Coly	IIe	IIe	45	140	37	50	120	2.3	6.0
Lf------------------- Lex	IIIw	IIIw	70	130	35	77	115	3.5	5.5
Lg------------------- Lex	IVs	IIIs	30	90	20	40	85	1.9	3.5

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability		Corn		Winter wheat	Grain sorghum		Alfalfa hay	
	N	I	N	I	N	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Ton	Ton
LoB------------------ Libory	IIIe	IIIe	45	120	25	45	115	3.0	5.0
Ma------------------- Massie	VIIIw	---	---	---	---	---	---	---	---
Pg------------------- Pits	VIIIs	---	---	---	---	---	---	---	---
Pm------------------- Platte	IVw	IVw	40	85	---	45	85	2.0	2.9
Ru------------------- Rusco	IIw	IIw	45	135	30	60	110	3.2	5.0
Sc------------------- Scott	IVw	---	---	---	15	30	---	---	---
SmB------------------ Simeon	VIs	IVs	---	90	---	---	90	---	3.0
To------------------- Tryon	Vw	---	---	---	---	---	---	---	---
UcF------------------ Uly-Coly	VIe	---	---	---	---	---	---	---	---
UF------------------- Ustorthents	VIIs	---	---	---	---	---	---	---	---
VaB------------------ Valentine	IVe	IVe	25	110	19	30	95	0.8	3.6
VaD------------------ Valentine	VIe	IVe	---	100	---	---	---	---	3.0
VaF------------------ Valentine	VIe	---	---	---	---	---	---	---	---
VbD------------------ Valentine-Els	VIe	IVe	---	110	---	---	---	---	3.4
Wa------------------- Wann	IIw	IIw	70	140	30	70	110	3.5	5.8

TABLE 7.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Ad: Alda	Subirrigated	5,200	4,900	4,600
Bo: Boel	Subirrigated	5,200	4,900	4,600
Bu: Butler	Clayey	3,800	3,400	3,000
CaC, CaD, CaF: Coly	Limy Upland	3,300	3,000	2,700
CkB*:				
Coly	Limy Upland	3,300	3,000	2,700
Kenesaw	Silty	4,000	3,600	3,300
CoD2*, CoF2*:				
Coly	Limy Upland	3,300	3,000	2,700
Uly	Silty	3,300	2,700	2,200
De: Detroit	Silty Lowland	4,500	4,200	3,800
Fm: Fillmore	Clayey Overflow	3,500	3,100	2,700
Gb: Gibbon	Subirrigated	5,500	5,300	5,000
Gc: Gibbon	Saline Subirrigated	4,000	3,800	3,500
HeB, HeC, HeD: Hersh	Sandy	3,300	3,000	2,600
Hf, HgB: Hobbs	Silty Overflow	3,300	3,000	2,800
Ho, HoB, HoC, HoC2, Hp, HpB: Holdrege	Silty	4,000	3,600	3,300
Hr: Hord	Silty Lowland	4,000	3,600	3,300
InB: Inavale	Sandy Lowland	3,500	3,200	3,000
Ke: Kenesaw	Silty	4,000	3,600	3,300
KgB*:				
Kenesaw	Silty	4.000	3,600	3,300
Coly	Limy Upland	3,300	3,000	2,700
Lf: Lex	Subirrigated	5,200	4,900	4,600
Lg: Lex	Saline Subirrigated	3,800	3,400	3,000

See footnote at end of table.

TABLE 7.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
LoB------------------------ Libory	Sandy Lowland---------------------------	3,700	3,400	3,200
Pm------------------------ Platte	Subirrigated----------------------------	5,000	4,600	4,200
Ru------------------------ Rusco	Silty Overflow--------------------------	3,300	3,000	2,800
SmB----------------------- Simeon	Shallow to Gravel-----------------------	1,700	1,300	1,000
To------------------------ Tryon	Wet Subirrigated------------------------	5,800	5,500	5,300
UcF*:				
Uly----------------------	Silty-----------------------------------	3,300	2,700	2,200
Coly---------------------	Limy Upland-----------------------------	3,300	3,000	2,700
VaB----------------------- Valentine	Sandy-----------------------------------	3,300	3,000	2,600
VaD, VaF------------------ Valentine	Sands-----------------------------------	3,200	2,900	2,600
VbD*:				
Valentine----------------	Sands-----------------------------------	3,200	2,900	2,600
Els----------------------	Subirrigated----------------------------	5,500	5,300	5,000
Wa------------------------ Wann	Subirrigated----------------------------	5,200	4,900	4,600

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--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 heights in feet, of--				
	<8	8-15	16-25	26-35	>35
Ad----------------- Alda	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar, Austrian pine, Russian mulberry, hackberry, green ash, Manchurian crabapple.	Honeylocust, golden willow.	Eastern cottonwood.
Bo----------------- Boel	Redosier dogwood, American plum.	Common chokecherry	Hackberry, green ash, Austrian pine, Russian mulberry, eastern redcedar, Manchurian crabapple.	Honeylocust, golden willow.	Eastern cottonwood.
Bu----------------- Butler	Lilac--------------	Siberian peashrub, Amur honeysuckle.	Eastern redcedar, ponderosa pine, hackberry, blue spruce.	Golden willow, green ash, honeylocust, silver maple.	Eastern cottonwood.
CaC, CaD, CaF----- Coly	Silver buffaloberry, fragrant sumac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian-olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
CkB*:					
Coly--------------	Silver buffaloberry, fragrant sumac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian-olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
Kenesaw-----------	Fragrant sumac, Amur honeysuckle, lilac.	Russian mulberry	Eastern redcedar, green ash, honeylocust, hackberry, Russian-olive, bur oak, Austrian pine.	Siberian elm------	---
CoD2*, CoF2*:					
Coly--------------	Silver buffaloberry, fragrant sumac, Siberian peashrub, Tatarian honeysuckle.	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 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights in feet, of--				
	<8	8-15	16-25	26-35	>35
De----------------- Detroit	American plum-----	Amur honeysuckle, lilac.	Eastern redcedar, Austrian pine, Russian-olive, ponderosa pine, green ash, Russian mulberry, hackberry.	Siberian elm, honeylocust.	---
Fm----------------- Fillmore	Redosier dogwood, American plum.	Common chokecherry	Eastern redcedar, green ash, hackberry, Russian mulberry, Austrian pine.	Golden willow, silver maple, honeylocust.	Eastern cottonwood.
Gb----------------- Gibbon	Redosier dogwood	Common chokecherry, American plum.	Eastern redcedar, hackberry, Russian mulberry, Manchurian crabapple.	Green ash, honeylocust, golden willow, Austrian pine.	Eastern cottonwood.
Gc----------------- Gibbon	Tatarian honeysuckle, lilac, silver buffaloberry.	Eastern redcedar, Russian-olive, Rocky Mountain juniper, Siberian peashrub.	Green ash, Siberian elm, golden willow.	---	Eastern cottonwood.
Go. Gothenburg					
HeB, HeC, HeD------ Hersh	Lilac, American plum.	Common chokecherry	Eastern redcedar, honeylocust, hackberry, ponderosa pine, green ash, Russian mulberry, Scotch pine, Austrian pine.	Siberian elm------	---
Hf----------------- Hobbs	---	American plum, Peking cotoneaster, lilac, Amur honeysuckle.	Eastern redcedar, Russian-olive.	Green ash, hackberry, Austrian pine, honeylocust, bur oak.	Eastern cottonwood.
HgB. Hobbs					
Ho, HoB, HoC, HoC2, Hp, HpB---- Holdrege	Lilac, Amur honeysuckle, fragrant sumac.	Russian mulberry	Eastern redcedar, Austrian pine, green ash, honeylocust, hackberry, bur oak, Russian-olive.	Siberian elm------	---
Hr----------------- Hord	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Ponderosa pine, hackberry, blue spruce, bur oak, Russian-olive, Russian mulberry.	Green ash, honeylocust.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights in feet, of--				
	<8	8-15	16-25	26-35	>35
InB: Inavale	Lilac, American plum.	Common chokecherry	Eastern redcedar, Austrian pine, Scotch pine, Russian mulberry, green ash, honeylocust, hackberry, ponderosa pine.	Siberian elm	---
Ke: Kenesaw	Fragrant sumac, Amur honeysuckle, lilac.	Russian mulberry	Eastern redcedar, green ash, honeylocust, hackberry, Russian-olive, bur oak, Austrian pine.	Siberian elm	---
KgB*:					
Kenesaw	Fragrant sumac, Amur honeysuckle, lilac.	Russian mulberry	Eastern redcedar, green ash, honeylocust, hackberry, Russian-olive, bur oak, Austrian pine.	Siberian elm	---
Coly	Silver buffaloberry, fragrant sumac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian-olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
Lf: Lex	Fragrant sumac, American plum.	Common chokecherry	Eastern redcedar, Austrian pine, green ash, Russian mulberry, hackberry, Manchurian crabapple.	Honeylocust, golden willow.	Eastern cottonwood.
Lg: Lex	Lilac, silver buffaloberry, Tatarian honeysuckle.	Eastern redcedar, Russian-olive, Rocky Mountain juniper, Siberian peashrub.	Golden willow, green ash, Siberian elm.	---	Eastern cottonwood.
LoB: Libory	Tatarian honeysuckle, lilac, skunkbush sumac.	Russian-olive, Manchurian crabapple, Siberian peashrub.	Ponderosa pine, green ash, honeylocust, hackberry, eastern redcedar.	Siberian elm	---
Ma. Massie					
Pg*. Pits					
Pm: Platte	Redosier dogwood, American plum.	Common chokecherry	Hackberry, green ash, Austrian pine, Russian-olive, eastern redcedar, Manchurian crabapple.	Honeylocust, golden willow.	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights in feet, of--				
	<8	8-15	16-25	26-35	>35
Ru. Rusco	American plum	Amur honeysuckle, lilac.	Green ash, Austrian pine, ponderosa pine, eastern redcedar, Russian mulberry, Russian-olive.	Honeylocust, hackberry.	Eastern cottonwood.
Sc. Scott					
SmB. Simeon					
To. Tryon	Redosier dogwood	---	---	Golden willow	Eastern cottonwood.
UcF*:					
Uly	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Bur oak, hackberry, eastern redcedar, green ash, Russian-olive, honeylocust, Austrian pine.	Siberian elm	---
Coly	Silver buffaloberry, fragrant sumac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian-olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
UF. Ustorthents					
VaB. Valentine	Lilac, Tatarian honeysuckle, skunkbush sumac.	Russian-olive, Manchurian crabapple, Siberian peashrub.	Hackberry, ponderosa pine, green ash, honeylocust, eastern redcedar.	Siberian elm	---
VaD, VaF. Valentine	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
VbD*:					
Valentine	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
Els	Lilac	Tatarian honeysuckle, common chokecherry, Siberian peashrub.	Eastern redcedar, green ash, hackberry, ponderosa pine.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
Wa. Wann	American plum, fragrant sumac.	Common chokecherry.	Eastern redcedar, Austrian pine, hackberry, green ash, Russian mulberry, Manchurian crabapple.	Honeylocust, golden willow.	Eastern cottonwood.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--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	Golf fairways
Ad-------------------- Alda	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight------------	Slight.
Bo-------------------- Boel	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Bu-------------------- Butler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CaC------------------- Coly	Slight----------	Slight----------	Moderate: slope.	Severe: erodes easily.	Slight.
CaD------------------- Coly	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CaF------------------- Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
CkB*:					
Coly-----------------	Slight----------	Slight----------	Slight----------	Severe: erodes easily.	Slight.
Kenesaw--------------	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
CoD2*:					
Coly-----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Uly------------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
CoF2*:					
Coly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Uly------------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
De-------------------- Detroit	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
Fm-------------------- Fillmore	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
Gb-------------------- Gibbon	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Gc-------------------- Gibbon	Severe: flooding, excess salt.	Severe: excess salt.	Severe: excess salt.	Moderate: wetness.	Severe: excess salt.
Go-------------------- Gothenburg	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, droughty, flooding.
HeB------------------- Hersh	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
HeC------------------- Hersh	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HeD: Hersh	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Hf: Hobbs	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
HgB: Hobbs	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Ho: Holdrege	Slight	Slight	Slight	Slight	Slight.
HoB, HoC, HoC2: Holdrege	Slight	Slight	Moderate: slope.	Slight	Slight.
Hp: Holdrege	Slight	Slight	Slight	Slight	Slight.
HpB: Holdrege	Slight	Slight	Moderate: slope.	Slight	Slight.
Hr: Hord	Slight	Slight	Slight	Slight	Slight.
InB: Inavale	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
Ke: Kenesaw	Slight	Slight	Slight	Slight	Slight.
KgB*:					
Kenesaw	Slight	Slight	Moderate: slope.	Slight	Slight.
Coly	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Lf: Lex	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Lg: Lex	Severe: flooding, excess salt.	Severe: excess salt.	Severe: excess salt.	Moderate: wetness.	Severe: excess salt.
LoB: Libory	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Ma: Massie	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
Pg*. Pits					
Pm: Platte	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty, flooding.
Ru: Rusco	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sc: Scott	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SmB------------------- Simeon	Slight----------	Slight----------	Slight----------	Slight------------	Moderate: droughty.
To-------------------- Tryon	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
UcF*:					
Uly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Coly----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
UF. Ustorthents					
VaB------------------- Valentine	Slight----------	Slight----------	Slight----------	Slight------------	Moderate: droughty.
VaD------------------- Valentine	Slight----------	Slight----------	Severe: slope.	Slight------------	Moderate: droughty.
VaF------------------- Valentine	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: droughty, slope.
VbD*:					
Valentine-----------	Slight----------	Slight----------	Severe: slope.	Slight------------	Moderate: droughty.
Els-----------------	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Wa-------------------- Wann	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--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
Ad----------------- Alda	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Good.
Bo----------------- Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Good.
Bu----------------- Butler	Good	Good	Good	Fair	Good	Good	Fair	Fair	Good	---	Fair	Good.
CaC, CaD----------- Coly	Fair	Good	Good	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
CaF---------------- Coly	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
CkB*:												
Coly---------------	Fair	Good	Good	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Kenesaw------------	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
CoD2*:												
Coly---------------	Fair	Good	Good	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Uly----------------	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
CoF2*:												
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.
De----------------- Detroit	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
Fm----------------- Fillmore	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Good	Fair.
Gb----------------- Gibbon	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Gc----------------- Gibbon	Poor	Poor	Poor	Good	Fair	Poor	Fair	Fair	Poor	Fair	Fair	Poor.
Go----------------- Gothenburg	Very poor.	Very poor.	Fair	Poor	Fair	Fair	Fair	Good	Poor	Poor	Fair	Fair.
HeB, HeC, HeD------ Hersh	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Hf----------------- Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
HgB---------------- Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Ho, HoB------------ Holdrege	Good	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.

See footnote at end of table.

TABLE 10.--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
HoC, HoC2 Holdrege	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Hp, HpB Holdrege	Good	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
Hr Hord	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
InB Inavale	Fair	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Ke Kenesaw	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
KgB*:												
Kenesaw	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Coly	Fair	Good	Good	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.	Fair.
Lf Lex	Fair	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Fair	Fair	Good.
Lg Lex	Poor	Poor	Poor	Good	Fair	Poor	Fair	Fair	Poor	Fair	Fair	Poor.
LoB Libory	Fair	Fair	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
Ma Massie	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good	Very poor.
Pg*. Pits												
Pm Platte	Fair	Good	Fair	Poor	Fair	Good	Fair	Good	Fair	Fair	Good	Fair.
Ru Rusco	Good	Good	Poor	Good	Good	Good	Good	Good	Good	Good	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.
To Tryon	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	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.
UF. Ustorthents												
VaB Valentine	Fair	Good	Fair	Poor	Fair	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VaD, VaF Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.

See footnote at end of table.

TABLE 10.--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
VbD*:												
Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Els	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
Wa Wann	Good	Good	Good	Good	Fair	Good	Poor	Fair	Good	Good	Fair	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--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 and 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
Ad: Alda	Severe: wetness, cutbanks cave.	Severe: flooding.	Severe: wetness, flooding.	Severe: flooding.	Severe: frost action.	Slight.
Bo: Boel	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
Bu: Butler	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
CaC: Coly	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
CaD: Coly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
CaF: Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CkB*:						
Coly	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Kenesaw	Slight	Slight	Slight	Slight	Moderate: low strength, frost action.	Slight.
CoD2*:						
Coly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
CoF2*:						
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
De: Detroit	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Fm: Fillmore	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, low strength, frost action.	Severe: ponding.
Gb: Gibbon	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness.
Gc: Gibbon	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Severe: excess salt.

See footnote at end of table.

TABLE 11.--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
Go------------------ Gothenburg	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, droughty, flooding.
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----------------- Hersh	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Hf------------------ Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
HgB----------------- Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Ho, HoB------------- Holdrege	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
HoC, HoC2----------- Holdrege	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Hp, HpB------------- Holdrege	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Hr------------------ Hord	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength.	Slight.
InB----------------- Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
Ke------------------ Kenesaw	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength, frost action.	Slight.
KgB*:						
Kenesaw-------------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength, frost action.	Slight.
Coly----------------	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Lf------------------ Lex	Severe: wetness, cutbanks cave.	Severe: flooding.	Severe: wetness, flooding.	Severe: flooding.	Severe: frost action, low strength.	Moderate: wetness.
Lg------------------ Lex	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Severe: excess salt.
LoB----------------- Libory	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Ma------------------ Massie	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pg*. Pits						

See footnote at end of table.

TABLE 11.--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
Pm---------------- Platte	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, droughty, flooding.
Ru---------------- Rusco	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Sc---------------- Scott	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
SmB--------------- Simeon	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
To---------------- Tryon	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.
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.
UF. Ustorthents						
VaB--------------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
VaD--------------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
VaF--------------- Valentine	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
VbD*:						
Valentine--------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Els---------------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Wa---------------- Wann	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and 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
Ad: Alda	Severe: wetness, poor filter.	Severe: flooding, wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy, seepage.
Bo: Boel	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Bu: Butler	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
CaC: Coly	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
CaD: Coly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
CaF: Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
CkB*:					
Coly	Slight	Moderate: seepage.	Slight	Slight	Good.
Kenesaw	Slight	Moderate: seepage.	Slight	Slight	Good.
CoD2*:					
Coly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
CoF2*:					
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
De: Detroit	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Fm: Fillmore	Severe: percs slowly, ponding.	Severe: ponding.	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Gb: Gibbon	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
Gc: Gibbon	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.

See footnote at end of table.

TABLE 12.--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
Go: Gothenburg	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
HeB, HeC: Hersh	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
HeD: Hersh	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
Hf, HgB: Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Ho: Holdrege	Slight	Moderate: seepage.	Slight	Slight	Good.
HoB, HoC, HoC2: Holdrege	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Hp: Holdrege	Slight	Moderate: seepage.	Slight	Slight	Good.
HpB: Holdrege	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Hr: Hord	Slight	Moderate: seepage.	Slight	Slight	Good.
InB: Inavale	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Ke: Kenesaw	Slight	Moderate: seepage.	Slight	Slight	Good.
KgB*:					
Kenesaw	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Coly	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Lf: Lex	Severe: wetness, poor filter.	Severe: wetness, flooding, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy, seepage.
Lg: Lex	Severe: wetness, percs slowly, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
LoB: Libory	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: too clayey, wetness.
Ma: Massie	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

See footnote at end of table.

TABLE 12.--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
Pg*. Pits					
Pm------------------ Platte	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Ru------------------ Rusco	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
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.
To------------------ Tryon	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
UcF*:					
Uly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Coly----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UF. Ustorthents					
VaB, VaD------------ Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VaF----------------- Valentine	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VbD*:					
Valentine-----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Els-----------------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Wa------------------ Wann	Severe: wetness.	Severe: seepage, wetness, flooding.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition and does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ad-------------------- Alda	Fair: wetness.	Probable-------------	Probable-------------	Poor: area reclaim.
Bo-------------------- Boel	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
Bu-------------------- Butler	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
CaC------------------- Coly	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
CaD------------------- Coly	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CaF------------------- Coly	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CkB*:				
Coly------------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Kenesaw---------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CoD2*:				
Coly------------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Uly-------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CoF2*:				
Coly------------------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Uly-------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
De-------------------- Detroit	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Fm-------------------- Fillmore	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
Gb-------------------- Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gc-------------------- Gibbon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
Go-------------------- Gothenburg	Poor: wetness.	Probable-------------	Probable-------------	Poor: area reclaim, small stones.
HeB, HeC-------------- Hersh	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
HeD------------------- Hersh	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hf, HgB: Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ho, HoB, HoC, HoC2, Hp, HpB: Holdrege	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hr: Hord	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
InB: Inavale	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Ke: Kenesaw	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
KgB*:				
Kenesaw	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Coly	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Lf: Lex	Fair: wetness.	Probable	Probable	Fair: area reclaim.
Lg: Lex	Fair: wetness.	Probable	Improbable: too sandy.	Poor: excess salt.
LoB: Libory	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Ma: Massie	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pg*. Pits				
Pm: Platte	Fair: wetness.	Probable	Probable	Poor: area reclaim, small stones.
Ru: Rusco	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sc: Scott	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
SmB: Simeon	Good	Probable	Improbable: too sandy.	Fair: small stones.
To: Tryon	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
UcF*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Coly	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
UF. Ustorthents				

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VaB, VaD, VaF: Valentine	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
VbD*:				
Valentine	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Els	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
Wa: Wann	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--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 and does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ad: Alda	Severe: seepage.	Severe: seepage, piping.	Frost action, cutbanks cave.	Wetness	Wetness, too sandy.	Favorable.
Bo: Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy.	Droughty.
Bu: Butler	Moderate: seepage.	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
CaC: Coly	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
CaD, CaF: Coly	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
CkB*:						
Coly	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Kenesaw	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
CoD2*, CoF2*:						
Coly	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Uly	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
De: Detroit	Slight	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Fm: Fillmore	Moderate: seepage.	Severe: hard to pack, ponding.	Percs slowly, frost action, ponding.	Percs slowly, ponding, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Gb: Gibbon	Severe: seepage.	Severe: piping, wetness.	Frost action	Wetness	Wetness	Favorable.
Gc: Gibbon	Moderate: seepage.	Severe: wetness.	Frost action, excess salt.	Wetness, excess salt.	Erodes easily, wetness.	Excess salt, erodes easily.
Go: Gothenburg	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty, rooting depth.
HeB: Hersh	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
HeC: Hersh	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
HeD: Hersh	Severe: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
Hf, HgB: Hobbs	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ho, HoB----------- Holdrege	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
HoC, HoC2--------- Holdrege	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Erodes easily	Erodes easily.
Hp, HpB----------- Holdrege	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
Hr---------------- Hord	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable------	Favorable------	Favorable.
InB--------------- Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Ke---------------- Kenesaw	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
KgB*:						
Kenesaw-----------	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
Coly--------------	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Lf---------------- Lex	Severe: seepage.	Severe: seepage, wetness, piping.	Frost action, cutbanks cave.	Wetness--------	Wetness, too sandy.	Favorable.
Lg---------------- Lex	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave, excess salt.	Wetness, excess salt.	Wetness, too sandy.	Excess salt.
LoB--------------- Libory	Severe: seepage.	Severe: piping.	Favorable------	Wetness, droughty, fast intake.	Erodes easily, wetness, soil blowing.	Erodes easily, droughty, rooting depth.
Ma---------------- Massie	Slight----------	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, percs slowly.
Pg*. Pits						
Pm---------------- Platte	Severe: seepage.	Severe: seepage, wetness, piping.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Ru---------------- Rusco	Moderate: seepage.	Severe: piping, ponding.	Ponding, frost action.	Ponding--------	Erodes easily, ponding.	Wetness, erodes easily.
Sc---------------- Scott	Moderate: seepage.	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Not needed-----	Not needed.
SmB--------------- Simeon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
To---------------- Tryon	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy.	Wetness, droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
UcF*:						
Uly	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Coly	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
UF. Ustorthents						
VaB, VaD Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
VaF Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
VbD*:						
Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Els	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
Wa Wann	Severe: seepage.	Severe: piping, wetness.	Frost action	Soil blowing, wetness.	Wetness, soil blowing.	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--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		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ad--------------- Alda	0-12	Loam--------------	ML, CL-ML, CL	A-4	0	90-100	85-100	85-100	50-75	20-35	3-10
	12-30	Fine sandy loam, sandy loam, very fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<26	NP-7
	30-60	Coarse sand, gravelly sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	70-100	65-95	30-95	2-15	<20	NP
Bo--------------- Boel	0-17	Fine sandy loam	SM	A-4, A-2	0	100	100	85-95	20-40	<20	NP
	17-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	85-95	0-25	---	NP
Bu--------------- Butler	0-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	5-15
	12-35	Clay, silty clay	CH	A-7	0	100	100	100	95-100	50-70	30-45
	35-41	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	35-60	15-35
	41-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	30-60	10-35
CaC, CaD, CaF---- Coly	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	6-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10
CkB*:											
Coly------------	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	6-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10
Kenesaw---------	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	2-12
	10-23	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	18-35	2-13
	23-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	20-35	2-12
CoD2*, CoF2*:											
Coly------------	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	5-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10
Uly-------------	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	7-28	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	28-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
De--------------- Detroit	0-16	Silt loam--------	CL	A-6, A-4	0	100	100	95-100	85-95	25-40	8-20
	16-38	Silty clay, silty clay loam.	CH, CL	A-7	0	100	100	95-100	90-100	50-60	25-35
	38-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	25-45	10-25
Fm--------------- Fillmore	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	12-35	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	40-75	20-45
	35-44	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	44-60	Silt loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	25-75	10-45

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Gb---------------- Gibbon	0-14	Loam--------------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	20-30	2-10
	14-37	Silt loam, clay loam.	CL	A-6	0	100	100	90-100	55-90	25-38	12-20
	37-50	Stratified fine sandy loam to silt loam.	SM, SC, CL, ML	A-4	0	100	100	70-95	35-90	<25	NP-8
	50-60	Sand--------------	SP, SP-SM, SM	A-1, A-2, A-3	0	90-100	75-100	40-80	2-30	---	NP
Gc---------------- Gibbon	0-10	Loam--------------	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	8-15
	10-40	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	80-95	30-45	10-20
	40-60	Silty clay loam, silty clay.	CL	A-7	0	100	100	95-100	85-95	40-50	20-28
Go---------------- Gothenburg	0-3	Loamy sand--------	SM	A-2	0	100	100	50-80	15-35	---	NP
	3-8	Fine sand, coarse sand, gravelly sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	65-80	0-15	---	NP
	8-60	Sand and gravel	SP, SM, SP-SM	A-1, A-2, A-3	0	70-95	65-95	30-65	3-15	---	NP
HeB, HeC, HeD---- Hersh	0-7	Fine sandy loam	SM, SC, SM-SC, ML	A-4	0	100	100	85-100	40-75	<20	NP-10
	7-11	Fine sandy loam, loamy very fine sand.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	80-100	40-65	<20	NP-5
	11-60	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SM-SC	A-4	0	100	100	80-100	35-50	<20	NP-5
Hf---------------- Hobbs	0-6	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	6-60	Silt loam, silty clay loam.	CL, CL-ML, MH	A-4, A-6, A-7	0	100	100	95-100	80-100	25-55	5-25
HgB--------------- Hobbs	0-9	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	9-60	Silt loam, silty clay loam, loam.	CL, CL-ML, MH	A-4, A-6, A-7	0	100	100	95-100	80-100	25-55	5-25
Ho, HoB, HoC, HoC2------------- Holdrege	0-13	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-40	2-18
	13-25	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	90-100	30-50	15-35
	25-31	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	95-100	95-100	25-40	9-17
	31-60	Silt loam---------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Hp, HpB----------- Holdrege	0-27	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-40	2-18
	27-43	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	90-100	30-50	15-35
	43-47	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	95-100	95-100	25-40	9-17
	47-60	Silt loam---------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Hr---------------- Hord	0-13	Silt loam---------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	3-18
	13-43	Silt loam, silty clay loam, loam.	CL	A-6, A-4	0	100	100	98-100	85-100	25-40	8-23
	43-60	Silt loam, very fine sandy loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	100	85-100	25-40	6-21
InB--------------- Inavale	0-5	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	5-10	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	10-60	Fine sand, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ke: Kenesaw	0-8	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	2-12
	8-22	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	18-35	2-13
	22-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	20-35	2-12
KgB*: Kenesaw	0-7	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	2-12
	7-18	Loam, silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	85-100	18-35	2-13
	18-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	20-35	2-12
Coly	0-5	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	5-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10
Lf: Lex	0-11	Loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	22-35	3-15
	11-24	Stratified sandy loam to silty clay loam.	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	60-90	20-45	3-25
	24-60	Gravelly sand, coarse sand, fine sand.	SP, SP-SM, SM	A-2, A-1, A-3	0	60-100	60-95	30-65	3-14	<20	NP
Lg: Lex	0-12	Loam	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	85-100	60-95	20-35	3-15
	12-31	Clay loam, silt loam, loam.	CL	A-6	0	95-100	95-100	90-100	70-85	30-40	12-22
	31-60	Gravelly sand, sand, coarse sand.	SP, SM, SP-SM	A-2, A-1, A-3	0	80-100	70-100	35-70	3-15	---	NP
LoB: Libory	0-16	Loamy fine sand	SM	A-2, A-4	0	100	100	65-85	15-45	---	NP
	16-24	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM	A-2	0	100	100	55-80	12-35	---	NP
	24-60	Silty clay loam, silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-95	20-40	4-24
Ma: Massie	0-10	Silty clay loam	CL	A-4, A-6, A-7	0	100	100	100	95-100	22-45	8-25
	10-60	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	100	95-100	45-70	20-45
Pg*. Pits											
Pm: Platte	0-6	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-95	22-35	4-15
	6-12	Very fine sandy loam, loam, fine sandy loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	95-100	75-95	45-75	<20	NP-5
	12-60	Gravelly coarse sand, coarse sand, gravelly sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-95	25-65	5-15	<20	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ru---------------- Rusco	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	60-100	20-40	3-15
	5-30	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-30
	30-60	Loam, very fine sandy loam, silt loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-100	20-35	3-15
Sc---------------- Scott	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	2-20
	6-37	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	41-75	20-45
	37-48	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	48-60	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6, A-7	0	100	100	90-100	90-100	25-50	8-24
SmB--------------- Simeon	0-6	Sandy loam-------	SM	A-2, A-4	0	95-100	90-100	60-80	30-40	<20	NP-4
	6-60	Sand, coarse sand, loamy sand.	SP, SP-SM, SM	A-1, A-2, A-3	0	90-100	75-100	40-80	2-30	---	NP
To---------------- Tryon	0-4	Loamy fine sand	SM, SP-SM	A-2	0	100	100	85-100	10-30	---	NP
	4-60	Fine sand, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	100	100	51-90	5-30	---	NP
UcF*:											
Uly--------------	0-9	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	9-27	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	27-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
Coly-------------	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	4-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10
UF. Ustorthents											
VaB, VaD, VaF---- Valentine	0-5	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	5-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-20	---	NP
VbD*:											
Valentine--------	0-5	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	5-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-20	---	NP
Els--------------	0-6	Loamy fine sand	SP-SM, SM	A-2, A-3	0	100	100	70-100	5-35	---	NP
	6-60	Fine sand, loamy sand, sand.	SP-SM, SM, SP	A-2, A-3	0	90-100	90-100	70-100	4-30	---	NP
Wa---------------- Wann	0-14	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<25	NP-5
	14-48	Sandy loam, fine sandy loam, loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	95-100	75-100	60-100	20-60	<25	NP-10
	48-60	Stratified sandy clay loam to coarse sand.	SM	A-2, A-4	0	95-100	95-100	70-100	15-40	<20	NP-3

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--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	Reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm					Pct
Ad---------------- Alda	0-12	12-25	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	4	6	2-4
	12-30	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low--------	0.20			
	30-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Bo---------------- Boel	0-17	8-18	1.50-1.70	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20	5	3	1-2
	17-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.20			
Bu---------------- Butler	0-12	18-35	1.20-1.40	0.6-2.0	0.20-0.22	5.1-7.3	<2	Moderate	0.37	4	6	2-4
	12-35	40-55	1.10-1.20	0.06-0.2	0.11-0.13	5.6-8.4	<2	High------	0.37			
	35-41	32-45	1.10-1.30	0.2-0.6	0.14-0.20	6.6-8.4	<2	High------	0.37			
	41-60	20-35	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.37			
CaC, CaD, CaF---- 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	1-2
	6-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
CkB*:												
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	1-2
	6-60	16-20	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
Kenesaw----------	0-10	12-20	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low--------	0.32	5	6	1-2
	10-23	10-18	1.20-1.30	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low--------	0.43			
	23-60	8-18	1.30-1.40	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
CoD2*, CoF2*:												
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	0-.5
	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--------------	0-7	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
	7-28	20-32	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	28-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
De---------------- Detroit	0-16	22-27	1.25-1.40	0.2-0.6	0.22-0.24	6.1-7.3	<2	Low--------	0.37	5	6	2-4
	16-38	35-45	1.35-1.50	0.06-0.2	0.12-0.18	6.6-7.8	<2	High------	0.37			
	38-60	18-35	1.30-1.50	0.2-0.6	0.18-0.22	6.6-8.4	<2	Moderate	0.37			
Fm---------------- Fillmore	0-12	18-35	1.30-1.40	0.6-2.0	0.21-0.24	5.6-6.5	<2	Moderate	0.37	4	6	3-4
	12-35	40-55	1.30-1.50	<0.06	0.11-0.14	5.6-7.8	<2	High------	0.37			
	35-44	32-40	1.20-1.40	0.2-0.6	0.18-0.20	6.6-8.4	<2	High------	0.37			
	44-60	18-45	1.30-1.50	0.06-2.0	0.10-0.22	6.6-8.4	<2	Moderate	0.37			
Gb---------------- Gibbon	0-14	20-25	1.40-1.60	0.6-2.0	0.21-0.23	7.4-8.4	<2	Low--------	0.32	5	4L	2-4
	14-37	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
	37-50	15-25	1.50-1.70	0.6-6.0	0.16-0.20	7.9-9.0	<2	Low--------	0.32			
	50-60	0-6	1.50-1.60	6.0-2.0	0.05-0.10	6.6-7.8	<2	Low--------	0.20			
Gc---------------- Gibbon	0-10	15-25	1.30-1.43	0.6-2.0	0.20-0.22	7.4-8.4	4-16	Low--------	0.28	5	4L	2-3
	10-40	20-32	1.20-1.30	0.6-2.0	0.22-0.24	7.9-8.4	4-8	Moderate	0.43			
	40-60	30-43	1.35-1.50	0.2-0.6	0.12-0.18	7.4-7.8	<4	Moderate	0.43			
Go---------------- Gothenburg	0-3	2-8	1.50-1.60	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17	2	2	<1
	3-8	1-5	1.50-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.17			
	8-60	0-2	1.70-1.90	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
HeB, HeC, HeD---- Hersh	0-7	10-18	1.30-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low--------	0.24	5	3	.5-1
	7-11	8-18	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.3	<2	Low--------	0.24			
	11-60	10-18	1.20-1.50	2.0-6.0	0.14-0.16	6.6-7.8	<2	Low--------	0.24			
Hf---------------- Hobbs	0-6	15-30	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	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
HgB--------------- Hobbs	0-9	15-30	1.20-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	9-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
Ho, HoB, HoC, HoC2------------- Holdrege	0-13	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
	13-25	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	25-31	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
	31-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43			
Hp, HpB---------- Holdrege	0-27	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	2-3
	27-43	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	43-47	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
	47-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.43			
Hr--------------- Hord	0-13	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
	13-43	20-35	1.35-1.45	0.6-2.0	0.17-0.22	6.1-7.8	<2	Low--------	0.32			
	43-60	18-30	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
InB-------------- Inavale	0-5	7-18	1.50-1.60	6.0-20	0.10-0.12	6.6-7.8	<2	Low--------	0.17	5	2	.5-1
	5-10	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low--------	0.17			
	10-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.17			
Ke--------------- Kenesaw	0-8	12-20	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low--------	0.32	5	6	1-2
	8-22	10-18	1.20-1.30	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low--------	0.43			
	22-60	8-18	1.30-1.40	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
KgB*:												
Kenesaw----------	0-7	12-20	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low--------	0.32	5	6	1-2
	7-18	10-18	1.20-1.30	0.6-2.0	0.17-0.22	6.6-8.4	<2	Low--------	0.43			
	18-60	8-18	1.30-1.40	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
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	1-2
	5-60	16-20	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
Lf--------------- Lex	0-11	15-27	1.40-1.60	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.28	4	4L	2-3
	11-24	7-32	1.30-1.70	0.6-2.0	0.15-0.22	6.1-8.4	<2	Low--------	0.28			
	24-60	2-5	1.50-1.70	>20	0.02-0.06	6.1-7.8	<2	Low--------	0.10			
Lg--------------- Lex	0-12	15-25	1.40-1.60	0.6-2.0	0.20-0.24	7.9-9.0	4-16	Low--------	0.28	4	4L	2-3
	12-31	27-32	1.40-1.60	0.2-0.6	0.15-0.19	7.9-9.0	4-16	Moderate	0.28			
	31-60	2-10	1.50-1.70	>20	0.02-0.05	7.9-8.4	<4	Low--------	0.10			
LoB-------------- Libory	0-16	2-12	1.60-1.80	6.0-20	0.07-0.12	5.6-7.3	<2	Low--------	0.17	5	2	1-2
	16-24	2-12	1.60-1.80	6.0-20	0.06-0.11	5.6-7.3	<2	Low--------	0.17			
	24-60	15-32	1.20-1.40	0.6-2.0	0.17-0.22	5.6-7.8	<2	Low--------	0.43			
Ma--------------- Massie	0-10	15-40	1.40-1.50	0.2-2.0	0.21-0.24	5.1-6.5	<2	Moderate	0.37	5	6	2-4
	10-60	35-55	1.20-1.40	<0.06	0.09-0.20	5.6-7.8	<2	High-------	0.37			
Pg*. Pits												
Pm--------------- Platte	0-6	10-20	1.50-1.70	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	2	4L	1-2
	6-12	7-18	1.70-1.90	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low--------	0.28			
	12-60	0-3	1.90-2.00	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Ru--------------- Rusco	0-5	17-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	5	2-3
	5-30	28-35	1.20-1.30	0.2-0.6	0.18-0.20	6.6-8.4	<2	Moderate	0.43			
	30-60	15-25	1.40-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
Sc--------------- Scott	0-6	15-35	1.25-1.40	0.6-2.0	0.21-0.24	5.6-7.3	<2	Low--------	0.37	3	6	2-4
	6-37	40-55	1.20-1.40	<0.06	0.10-0.14	5.6-7.8	<2	High-------	0.37			
	37-48	27-40	1.15-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	High-------	0.37			
	48-60	18-35	1.30-1.50	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.37			
SmB-------------- Simeon	0-6	6-18	1.30-1.50	2.0-6.0	0.13-0.15	6.1-7.8	<2	Low--------	0.24	5	3	.5-1
	6-60	2-10	1.50-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low--------	0.15			
To--------------- Tryon	0-4	3-10	1.40-1.60	6.0-20	0.10-0.12	5.6-8.4	<2	Low--------	0.17	5	8	4-8
	4-60	1-7	1.50-1.70	6.0-20	0.06-0.08	5.6-7.8	<2	Low--------	0.17			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm					Pct
UcF*:												
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	2-3
	9-27	20-32	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			
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			
UF. Ustorthents												
VaB, VaD, VaF---- Valentine	0-5	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
	5-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
VbD*:												
Valentine--------	0-5	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
	5-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
Els--------------	0-6	2-8	1.60-1.80	6.0-20	0.07-0.12	6.1-8.4	<2	Low--------	0.17	5	2	.5-1
	6-60	0-8	1.50-1.60	6.0-20	0.05-0.08	6.1-8.4	<2	Low--------	0.15			
Wa--------------- Wann	0-14	5-15	1.70-1.90	2.0-6.0	0.13-0.18	6.6-8.4	<2	Low--------	0.20	5	3	1-2
	14-48	3-18	1.70-1.90	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low--------	0.20			
	48-60	3-22	1.40-1.60	2.0-6.0	0.09-0.12	7.4-8.4	<2	Low--------	0.15			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[See text for definition of terms. 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			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
Ad------------------ Alda	B	Rare---------	---	---	2.0-3.0	Apparent	Nov-May	High-----	Moderate	Low.
Bo------------------ Boel	A	Rare---------	---	---	2.5-3.5	Apparent	Nov-May	Moderate	High-----	Low.
Bu------------------ Butler	D	None---------	---	---	0.5-2.0	Perched	Mar-Jul	High-----	High-----	Low.
CaC, CaD, CaF----- Coly	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
CkB*:										
Coly--------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
Kenesaw-----------	B	None---------	---	---	>6.0	---	---	Moderate	Moderate	Low.
CoD2*, CoF2*:										
Coly--------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
Uly---------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
De------------------ Detroit	C	None---------	---	---	>6.0	---	---	Low------	High-----	Low.
Fm------------------ Fillmore	D	None---------	---	---	+.5-1.0	Perched	Mar-Jul	High-----	High-----	Low.
Gb------------------ Gibbon	B	Rare---------	---	---	2.0-3.0	Apparent	Nov-Jun	High-----	High-----	Low.
Gc------------------ Gibbon	B	Rare---------	---	---	1.5-3.0	Apparent	Nov-Jun	High-----	High-----	High.
Go------------------ Gothenburg	D	Frequent----	Brief-----	Mar-Jun	0-2.0	Apparent	Nov-Jun	Moderate	Moderate	Low.
HeB, HeC, HeD----- Hersh	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Low.
Hf------------------ Hobbs	B	Occasional	Brief-----	Apr-Sep	>6.0	---	---	Moderate	Low------	Low.
HgB----------------- Hobbs	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	Moderate	Low------	Low.
Ho, HoB, HoC, HoC2, Hp, HpB---- Holdrege	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Low.
Hr------------------ Hord	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
InB----------------- Inavale	A	Rare---------	---	---	>6.0	---	---	Low------	Moderate	Low.
Ke------------------ Kenesaw	B	None---------	---	---	>6.0	---	---	Moderate	Moderate	Low.
KgB*:										
Kenesaw-----------	B	None---------	---	---	>6.0	---	---	Moderate	Moderate	Low.
Coly--------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.

See footnote at end of table.

TABLE 17.--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					
Lf----------------- Lex	B	Rare---------	---	---	1.5-3.0	Apparent	Nov-May	High-----	High-----	Low.
Lg----------------- Lex	B	Rare---------	---	---	1.5-3.0	Apparent	May-Nov	High-----	High-----	High.
LoB---------------- Libory	A	None---------	---	---	2.0-3.0	Perched	Mar-Jun	Low------	Moderate	Low.
Ma----------------- Massie	D	None---------	---	---	+2-1.0	Perched	Mar-Aug	High-----	High-----	Low.
Pg*. Pits										
Pm----------------- Platte	B	Occasional	Brief-----	Mar-Oct	1.0-2.0	Apparent	Feb-Jun	Moderate	High-----	Moderate.
Ru----------------- Rusco	D	None---------	---	---	+.5-2.0	Perched	Mar-Jun	High-----	High-----	Low.
Sc----------------- Scott	D	None---------	---	---	+.5-1.0	Perched	Mar-Aug	High-----	High-----	Low.
SmB---------------- Simeon	A	None---------	---	---	>6.0	---	---	Low------	Low------	Low.
To----------------- Tryon	D	Rare---------	---	---	0-1.5	Apparent	Nov-May	Moderate	High-----	Low.
UcF*: Uly---------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
Coly--------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
UF. Ustorthents										
VaB, VaD, VaF----- Valentine	A	None---------	---	---	>6.0	---	---	Low------	Low------	Low.
VbD*: Valentine---------	A	None---------	---	---	>6.0	---	---	Low------	Low------	Low.
Els---------------	A	None---------	---	---	1.5-3.0	Apparent	Nov-May	Moderate	Moderate	Low.
Wa----------------- Wann	B	Rare---------	---	---	1.5-3.5	Apparent	Mar-Jul	High-----	Moderate	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth in inches	Classification		Grain-size distribution									Liquid limit	Plasticity index	Specific gravity
			Percentage passing sieve--						Percentage smaller than--					
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.005 mm	.002 mm			
												Pct		G/cc
Alda loam:[1] (S77NE99-46)														
Ap, 0 to 6	A-4(4)	CL-ML	100	100	99	97	89	53	---	---	---	24	4	2.63
C1, 16 to 24	A-4(3)	SM-SC	100	100	100	99	88	48	---	---	---	25	7	2.53
C2, 24 to 30	A-4(1)	SM-SC	100	100	100	98	86	40	---	---	---	22	4	2.51
Holdrege silt loam:[2] (S77NE99-55)														
Ap, 0 to 5	A-4(8)	CL	100	100	100	100	100	48	---	---	---	33	9	2.60
Bt2, 18 to 25	A-7-6 (15)	CL	100	100	100	100	100	99	---	---	---	48	24	2.67
C, 31 to 60	A-6(9)	CL	100	100	100	100	100	99	---	---	---	37	13	2.66
Kenesaw silt loam:[3] (S77NE99-16)														
Ap, 0 to 8	A-4(8)	AL	100	100	100	100	100	97	---	---	---	32	8	2.62
C, 31 to 60	A-4(8)	ML	100	100	100	100	100	98	---	---	---	34	9	2.67
Simeon sandy loam:[4] (S79NE99-1)														
Ap, 0 to 8	A-2-4 (-1)	SM	100	100	98	95	77	34	---	---	---	19	1	2.63
AC, 6 to 12	A-3(-3)	SP-SM	100	98	96	92	65	10	---	---	---	NP	NP	2.65
C, 12 to 60	A-3(-3)	SP	100	99	97	94	59	3	---	---	---	NP	NP	2.66
Wann fine sandy loam:[5] (S78NE99-12)														
C1, 14 to 33	A-4(1)	SM	100	100	99	97	86	38	---	---	---	20	3	2.66
C2, 33 to 42	A-4(1)	SM	100	100	99	98	88	40	---	---	---	19	3	2.65

[1]Alda loam, 300 feet west and 3,500 feet north of SE corner, sec. 22, T. 8 N., R. 16 W.

[2]Holdrege silt loam, 1,900 feet west and 1,950 feet north of SE corner, sec. 23, T. 6 N., R. 15 W.

[3]Kenesaw silt loam, 100 feet north and 2,200 feet west of SE corner, sec. 16, T. 7 N., R. 14 W.

[4]Simeon sandy loam, 230 feet north and 1,800 feet west of SE corner, sec. 30, T. 8 N., R. 14 W.

[5]Wann fine sandy loam, 450 feet south and 1,100 feet east of NW corner, sec. 17, T. 8 N., R. 13 W.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alda	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
Butler	Fine, montmorillonitic, mesic Abruptic Argiaquolls
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Detroit	Fine, montmorillonitic, mesic Pachic Argiustolls
Els	Mixed, mesic Aquic Ustipsamments
Fillmore	Fine, montmorillonitic, mesic Typic Argialbolls
*Gibbon	Fine-silty, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Gothenburg	Mixed, mesic Typic Psammaquents
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
Inavale	Sandy, mixed, mesic Typic Ustifluvents
Kenesaw	Coarse-silty, mixed, mesic Typic Haplustolls
*Lex	Fine-loamy over sandy or sandy-skeletal, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Libory	Sandy over loamy, mixed, mesic Aquic Haplustolls
Massie	Fine, montmorillonitic, mesic Typic Argialbolls
Platte	Sandy, mixed, mesic Mollic Fluvaquents
Rusco	Fine-silty, mixed, mesic Aquic Argiustolls
Scott	Fine, montmorillonitic, mesic Typic Argialbolls
Simeon	Mixed, mesic Typic Ustipsamments
Tryon	Mixed, mesic Typic Psammaquents
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Ustorthents	Mixed, mesic Typic Ustorthents
Valentine	Mixed, mesic Typic Ustipsamments
Wann	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls

* This soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series.

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