United States Department of Agriculture

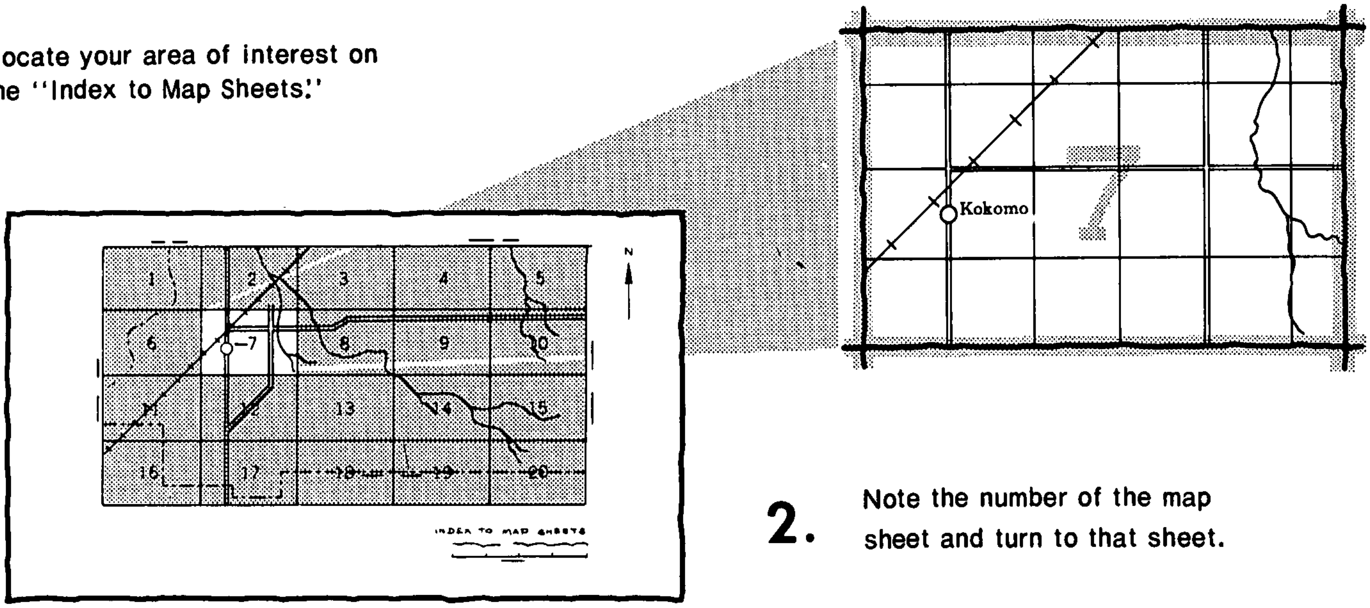
Soil Conservation Service

In cooperation with University of Nebraska, Conservation and Survey Division

Soil Survey of Valley County, Nebraska

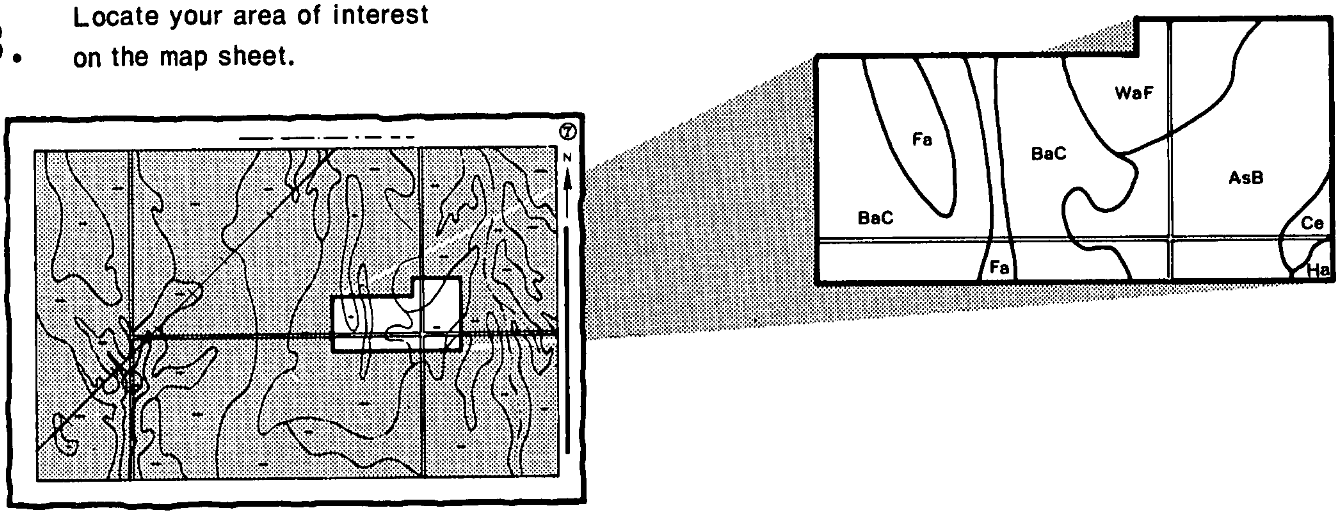
HOW TO USE

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

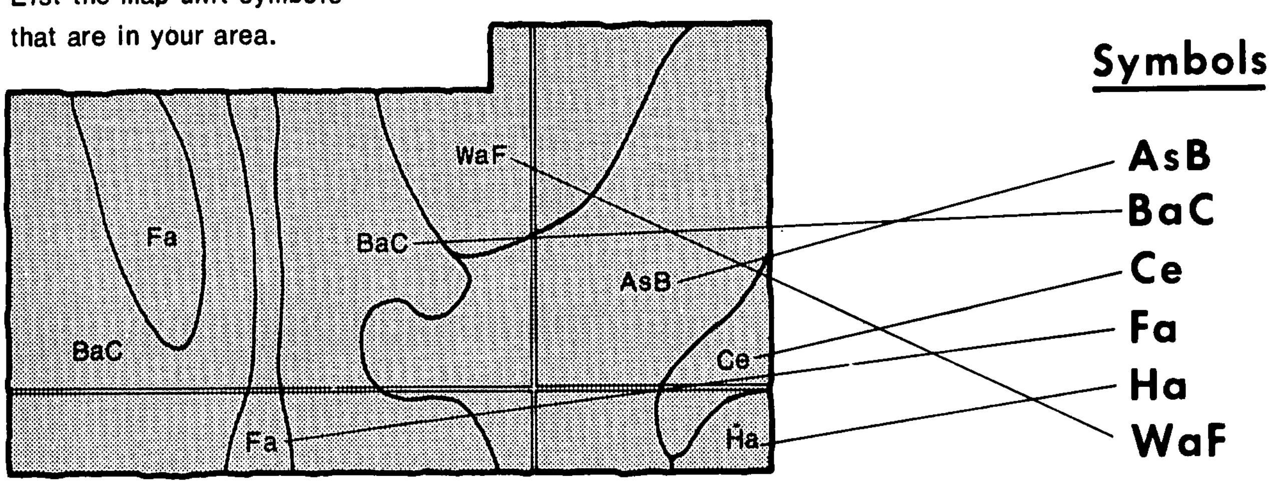


2. Note the number of the map sheet and turn to that sheet.

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

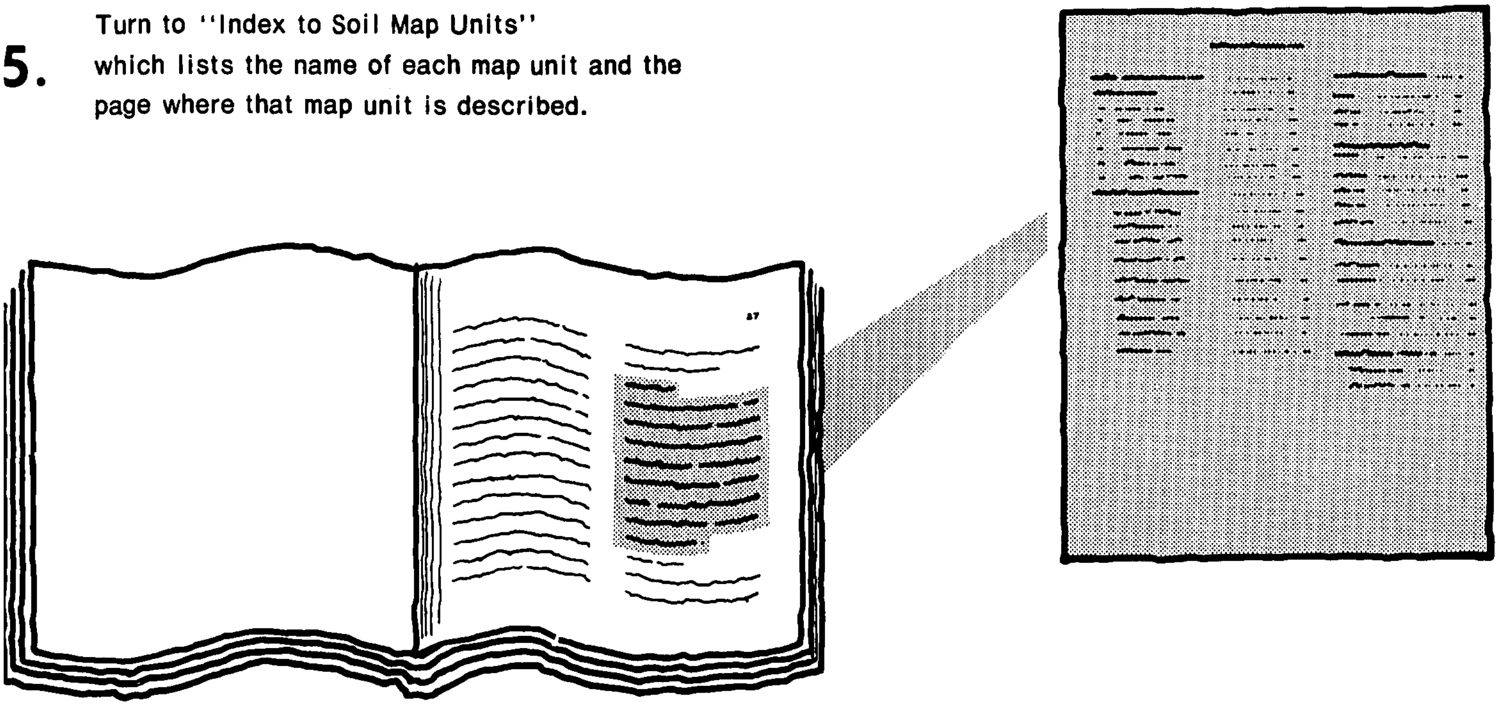


4. List the map unit symbols that are in your area.

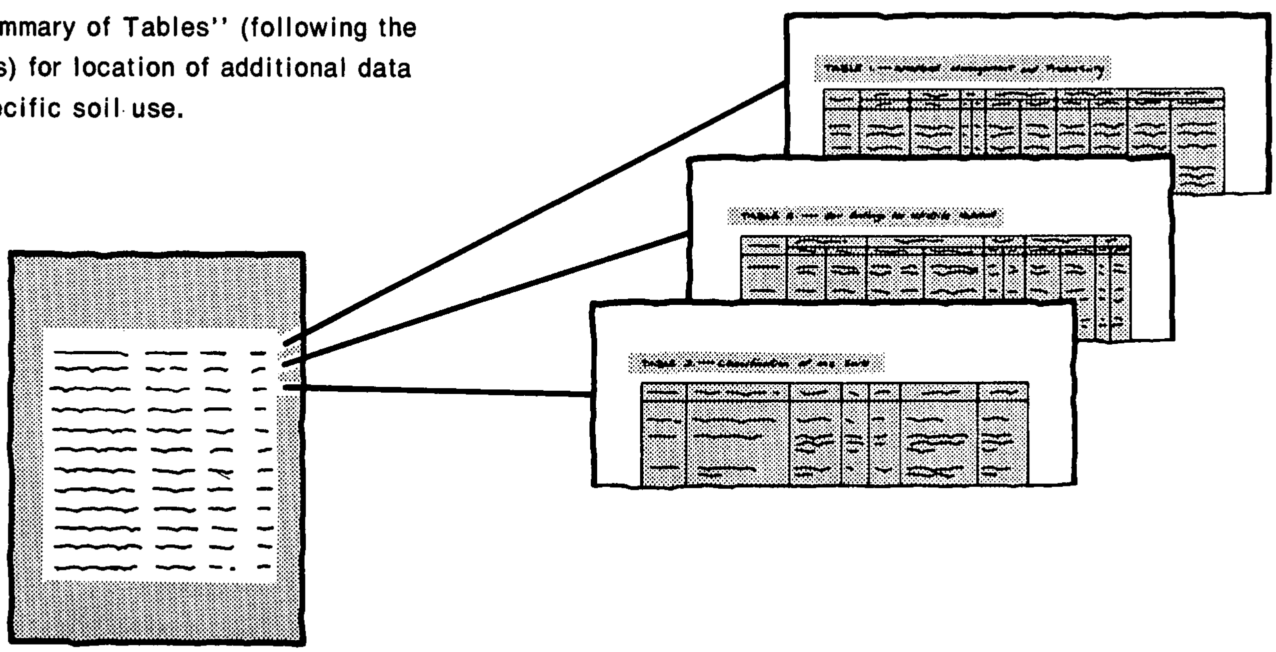


THIS SOIL SURVEY

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 including the Agricultural Experiment Stations, 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.

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service and the University of Nebraska, Conservation and Survey Division. It is part of the technical assistance furnished to the Lower Loup Natural Resource District (NRD). The NRD accelerated completion of the survey by providing financial assistance to employ soil scientists. The Valley County Supervisors, the NRD, and the Old West Regional Commission provided financial assistance to fund aerial photography.

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: Terraces, contour farming, and farmstead windbreaks in an area of gently sloping Holdrege soils. These measures help to control erosion. A cover of native grasses helps to control erosion on the steep and very steep Coly and Uly soils in the background.

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Soil Series

Issued October 1985

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Summary of Tables

Foreword

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

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

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

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

Sherman L. Lewis
State Conservationist
Soil Conservation Service

Soil Survey of Valley County, Nebraska

By Jay R. Wilson and Wayne Vanek, soil scientists, Soil Conservation Service, and Robert S. Ohm and William C. Markley, research soil scientists, Conservation and Survey Division, University of Nebraska

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

VALLEY COUNTY is in the central part of Nebraska (fig. 1). It has an area of 365,331 acres, or 576 square miles. It is bordered on the east by Greeley County, on the north by Garfield County, on the west by Custer County, and on the south by Sherman County.

Agriculture is the main economic enterprise in Valley County. Farms are mainly combination grain- and livestock-production enterprises. Most of the residents are employed in agriculture or related businesses.

This survey updates the soil survey of Valley County published in 1932 (*5*). It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

This section provides general information about Valley County. It describes the history and population, climate, geology and ground water, physiography and drainage, transportation facilities, and trends in farming and land use.

History and Population

The first permanent settlement in the area now known as Valley County was established in 1872, near the present town of Ord. The county was established and organized in 1873. Its boundaries have remained unchanged (*5*).

In 1874, Fort Hartsuff was established to give the settlers protection from the Sioux and the Pawnee. It was constructed principally of native material. Lumber was obtained from cedar trees cut in the canyons to the north. Thick walls were constructed from the sand and gravel obtained from nearby Gravel Creek. Lime was obtained from a quarry downriver, and cement was hauled from Grand Island, about 80 miles away.

Fort Hartsuff served as a social center for the settlers. The town of Calamus was established near the fort and flourished for some time. When the fort was ordered abandoned in 1881, the town rapidly lost population to other settlements which were nearer the railroad. After considerable political maneuvering, Fort Hartsuff was sold. It was a farmstead for many years. Later, the site was presented to the Game and Parks Commission, which still owns and operates it.

According to federal census records, the population of Valley County was 9,533 in 1930 (*5*). By 1980, it declined

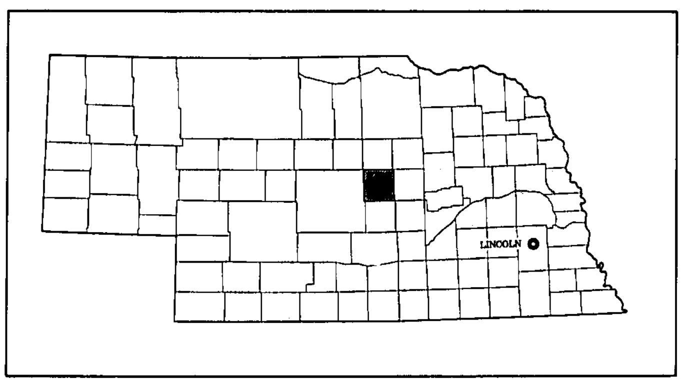

Figure 1.—Location of Valley County in Nebraska.

to 5,633 (*11*). Ord, the county seat and largest town, has a population of 2,658. It is in the central part of the county. Arcadia, Elyria, and North Loup are smaller towns, each having less than 500 residents.

Climate

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

In Valley County winters are cold because incursions of continental air bring fairly frequent spells of low temperature. Summers are characterized by hot temperatures and occasional interruptions of cooler air from the north. Snowfall is fairly frequent in winter, but the snow cover is usually not continuous. Rainfall is heaviest 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 North Loup, Nebraska, in the period 1951 to 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25 degrees F, and the average daily minimum temperature is 13 degrees. The lowest temperature on record, which occurred at North Loup on January 27, 1963, is -32 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on July 11, 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.

Of the total annual precipitation, 18 inches, or more than 75 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 14 inches. The heaviest 1-day rainfall during the period of record was 8.35 inches at North Loup on August 12, 1966. Thunderstorms occur on about 49 days each year, and most occur in summer. Severe duststorms occur occasionally in spring when strong, dry winds blow over unprotected soils. Tornadoes and severe thunderstorms, some accompanied by hail, also occur occasionally. These storms are local in extent and of short duration. The pattern of damage caused by these storms is variable and spotty.

The average seasonal snowfall is about 30 inches. The greatest snow depth at any one time during the period of record was 18 inches. On the average, 24 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

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 75 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 14 miles per hour, in spring.

Geology and Ground Water

Quaternary-age deposits mantle Miocene-age bedrock in nearly all of the county, except for small isolated areas. Eolian sand mantles the northeast corner of the county and some of the terrace northwest of Arcadia. Loess mantles nearly all the uplands, except for the areas mantled by eolian sand where fluvial silt and sand or Miocene-age material is at the surface. Peoria Loess is the principal parent material in the uplands (*3, 4*).

Pierre Shale of Cretaceous age underlies the entire county. It is black and bluish gray marine shale deposited late in Cretaceous time. It yields no water to wells in this county. Its upper surface is the base of an aquifer.

The Ogallala Group of Miocene age overlies the Pierre Shale. It is the oldest exposed formation. It crops out along Menenger Creek, along the North Loup River, along the bluffs and ravines bordering Mira Valley, and in the uplands bordering Mira Valley. This group consists of interbedded, consolidated and unconsolidated layers of sand, sandy gravel, silt, and clay. It generally becomes progressively finer textured in an eastward and southward direction. It ranges in thickness from about 600 feet along the western edge of the county to about 200 feet along the eastern edge.

Unconsolidated sand and gravel and fluvial silt and sand of Quaternary age overlie the Ogallala Group. The sand and gravel range in thickness from a few feet to about 140 feet. Generally, the range is 4 to 50 feet. Sand and gravel are mined from the valley fill of the North Loup River. They are used locally in concrete and for road surfacing. Many shallow wells are supplied from Quaternary deposits, especially in the river valleys and on the terraces.

Wells in both the Ogallala and Quaternary aquifers provide water for domestic and livestock use and for irrigation. The Ogallala is the principal aquifer supplying irrigation wells. The chemical quality of the ground water is suitable for all uses. Water from the Ogallala aquifer is rated hard and very hard for domestic and municipal uses. Water from shallow wells in areas of thick eolian sand is rated soft or slightly hard. Water from the Quaternary aquifer is rated between that of the Ogallala aquifer and that of the shallow wells. Water from some wells has a high content of iron or nitrate. The high nitrate content suggests a local ground water or well pollution problem. Both iron and nitrate are more common in the shallow wells than in the deep wells drawing water from the Ogallala aquifer.

Physiography and Drainage

Most of Valley County is drained by the Middle Loup and the North Loup Rivers and their tributaries. These streams and rivers flow in a parallel course, generally in a southeasterly direction. Practically all of the county is well drained. In large areas of the loess uplands, surface runoff is rapid and erosion ranges from slight to severe. The only poorly drained soils occur locally on bottom land and in scattered shallow basins on the more nearly level divides throughout the uplands.

The general physiography is one of deeply dissected loess uplands and a few remnants of higher, gently rolling loess tablelands. The dissected loess uplands are transversed by several lower, long and narrow, flat river and stream valleys.

About 7,000 acres of the northeast corner of the county consists of sandhills, which are a part of the broad expanse of the Nebraska Sandhills. This area is characterized by irregularly shaped, nearly level to hilly sand dunes. The drainage pattern in the sandhills is not so well defined as that of the loess uplands. The drainage is generally subterranean.

Transportation Facilities

State highways and county roads provide most of the transportation routes in Valley County. State Highway 11 follows the North Loup River from the southeastern part of the county to the northwest. It passes through North Loup, Ord, and Elria. State Highway 70 enters the county in the southwest corner, passes through Arcadia and Ord, and extends to the northeast corner. State Highway 22 extends from North Loup to Highway 70. State Highway 58 enters the county from the south and connects with Highway 70. Most county roads are improved with gravel surfaces. Hard surface or gravel roads are along more than 50 percent of the section lines.

Rail transportation is provided through the valleys of the North Loup and Middle Loup Rivers. The county is served by an airport at Ord.

Trends in Farming and Land Use

Farming and ranching have been the most important enterprises in Valley County since the area was settled. In the early years, crops were grown mainly for local use. When railroads were extended into the county and roads were improved, the county began to ship grain and livestock to other markets. Total production has increased over the years because of an increase in the extent of irrigation; more efficient and larger machinery; use of fertilizer, herbicides, and pesticides; and improved crop varieties. Farms have decreased in number and have increased in size. In 1981, the county had 590 farms, which are a combination of cash-grain and livestock enterprises (*6*). The acreage of irrigated crops is steadily increasing. In 1970, about 47,600 acres was irrigated. By 1981, the irrigated acreage had increased to 77,000 acres. Irrigation water is supplied from wells and canals. Center-pivot irrigation systems are increasingly used. In 1970, the number of registered irrigation wells was 264; in 1981, the number was 481. The North Loup Division of the Missouri Basin Irrigation Development, now under construction, will provide irrigation water for an estimated 28,800 acres in Valley County. The proposed location of the Gernium, Mirdan, and Scotia irrigation canals and the Davis Creek reservoir is shown on the soil maps. The reservoir that provides the irrigation water is located in an area on the Calamus River, west of Burwell and on the Garfield-Loup county line.

Corn is the main cultivated crop in the county. Other crops are alfalfa, grain sorghum, soybeans, wheat, oats, and barley. In 1970, corn was grown on about 53,390 acres, of which 30,270 acres was irrigated. In 1981, it was grown on 68,000 acres, of which 59,400 acres was irrigated (*7*). Sorghum was harvested from 5,700 acres in 1970 and from 14,000 acres in 1981. Soybeans were harvested from 2,500 acres, wheat from 9,200 acres, oats from 1,000 acres, and barley from 200 acres in 1981. Alfalfa hay is an important crop, although the acreage decreased from 32,700 acres in 1970 to 27,600 acres in 1981.

The raising of livestock is an important enterprise on most farms. The number of cattle has increased from 71,000 head in 1970 to 75,000 in 1981. The number of milk cows decreased from 2,950 head in 1970 to 2,100 in 1981. The number of hogs was 47,000 in 1981.

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 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 soil on the landscape.

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

General Soil Map Units

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

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

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

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

Soil Descriptions

1. Coly-Uly Association

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

This association consists of soils on ridgetops and irregularly shaped side slopes that extend to very narrow bottom land along intermittent drainageways. Slopes range from 6 to 60 percent.

This association occupies about 204,950 acres, or about 56.4 percent of the county. It is about 54 percent Coly soils, 40 percent Uly soils, and 6 percent minor soils (fig. 2).

Coly soils are on narrow ridgetops and side slopes. They are moderately steep and very steep. They are well drained to excessively drained. Typically, the surface layer is grayish brown, very friable, calcareous silt loam about 4 inches thick. The transitional layer is light brownish gray, very friable, calcareous silt loam about 6 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Uly soils are on side slopes and long, narrow ridgetops. They are strongly sloping to steep. They are well drained. Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is silt loam about 19 inches thick. It is grayish brown and friable in the upper part, light brownish gray in the next part, and light gray in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Minor in this association are Holdrege, Hord, and Hobbs soils. Holdrege soils are nearly level to gently sloping and are on ridgetops and side slopes. Hord soils are on foot slopes and stream terraces. They formed in alluvium. Hobbs soils are nearly level and are on bottom land along intermittent drainageways. They are occasionally flooded.

Farms in areas of this association are mainly a combination of livestock and cash-grain enterprises. Livestock are mainly cow-calf herds, which graze in the extensive areas of range. Crops, such as corn, grain sorghum, wheat, and alfalfa are grown on the less sloping soils.

Maintaining or improving the range condition and forage production is the main management concern. The range condition can be maintained or improved by range management that includes proper grazing use, timely deferment of grazing or haying, and a grazing system that alternates grazing periods with rest periods and changes the order of these periods each year. Water erosion is the main hazard in cultivated areas. In the areas managed for dryland crops, an insufficient amount of rainfall is the main limitation. Distributing an adequate amount of irrigation water while adequately controlling erosion is the chief concern in managing irrigated areas.

Farms in areas of this association average about 640 acres in size. Roads are not along all section lines. A few paved roads and highways cross the association. Livestock is marketed within the county or is shipped to major markets. Most crops are fed to livestock on the farm or are marketed at local elevators.

2. Holdrege-Uly-Cozad Association

Deep, nearly level to moderately steep, well drained, silty soils on uplands and in valleys

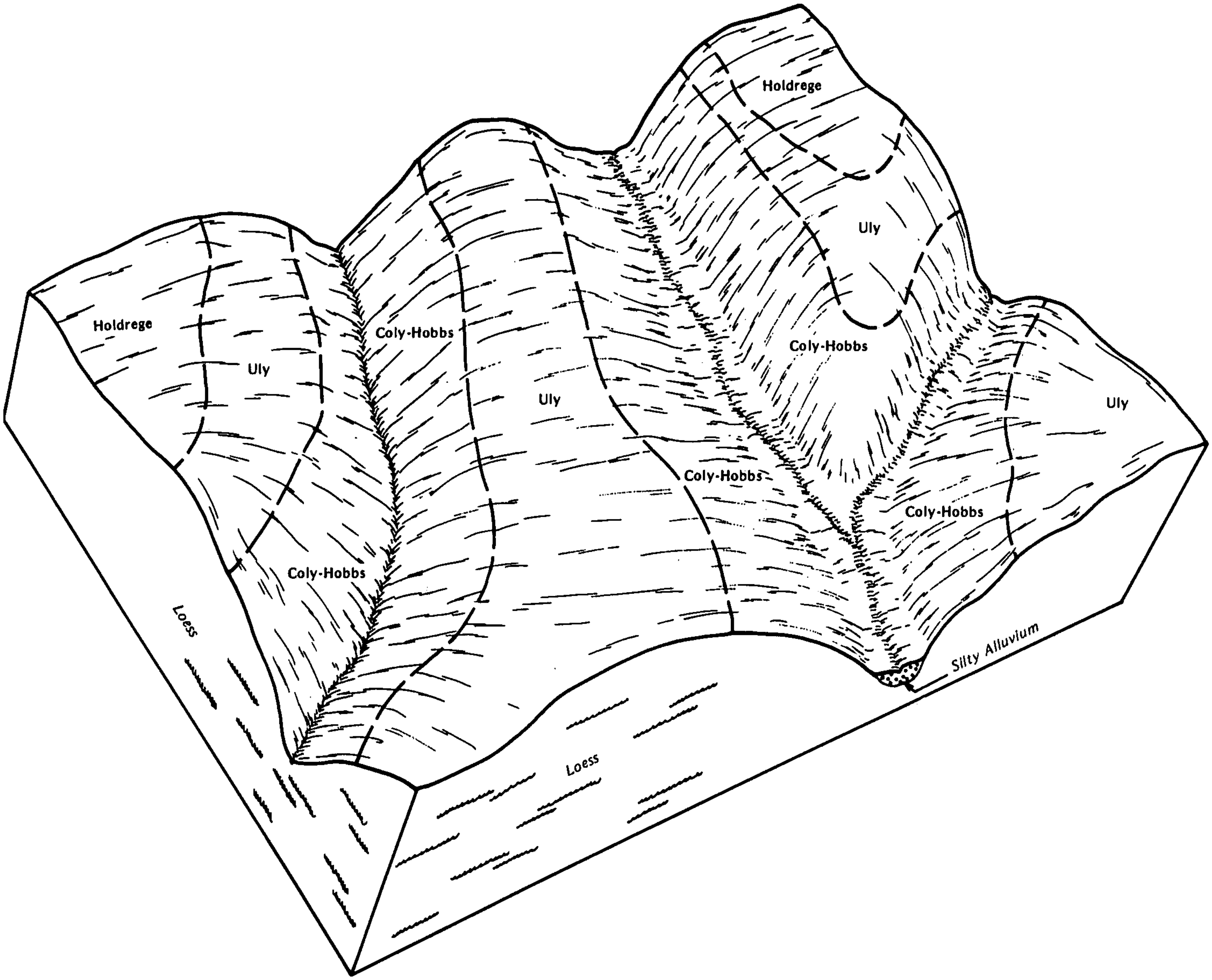

Figure 2.—Typical pattern of soils and parent material in the Coly-Uly association.

This association consists of smooth, sloping areas on uplands and in valleys. Slopes range from 0 to 17 percent.

This association occupies about 56,200 acres, or about 15.4 percent of the county. It is about 60.0 percent Holdrege soils, 14.5 percent Uly soils, 14.0 percent Cozad soils, and 11.5 percent minor soils (fig. 3).

Holdrege soils are on smooth ridgetops and side slopes in the uplands. They are nearly level to gently sloping. Typically, the surface layer is very dark 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 about 22 inches thick. It is grayish brown, firm silty clay loam in the upper part and pale brown silt loam in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam.

Uly soils are on convex ridges, long and smooth side slopes, and irregularly shaped side slopes that extend to intermittent drainageways in the uplands. These soils are strongly sloping and moderately steep. Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is silt loam about 6 inches thick. It is brown and friable in the upper part and pale brown in the lower part. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Cozad soils are nearly level to gently sloping. They are on foot slopes and in valleys. Typically, the surface layer is dark grayish brown, very friable silt loam about 8 inches thick. The subsoil is silt loam about 17 inches thick. It is grayish brown and very friable in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is light gray very fine sandy loam.

The minor soils in this association are mainly Butler, Detroit, and Hobbs soils and Fillmore Variant soils. Butler, Detroit, and Fillmore Variant soils are nearly level and are on stream terraces. Typically, they contain more clay in subsoil than the major soils. Hobbs soils are occasionally flooded and are on bottom land.

Farms in areas of this association are mainly a combination of cash-grain and livestock enterprises. Corn and alfalfa are the main crops. Many areas are irrigated. High-producing irrigation wells are in areas of this association. Water erosion is the main hazard. In the areas managed for dryland crops, an insufficient amount of rainfall is the main limitation. Water erosion can be controlled by terraces, contour farming, and conservation tillage practices that leave crop residue on the surface. Distributing an adequate amount of irrigation water while adequately controlling erosion is the chief concern in managing irrigated areas.

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

3. Holdrege-Hord-Uly Association

Deep, nearly level to strongly sloping, well drained, silty soils on upland tableland

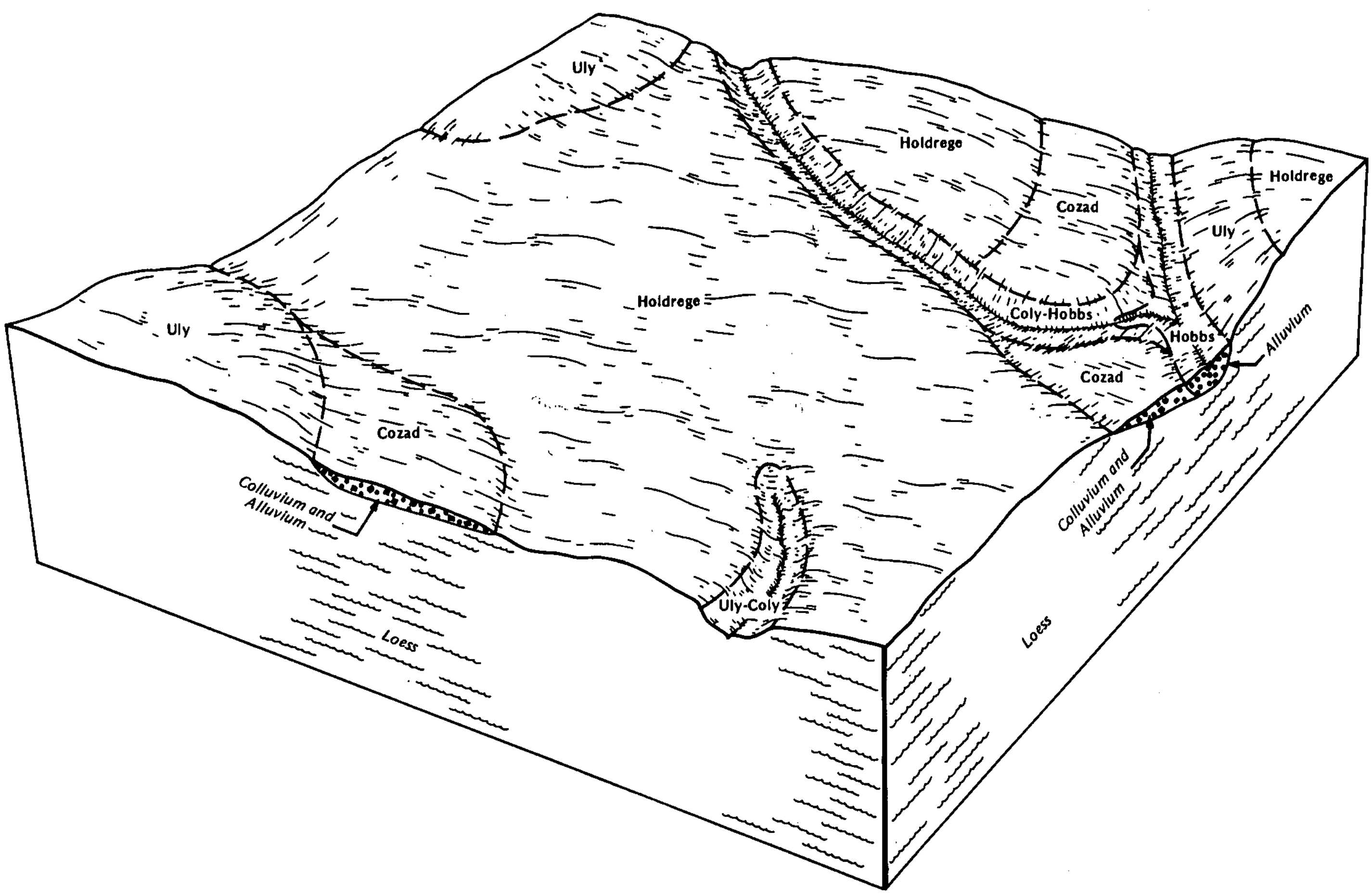

Figure 3.—Typical pattern of soils and parent material in the Holdrege-Uly-Cozad association.

This association consists of soils on smooth tableland in the uplands. Slopes range from 0 to 11 percent.

This association occupies about 8,000 acres, or about 2.2 percent of the county. It is about 70 percent Holdrege soils, 11 percent Hord soils, 11 percent Uly soils, and 8 percent minor soils.

Holdrege soils are on smooth side slopes. They are nearly level to gently sloping. Typically, the surface layer is dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer also is dark grayish brown, very friable silt loam. It is about 4 inches thick. The subsoil is about 19 inches thick. It is dark grayish brown and grayish brown, firm silty clay loam in the upper part and pale brown, friable silt loam in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam.

Hord soils are in long, narrow swales between ridges and below the Holdrege soils. They are nearly level and very gently sloping. Typically, the surface layer is grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark gray, friable silt loam about 16 inches thick. The subsoil is friable silt loam about 21 inches thick. It is dark grayish brown in the upper part, grayish brown in the next part, and pale brown in the lower part. The underlying material to a depth of 60 inches is light brownish gray silt loam.

Uly soils are on side slopes and narrow ridgetops. They are strongly sloping. Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil also is friable silt loam about 10 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Minor in this association are Fillmore Variant and Scott soils. These soils are in depressions on the tableland and are commonly ponded.

Farms in areas of this association are mainly cash-grain and livestock enterprises. Corn, grain sorghum, wheat, and alfalfa are the major crops. The soils are used for dryland farming or are irrigated with sprinkler or gravity systems. Irrigation wells generally are several hundred feet deep. Water erosion is only a slight or moderate hazard on the nearly level to gently sloping Holdrege and Hord soils, but it is a severe hazard on the strongly sloping Uly soils. In the areas managed for dryland crops, an insufficient amount of rainfall is the main limitation. Distributing an adequate amount of irrigation water while adequately controlling erosion is the chief concern in managing irrigated areas. Water erosion can be controlled by terraces, contour farming, and conservation tillage practices that leave crop residue on the surface.

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

4. Valentine Association

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

This association is in the Nebraska Sandhills. Slopes range from 0 to 45 percent, but they are generally less than 17 percent.

This association occupies about 11,500 acres, or about 3.2 percent of the county. It is about 95 percent Valentine soils and 5 percent minor soils (fig. 4).

Valentine soils are nearly level to hilly. They are on sand dunes. Typically, the surface layer is dark grayish brown loamy fine sand about 5 inches thick. The transitional layer is grayish brown fine sand about 4 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand.

The minor soils in this association are mainly the Hersh and Ipage soils. These soils are in swales or on nearly level stream terraces, generally below the Valentine soils. Ipage soils are moderately well drained.

The ranches in areas of this association are mainly limited to those used only for grazing. Much of the association is poorly suited to dryland or irrigated crops because of the slope, the erosion hazard, low fertility, and low available water capacity. An abundant supply of good quality ground water is available.

Maintaining or improving the range condition is the main management concern. The range condition and forage production can be maintained or improved by range management that includes proper grazing use, timely deferment of grazing or haying, and a grazing system that alternates grazing periods with rest periods and changes the order of these periods each year.

Ranches average about 1,280 acres in size. A few roads cross this association. Livestock is marketed within the county or is shipped to major markets.

5. Valentine-Hersh-Gates Association

Deep, nearly level to moderately steep, well drained and excessively drained, sandy and loamy soils on uplands and in upland valleys

This association consists of sand-loess transitional areas adjacent to the sandhills. Slopes range from 0 to 17 percent.

This association occupies about 7,681 acres, or about 2.1 percent of the county. It is about 43 percent Valentine soils, 33 percent Hersh soils, 11 percent Gates soils, and 13 percent minor soils.

Valentine soils are nearly level to rolling. They are on uplands. They are excessively drained. Typically, the surface layer is dark grayish brown, loose loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand.

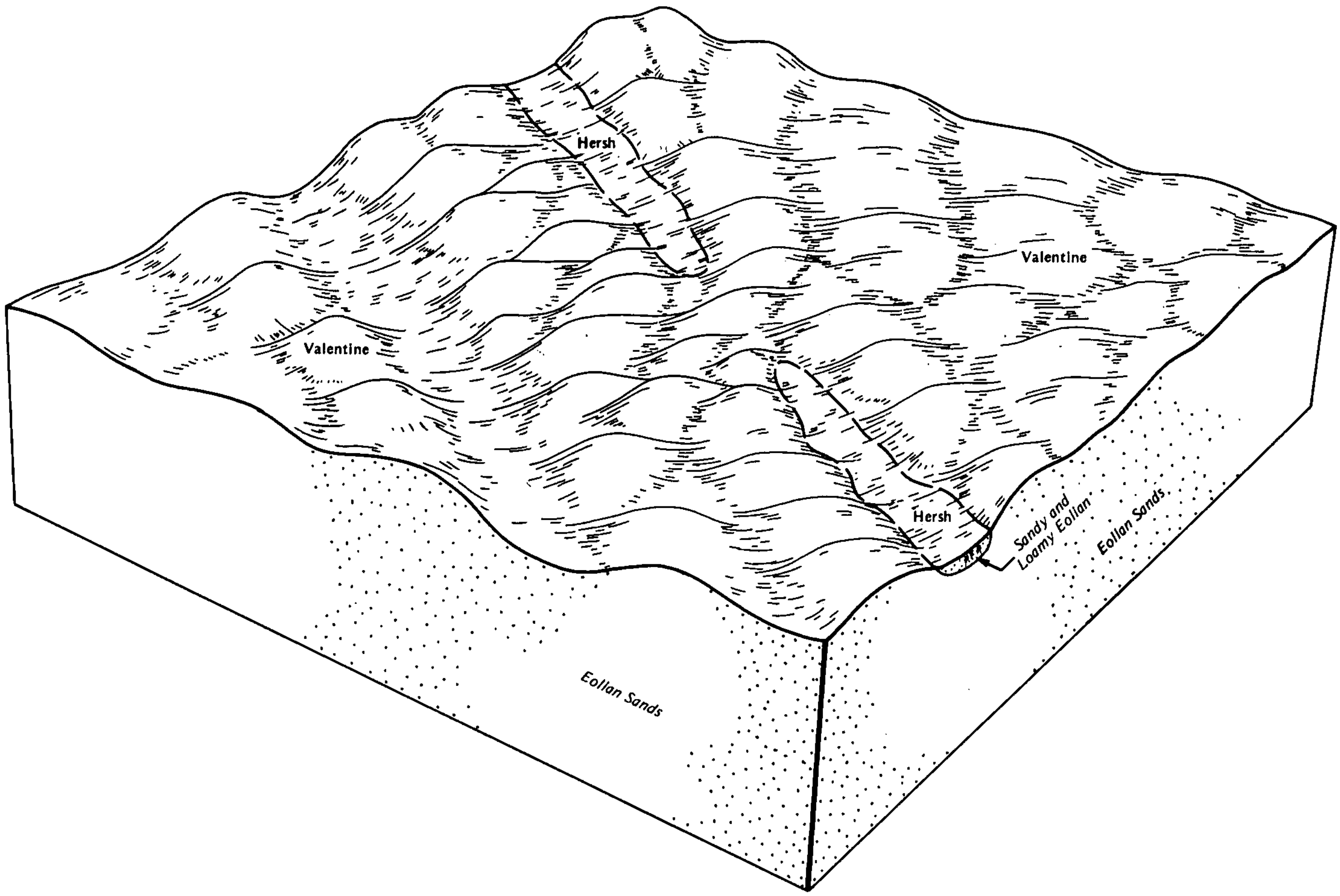

Figure 4.—Typical pattern of soils and parent material in the Valentine association.

Hersh soils generally are nearly level to moderately steep. They are on smooth side slopes or slightly hummocky ridges. They are well drained. Typically, the surface layer is grayish brown, very friable fine sandy loam about 6 inches thick. The transitional layer is brown fine sandy loam about 8 inches thick. The underlying material to a depth of 60 inches is pale brown fine sandy loam.

Gates soils are gently sloping and strongly sloping. They are on smooth side slopes and low ridges. They are well drained. Typically, the surface layer is light brownish gray, very friable very fine sandy loam about 5 inches thick. The transitional layer is light brown gray very fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray very fine sandy loam.

Minor in this association are Cozad and Ipage soils. These soils are nearly level and very gently sloping and are in areas below the major soils.

Farms in areas of this association are mainly a combination of cash-grain and livestock enterprises. Water erosion and soil blowing are the main hazards in cultivated areas. In the areas managed for dryland crops, an insufficient amount of rainfall is the main limitation. Erosion can be controlled by terraces, contour farming, and conservation tillage practices that leave crop residue on the surface. Distributing an adequate amount of irrigation water while adequately controlling erosion is the chief concern in managing irrigated areas. The range condition and forage production can be maintained or improved by range management that includes proper grazing use, timely deferment of grazing or haying, and a grazing system that alternates grazing periods with rest periods and changes the order of these periods each year.

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

6. Cozad-Hord Association

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

This association consists of soils parallel to the major rivers and streams. Slopes range from 0 to 6 percent.

This association occupies about 34,000 acres, or about 9.4 percent of the county. It is about 47 percent Cozad soils, 37 percent Hord soils, and 16 percent minor soils (fig. 5).

Cozad soils are nearly level and very gently sloping. They are on long, smooth slopes on stream terraces. Typically, the surface layer is dark gray, very friable silt loam about 6 inches thick. The subsurface layer is dark gray, friable silt loam about 4 inches thick. The subsoil is very friable silt loam about 12 inches thick. It is grayish brown in the upper part and light grayish brown in the lower part. The underlying material to a depth of 60 inches is stratified, very pale brown very fine sandy loam.

Hord soils are nearly level and very gently sloping. They are on long, smooth slopes on stream terraces. Typically, the surface layer is very dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is dark gray, very friable silt loam about 12 inches thick. The subsoil is friable silt clay loam about 24 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Minor in this association are Blendon, Butler, Detroit, Hobbs, and Simeon soils. Butler and Detroit soils are slightly lower on the landscape than the major soils, and Blendon and Simeon soils are slightly higher. Hobbs soils are on bottom land below the major soils.

Farms in areas of this association are mainly a combination of cash-grain and livestock enterprises. Corn and alfalfa are the main crops. These soils are generally irrigated by gravity systems. High producing irrigation wells can be drilled in areas of this association. Many areas receive water from the Burwell-Sumter, Taylor-Ord, and Farwell Canals. The efficient application of irrigation water is the main management concern.

Farms in areas of this association average about 640 acres in size. Gravel or improved dirt roads are along

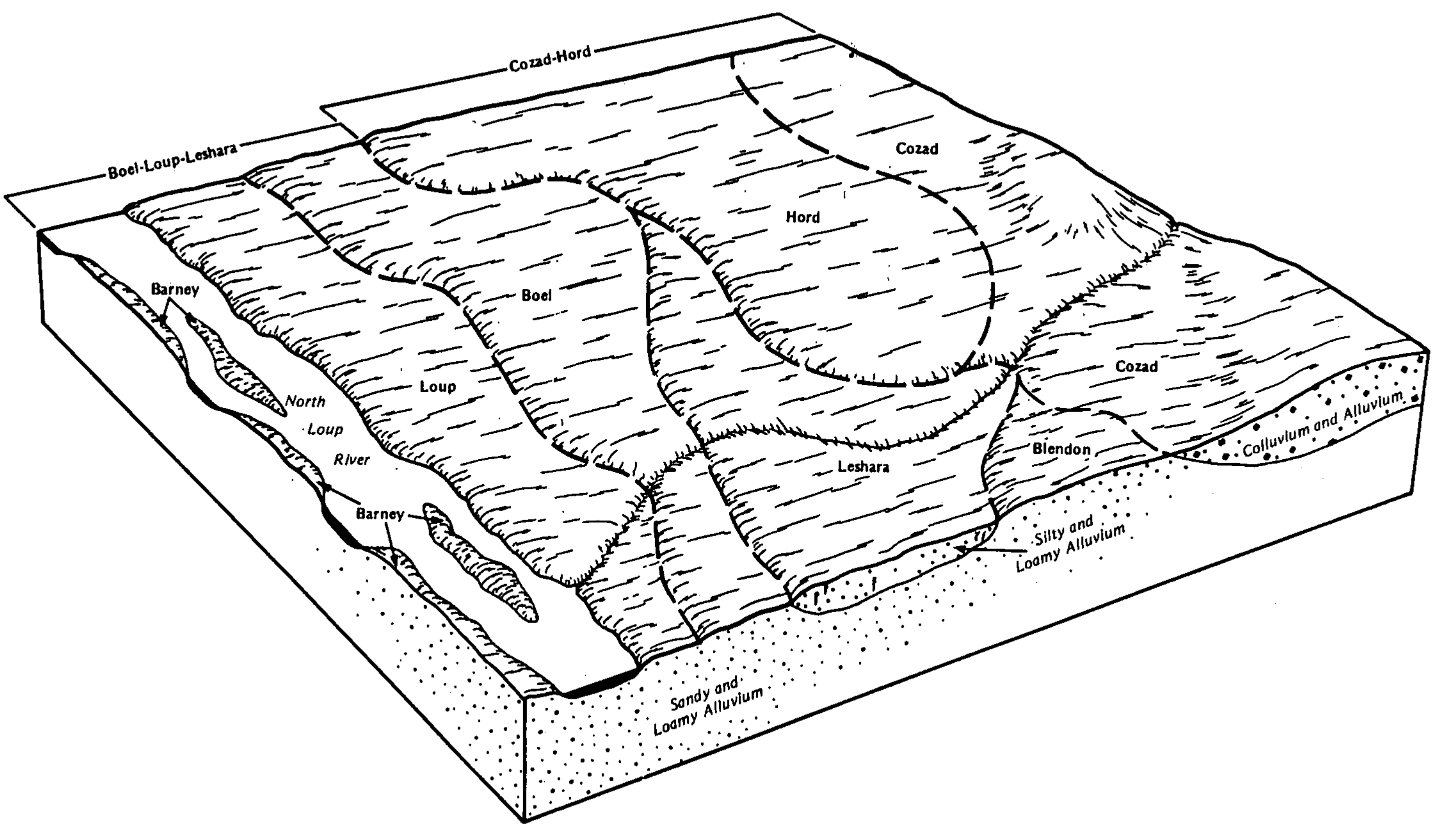

Figure 5.—Typical pattern of soils and parent material in the Cozad-Hord and Boel-Loup-Leshara associations.

most section lines. A few paved highways cross the association. Livestock is marketed mainly within the county, or it is shipped to major markets. Grain is generally stored on the farm and is fed to livestock or marketed at local grain elevators.

7. Hord-Hobbs Association

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

This associaion is on stream terraces and bottom land. Slopes range from 0 to 3 percent.

This association occupies 23,200 acres, or 6.4 percent of the county. It is about 32 percent Hord soils, 30 percent Hobbs soils, and 38 percent minor soils.

Hord soils are on long, smooth slopes on the stream terraces adjacent to major streams. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark gray, very friable silt loam about 12 inches thick. The subsoil is silty clay loam about 24 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Hobbs soils are on the long, narrow bottom land along entrenched, meandering stream channels. Typically, the surface layer is stratified, grayish brown, friable silt loam about 7 inches thick. The subsurface layer also is stratified, grayish brown, friable silt loam. It is about 17 inches thick. The underlying material to a depth of 60 inches is stratified dark gray and pale brown silt loam.

Minor in this association are Butler, Cozad, Detroit, Holdrege, and Uly soils. Butler and Detroit soils are slightly lower on the landscape than the Hord soils. Cozad soils are in the same positions on the landscape as the Hord soils. Holdrege soils are very gently sloping and are on side slopes above the major soils. Uly soils are strongly and are on side slopes.

Farms in areas of this association are mainly a combination of cash-grain and livestock enterprises. Corn and alfalfa are the main crops. The major soils are generally irrigated by gravity systems. High producing irrigation wells are in areas of this association. The efficient application of irrigation water is the main management concern.

Farms average about 480 acres in size. Gravel or improved dirt roads are along some section lines. A few paved highways cross the association. Livestock is marketed mainly within the county or is shipped to major markets. Grain is generally stored on the farm and is fed to livestock or marketed at local grain elevators.

8. Boel-Loup-Leshara Association

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

This association consists of long, narrow areas on bottom land adjacent to the North Loup and Middle Loup Rivers. The major soils are occasionally flooded. Slopes range from 0 to 2 percent.

This association occupies about 17,800 acres, or 4.9 percent of the county. It is about 25 percent Boel soils, 25 percent Loup soils, 25 percent Leshara soils, and 25 percent minor soils (fig. 5).

Boel soils are slightly higher on the landscape than Loup soils. They are somewhat poorly drained. Typically, the surface layer is dark grayish brown, very friable fine sandy loam or loamy fine sand about 7 inches thick. The transitional layer is grayish brown fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray fine sand.

Loup soils are poorly drained. Typically, the surface layer is dark gray, very friable loam about 5 inches thick. The subsurface layer also is dark gray, very friable loam about 5 inches thick. The upper part of the underlying material is light gray fine sand. The lower part to a depth of 60 inches is light gray sand.

Leshara soils are adjacent to stream and river channels. They are somewhat poorly drained. Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsurface layer is dark grayish brown silt loam about 8 inches thick. The transitional layer is grayish brown silt loam about 5 inches thick. The upper part of the underlying material is grayish brown silt loam. The next part is light brownish gray, stratified very fine sandy loam. The lower part to a depth of 60 inches is light gray, stratified fine sand and sand.

Minor in this association are Barney, Gibbon, and Saltine soils. The poorly drained Barney soils are in areas adjacent to the major rivers and below the Loup soils. The somewhat poorly drained Gibbon and Saltine soils are in areas above the Loup soils. Gibbon soils are subject to rare flooding.

The farms and ranches in areas of this association generally are headquartered in adjacent associations. Boel and Leshara soils are generally irrigated. Loup soils are used as range or hayland. Proper management of irrigation water and proper grazing use are the major concerns in managing the soils. Proper grazing use includes timely deferment of grazing or haying and restricted use during very wet periods.

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

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, 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, 1 to 3 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, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Uly-Coly silt loams, 15 to 30 percent slopes, is an example.

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits and Dumps 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.

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

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

Soil Descriptions

Ba—Barney loam, channeled, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom land. It is frequently flooded for long periods. It formed in a thin layer of loamy alluvium over sandy and gravelly alluvium. Areas are generally long and narrow and are adjacent to river channels or abandoned channels. They range from 10 to 150 acres in size.

Typically, the surface layer is stratified, dark gray, friable, calcareous loam about 6 inches thick. The subsurface layer is stratified, gray loamy fine sand about 3 inches thick. The underlying material to a depth of 60 inches is stratified, light gray sand. In some areas the surface layer is fine sandy loam or loamy fine sand and may be thinner and lighter in color. In other areas the soil is better drained.

Included with this soil in mapping are small areas of Boel and Loup soils. These soils are slightly higher on the landscape than the Barney soil. Boel soils are somewhat poorly drained. Loup soils have a dark surface layer that is thicker than that of the Barney soil. Also, they have a slightly lower seasonal high water table. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the surface soil of the Barney soil and rapid in the underlying material. The seasonal high water table is at the surface in wet years and is within a depth of 2 feet in dry years. It is highest in the spring, when the water level in streams is highest. Available water capacity is low. Organic matter content is moderately low, and natural fertility is medium. Runoff is very slow.

Most of the acreage supports native grasses or trees and shrubs. It is used for grazing or for wildlife habitat. This soil is unsuited to dryland and irrigated crops and to pasture or hay because of the high water table and the flooding.

This soil is suited to range. The natural plant community is mostly tall and mid grasses and grasslike plants dominated by prairie cordgrass, bluejoint reedgrass, northern reedgrass, and various sedges. After the plants are overgrazed or improperly harvested for hay, the site may be dominated by timothy, redtop, foxtail barley, Kentucky bluegrass, clovers, sedges, and rushes. When the surface soil is wet, overgrazing can cause surface compaction and the formation of small mounds, making grazing or harvesting for hay difficult. The soil generally is not used for hay because of the excessive wetness, the trees and shrubs, and the inaccessibility caused by the meandering stream channels. Livestock have easy access to water because flowing streams commonly intersect areas of this soil.

This soil is not suited to the trees and shrubs grown as windbreaks because of the seasonal high water table and the frequent flooding. The trees and shrubs that enhance wildlife can be established if the species selected for planting are those that can withstand the wetness.

This soil generally is unsuited to septic tank absorption fields, sewage lagoons, dwellings, and local roads because of the wetness, the flooding, and seepage of effluent into the ground water.

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

Be—Blendon fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces. It formed in sandy and loamy alluvium. Areas range from 15 to 750 acres in size.

Typically, the surface layer is dark grayish brown, friable fine sandy loam about 6 inches thick. The subsurface layer also is dark grayish brown, friable fine sandy loam. It is about 10 inches thick. The subsoil is friable fine sandy loam about 15 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of more than 60 inches is very pale brown fine sand. In some areas, the surface layer is loam or the dark colors extend to a depth of less than 20 inches. In other areas the underlying material contains gravel.

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

Permeability is moderately rapid in subsoil of the Blendon soil and rapid in underlying material. Available water capacity is moderate. Organic matter content also is moderate, and natural fertility is medium. Tilth is good, and the soil can be easily worked throughout a wide range of moisture conditions. The water intake rate is moderately high.

Most of the acreage is used for irrigated crops. A few small areas support native grasses.

If used for dryland farming, this soil is suited to grain sorghum, wheat, and alfalfa. Soil blowing is a hazard unless the surface is adequately protected by crops or crop residue. Conservation tillage practices that leave crop residue on the surface help to control soil blowing and conserve moisture. Stripcropping, stubble mulching, and field windbreaks also help to control soil blowing. Returning crop residue and green manure crops to the soil helps to maintain or improve the organic matter content.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is well suited to most sprinkler systems. Soil blowing is a hazard unless the surface is adequately protected by crops or crop residue. Conservation tillage practices that leave crop residue on the surface help to control soil blowing and conserve moisture. If gravity irrigation systems are used, relatively short runs are needed because of the moderately high intake rate.

This soil is suited to pasture and hay. Forage production can be increased or maintained and soil blowing controlled by proper stocking rates and rotation grazing. Applying fertilizer and seeding a mixture of suitable grasses and legumes also increase production.

This soil is suited to range. A cover of range plants is very effective in controlling soil blowing. The natural plant community is dominated by blue grama, little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. After the plants are continuously overgrazed, the site is dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a good site for the trees and shrubs grown as windbreaks. Soil blowing, lack of sufficient moisture, and competition from weeds and grasses are the main management concerns. Soil blowing can be controlled by establishing strips of sod or a cover crop between the rows. Irrigation can provide supplemental moisture during periods of low rainfall. Weeds and grasses can be controlled by cultivating between the rows with conventional equipment or by applying appropriate herbicides in the rows.

This soil is suitable as a site for dwellings. It readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity may result in the pollution of the underground water table. Seepage is a limitation on sites for sewage lagoons. It can be controlled by lining or sealing the lagoon. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is dark grayish brown, loose loamy fine sand about 6 inches thick. The subsurface layer also is dark grayish brown, loose loamy fine sand. It is about 5 inches thick. The underlying material to a depth of 60 inches is light gray fine sand. In some areas the surface layer is fine sandy loam or very fine sandy loam. In other areas it is lighter colored and thinner.

Included with this soil in mapping are small areas of Barney, Ipage, and Loup soils. Barney and Loup soils are poorly drained and are in the slightly lower positions on the landscape. Ipage soils are moderately well drained and are in the slightly higher positions on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is rapid in the Boel soil. The depth to the seasonal high water table ranges from 1.5 feet in wet years to 3.5 feet in dry years. Available water capacity is low. Organic matter content is moderately low, and natural fertility is medium. The water intake rate is very high.

Most areas are used for cultivated crops. A few support native grasses and are used for grazing or hay.

If used for dryland farming, this soil is poorly suited to most of the crops commonly grown in the county. The principal management concerns are the wetness and soil blowing. During periods when the water table is low, the lack of moisture caused by the low available water capacity also is a concern. In areas where suitable outlets are available, tile drains or open ditches help to lower the seasonal high water table below detrimental levels. Conservation tillage practices that leave crop residue on the surface help to control soil blowing and conserve moisture.

If irrigated by sprinklers, this soil is poorly suited to corn, grain sorghum, and alfalfa. It is not suited to gravity irrigation because of the very high intake rate and the low available water capacity. The wetness and soil blowing are the principal management concerns. Tile drains or open ditches reduce the wetness. Soil blowing can be controlled by field windbreaks and conservation tillage practices that leave crop residue on the surface. A uniform distribution of water and carefully controlled application rates are important considerations.

This soil is poorly suited to pasture and hay. The wetness and the flooding are management concerns. Deposition of silt or sand by floodwater can damage the grasses. Grazing or haying should be delayed until the surface is firm. Forage production can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to irrigation. Because of leaching through this rapidly permeable soil, however, applying an excessive amount of fertilizer can result in the contamination of the ground water.

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 bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by timothy, redtop, foxtail barley, Kentucky bluegrass, clovers, sedges, and rushes.

This soil is a good site for the trees and shrubs grown as windbreaks. The species that can withstand the occasional wetness survive and grow well. Soil blowing can damage new seedlings. It can be controlled by planting a cover crop between the rows.

This soil is unsuited to septic tank absorption fields, sewage lagoons, and dwellings because of the wetness, the flooding, and seepage. A suitable alternative site is needed. Constructing local roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding and by wetness.

The capability units are IVw-5, dryland, and IVw-11, irrigated; Subirrigated range site; windbreak suitability group 2S.

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

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 7 inches thick. The transitional layer is grayish brown fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray fine sand. In some areas the surface layer is lighter colored or is loamy fine sand, very fine sandy loam, or loam. In other areas the upper part of the underlying material is fine sandy loam.

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

Permeability is moderately rapid in the upper part of the Boel soil and rapid in the lower part. The depth to the seasonal high water table ranges from 1.5 feet in wet years to 3.5 feet in dry years. Available water capacity is low. Organic matter content is moderately low, and natural fertility is medium. The water intake rate is moderately high.

Most areas are cultivated and irrigated. A few small areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. The wetness is the principal limitation. During wet years it can delay cultivation in the spring. In areas where suitable outlets are available, tile drains or open ditches help to lower the seasonal high water table below detrimental levels.

If irrigated by sprinklers, this soil is suited to corn, grain sorghum, and alfalfa. Some areas are irrigated by gravity systems. The wetness is the principal limitation. Tile drains or open ditches help to lower the water table. If gravity systems are used, relatively short runs are needed because of the moderately high intake rate and the low available water capacity. If sprinkler systems are used, obtaining a uniform distribution of water and controlled application rates is easier.

This soil is suited to pasture and hay. The wetness and the flooding are management concerns. Deposition of silt or sand by floodwater can damage the grasses. Grazing or haying should be delayed until the surface is firm. Forage production can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to irrigation.

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 bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by timothy, redtop, foxtail barley, Kentucky bluegrass, clovers, sedges, and rushes.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. The species that can withstand the occasional wetness survive and grow well.

This soil is unsuited to septic tank absorption fields, sewage lagoons, and dwellings because of the wetness, the flooding, and seepage. A suitable alternative site is needed. Constructing local roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding and by wetness.

The capability units are IIIw-6, dryland, and IIIw-11, irrigated; Subirrigated range site; windbreak suitability group 2S.

Bu—Butler silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil formed in alluvium on stream terraces. Areas range from 20 to 200 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 7 inches thick. The subsurface layer is friable silt loam about 5 inches thick. It is dark grayish brown in the upper part and gray in the lower part. The subsoil is about 36 inches thick. It is dark grayish brown silty clay in the upper part, gray silty clay in the next part, and gray silty clay loam in the lower part. The underlying material to a depth of 60 inches is light gray silt loam.

Included with this soil in mapping are small areas of Cozad, Detroit, and Hord soils. Detroit soils are moderately well drained and are in positions on the landscape similar to those of the Butler soil. Cozad and Hord soils have less clay in the subsoil than the Butler soil. Also, they are higher on the landscape. Included soils make up about 10 to 15 percent of the map unit.

Permeability is slow in the Butler soil. A perched seasonal high water table is at a depth of about 0.5 foot to 2.0 feet, mainly for short periods early in spring. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. Runoff is slow. The water intake rate is low. The shrink-swell potential is moderate in the surface layer and high in the subsoil.

Most of the acreage is used for cultivated crops. Some small areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. The clayey subsoil restricts water movement through the soil and inhibits the penetration of plant roots. Crops may be adversely affected by a lack of moisture during dry periods. A cropping sequence that includes legumes improves soil structure, water movement, and root penetration. Selecting drought-tolerant crops for planting reduces crop losses.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is suited to gravity and sprinkler irrigation. The low water intake rate, the slow permeability, and restricted root penetration are the main management concerns. Careful water management measures, such as timely applications and proper application rates, are important considerations. If the soil is leveled for gravity irrigation, the firm, clayey subsoil should not be exposed because it absorbs water slowly and cannot be easily tilled. Crops do not grow well if the subsoil is exposed. Irrigation tailwater recovery systems improve efficiency and conserve water.

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

This soil is suited to range. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, green needlegrass, and western wheatgrass. When the plants are continuously overgrazed, big bluestem and little bluestem decrease in abundance and sideoats grama, blue grama, and western wheatgrass increase. If overgrazing continues for many years, the less desirable plants, especially pricklypear, buckbrush, Arkansas rose, western snowberry, and annual and perennial weeds, increase in abundance. Forage production is severely reduced during dry years because of insufficient moisture.

This soil generally is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Removal of competing vegetation and good seedbed preparation help to establish new seedlings. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods.

This soil is not suited to septic tank absorption fields because of the slow permeability in the subsoil and the wetness. It is poorly suited to sewage lagoons because of the perched water table. It is not suited to dwellings because of the wetness and the high shrink-swell potential in the subsoil. A suitable alternative site is needed.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system helps to prevent the damage caused by frost action and by wetness. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

The capability unit is IIw-2, dryland and irrigated; Clayey range site; windbreak suitability group 2W.

CrE2—Coly-Hobbs silt loams, 2 to 17 percent slopes, eroded. These deep, well drained soils are adjacent to intermittent drainageways in the uplands and to draingeways that cross stream terraces. The moderately steep Coly soil is on side slopes. It formed in calcareous loess. The nearly level Hobbs soil is on narrow bottom land. It is occasionally flooded. It formed in alluvium. Areas range from 20 to 200 acres in size. They are 55 to 75 percent Coly soil and 20 to 35 percent Hobbs soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Coly soil has a surface layer of pale brown, friable, calcareous silt loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Typically, the Hobbs soil has a surface layer of very dark gray silt loam about 6 inches thick. The underlying material to a depth of 60 inches is stratified dark grayish brown and grayish brown silt loam.

Included with these soils in mapping are small areas of Cozad, Holdrege, Hord, and Uly soils. Cozad and Hord soils have a surface layer that is darker than that of the Coly soil. They are not stratified. They are higher on the landscape than Hobbs soil. Holdrege and Uly soils have more clay in the subsoil than the Coly and Hobbs soils. They are side slopes along the intermittent drainageways. Included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in the Coly and Hobbs soils, and available water capacity is high. Runoff is rapid on the Coly soil and medium on the Hobbs soil. Organic matter content is low in the Coly soil and moderate in the Hobbs soil. Natural fertility is medium in the Coly soil and high in the Hobbs soil.

Most of the acreage is used for cultivated crops. Some small areas of grasses are used for grazing.

These soils are not suited for dryland or irrigated crops because of a severe hazard of water erosion on the moderately steep Coly soil. They are suited to introduced grasses for grazing or haying. Reseeding to native grasses is a suitable alternative to farming.

The Coly soil is suited to reseeding of native grasses for range. A cover of these grasses is very effective in controlling water erosion. The species seeded are mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, and western wheatgrass. When the plants are continuously overgrazed, big bluestem and little bluestem decrease in abundance and sideoats grama, blue grama, tall dropseed, western wheatgrass, and annual and perennial weeds increase. Also, woody plants, including bur oak, eastern redcedar, buckbrush, snowberry and sumac, invade the site. Brush management is generally needed to control these plants.

The Hobbs 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, switchgrass, western wheatgrass, and various sedges. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Also, woody plants, including snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

The Coly soil is a fair site for the trees and shrubs grown as windbreaks. A high content of calcium carbonate and competition from grasses and weeds are the principal management concerns. Also, water erosion is a hazard. It can be controlled by planting on the contour and terracing. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation and by timely cultivation or applications of approved herbicides. The Hobbs soil is a good site for windbreaks. It receives beneficial runoff from adjacent areas.

The Coly soil is limited as a site for septic tank absorption fields and dwellings because of the moderately steep slope. Installing septic tank absorption fields on the contour or land shaping helps to ensure better performance. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. The Hobbs soil is unsuitable as a site for septic tank absorption fields, sewage lagoons, and dwellings because of the flooding.

Local roads constructed across areas of these soils should be designed so that the surface pavement and base material are thick enough to compensate for low soil strength. Providing coarser grained base material helps to ensure better performance. Constructing the roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding on the Hobbs soil. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage. Cutting and filling generally are needed to provide a suitable grade.

The capability unit is VIe-9, dryland. The Coly soil is in windbreak suitability group 8 and in Limy Upland range site. The Hobbs soil is in windbreak suitability group 1 and in Silty Overflow range site.

CrG—Coly-Hobbs silt loams, 2 to 60 percent slopes. These deep soils are on uplands and the adjacent bottom land. The excessively drained Coly soil formed in calcareous loess on very steep canyon sides and narrow ridges between canyons. The canyon sides commonly have a succession of catsteps (fig. 6), which expose the parent material. The well drained, nearly level and very gently sloping Hobbs soil formed in stratified alluvium on bottom land along intermittent drainageways. It is occasionally flooded. Areas range from 50 to 1,000 acres in size. They are 80 to 90 percent Coly soil and 5 to 15 percent Hobbs soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Coly soil is grayish brown, very friable, calcareous silt loam about 4 inches

Figure 6.—An area of Coly-Hobbs silt loams, 2 to 60 percent slopes. Catsteps are common in areas of the Coly soil.

thick. The transitional layer is light brownish gray, very friable, calcareous silt loam about 6 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. In some areas the surface layer is overblown with a few inches of more recent silt or sand. In many places reddish brown silt and sand are exposed on the lower parts of canyon walls.

Typically, the surface layer of the Hobbs soil is grayish brown, friable, stratified silt loam about 8 inches thick. The underlying material to a depth of 60 inches is light grayish brown and pale brown, stratified silt loam. In some areas the surface layer is calcareous. In other areas the soil is stratified with a few thin layers of sand.

Included with these soils in mapping are small areas of Uly soils. These included soils are on the broader ridges between canyons and on the lower side slopes. They are not stratified. They have a surface layer that is darker and thicker than that of the Coly soil, are leached of carbonates to a greater depth, and have a weakly expressed subsoil. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Coly and Hobbs soils, and available water capacity is high. Runoff is very rapid on the Coly soil and medium on the Hobbs soil. Organic matter content is moderately low in the Coly soil and moderate in the Hobbs soil. Natural fertility is medium in the Coly soil and high in the Hobbs soil.

All of the acreage supports native grasses and is used mainly for grazing. These soils also provide habitat for many kinds of wildlife. They are unsuited to dryland or irrigated crops and to pasture and hay because of the very steep slopes and the inaccessibility caused by the rugged terrain.

The Coly soil is suited to range. A cover of range plants is effective in controlling water erosion. The natural plant community is dominated by big bluestem, little bluestem, and sideoats grama. When the plants are continuously overgrazed, big bluestem and little bluestem decrease in abundance and sideoats grama, plains muhly, sand dropseed, Kentucky bluegrass, and numerous annual and perennial weeds increase. If overgrazing continues for many years, the less desirable woody plants, including smooth sumac, snowberry, woods rose, bur oak, and small soapweed, increase in abundance. Brush management is generally needed to control these plants. Because of the slope, some areas are inaccessible. As a result, poor livestock distribution can be a problem. Obtaining a uniform distribution of grazing is difficult because livestock tend to overgraze the easily accessible Hobbs soil on narrow bottom land and the narrow ridges between the canyons and tend to avoid the very steep areas of the Coly soil. In most areas overgrazing on the narrow bottom land and narrow ridges has resulted in deterioration of the potential natural vegetation. Gullies caused by water erosion can form if livestock continuously take the same path on very steep slopes to watering and salting facilities. Carefully locating these facilities and providing an adequate number of them help to prevent gullying and help to achieve a more uniform distribution of grazing.

The Hobbs 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, and western wheatgrass. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Also, woody plants, including snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

The Coly soil is unsuited to the trees and shrubs grown as windbreaks because of the very steep slopes. The survival and growth rates of adapted species are poor. The trees and shrubs that enhance wildlife habitat can be planted by hand. The Hobbs soil is a good site for trees and shrubs.

These soils are well suited to habitat for wildlife, such as pheasants, quail, prairie chickens, grouse, rabbits, coyotes, and deer. They provide both food and good cover for these animals.

These soils are unsuited to septic tank absorption fields, sewage lagoons, and dwellings because of the excessive slope of the Coly soil and the flooding on the Hobbs soil. A suitable alternative site is needed. The soils are poorly suited to local roads because of the excessive slope of the Coly soil and the occasional flooding on the Hobbs soil. Extensive grading would be needed during road construction. In many areas roads are routed around these soils and thus construction problems are avoided. The roads should be designed so that the surface pavement and base material are thick enough to compensate for low soil strength. Providing coarser grained base material helps to ensure better performance.

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

CuE2—Coly-Uly silt loams, 11 to 17 percent slopes, eroded. These deep, well drained, moderately steep soils are on side slopes and convex ridges in the uplands. They formed in loess. The Coly soil is on convex, narrow ridges and the upper parts of side slopes. The Uly soil is on the less sloping, lower parts of the side slopes and in concave areas. Areas range from 20 to 200 acres in size. They are 45 to 60 percent Coly soil and 20 to 40 percent Uly soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

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

Typically, the Uly soil has a surface layer of grayish brown, friable silt loam about 7 inches thick. The subsoil is pale brown, friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is light gray silt loam.

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

Permeability is moderate in the Coly and Uly soils, and available water capacity is high. Runoff is rapid. Organic matter content is low, and natural fertility is medium. Tilth is good.

Most of the acreage is cropland. Some areas have been reseeded to grasses and are used as range or pasture. These soils are not suited to dryland or irrigated crops or to pasture and hay because of a very severe water erosion hazard. Reseeding to native grasses is a suitable alternative to farming.

The Coly soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, big bluestem and little bluestem decrease in abundance and sideoats grama, blue grama, tall dropseed, western wheatgrass, and annual and perennial weeds increase. Also, woody plants, including bur oak, eastern redcedar, buckbrush, snowberry, and sumac, invade the site. Brush management and prescribed burning may be needed to control these plants.

The Uly soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

These soils are fair sites for the trees and shrubs grown as windbreaks. A high content of calcium carbonate and competition from grasses and weeds are the principal management concerns. Also, water erosion is a hazard. It can be controlled by planting on the contour and terracing. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation and by timely cultivation or applications of approved herbicides.

The slope is a limitation if these soils are used as sites for sanitary facilities or dwellings. Installing septic tank absorption fields on the contour and land shaping help to ensure better performance. A less sloping alternative site for sewage lagoons is needed. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to an acceptable gradient.

Local roads constructed across areas of these soils should be designed so that the surface pavement and base material are thick enough to compensate for low soil strength. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage. Cutting and filling generally are needed to provide a suitable grade.

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

Cx—Cozad silt loam, 0 to 1 percent slopes. This deep, well drained, nearly level soil is in upland valleys. It formed in alluvium and colluvium derived from the adjacent loess uplands. Areas range from 10 to 500 acres in size.

Typically, the surface layer is grayish brown, very friable silt loam about 6 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 4 inches thick. The subsoil is brown, friable silt loam about 12 inches thick. The underlying material is light gray silt loam about 20 inches thick. Below this is a buried surface layer of dark gray silt loam about 12 inches thick. The buried underlying material to a depth of 60 inches is light gray silt loam. In some areas the surface layer and subsoil are dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Holdrege soils. These soils have more clay in the subsoil than the Cozad soil. Also, they are higher on the landscape. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Cozad soil. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

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

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. Land leveling is commonly needed to establish a suitable grade for gravity systems. Efficient water use and control of runoff are important considerations. Reuse systems improve efficiency and conserve water.

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

This soil is suited to range. The natural plant community is a mixed grass prairie dominated by big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. The soil is suited to dwellings. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

CxB—Cozad silt loam, 1 to 3 percent slopes. This deep, well drained, very gently sloping soil is on foot slopes in upland valleys. It formed in alluvium and colluvium derived from the adjacent loess uplands. Areas range from 10 to 200 acres in size.

Typically, the surface soil is dark grayish brown, very friable silt loam about 8 inches thick. The subsoil is very friable silt loam about 17 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is light gray very fine sandy loam. In some areas the surface layer has been altered by land leveling. Buried soils are common. In places the surface layer and subsoil are dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Holdrege soils. These soils have more clay in the subsoil than the Cozad soil. Also, they are higher on the landscape. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Cozad soil. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard unless the surface is protected by vegetation or crop residue. Terraces, contour farming, and conservation tillage practices that leave crop residue on the surface help to control erosion and conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. Terraces, contour farming, and conservation tillage practices, such as minimum tillage, help to control erosion and conserve moisture. Land leveling is commonly needed to establish a suitable grade for gravity systems. Efficient water use and control of runoff are important considerations.

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

This soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. The soil is suited to dwellings. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

CxC—Cozad silt loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on foot slopes in the uplands. It formed in alluvium. Areas range from 10 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer also is dark grayish brown, friable silt loam. It is about 6 inches thick. The subsoil is grayish brown, friable silt loam about 12 inches thick. The underlying material to a depth of 60 inches is pale brown silt loam. In some areas the surface layer is thinner and lighter colored. In other areas the surface layer and subsoil are dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Holdrege soils. These soils have more clay in the subsoil than the Cozad soil. Also, they are higher on the landscape. They make up 2 to 10 percent of the map unit.

Permeability is moderate in the Cozad soil, and available water capacity is high. Runoff is medium. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate.

Most of the acreage is used for cultivated crops. Some small areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard if cultivated crops are grown. Conservation tillage practices that leave crop residue on the surface are effective in controlling erosion and in conserving moisture. Terraces and contour farming also help to control erosion. Returning crop residue to the soil helps to maintain or improve the organic matter content and fertility.

If irrigated by sprinkler systems, this soil is suited to corn and grain sorghum and to alfalfa and grasses for hay or pasture. It is not suited to gravity irrigation systems unless the slope can be reduced to a nonerosive grade by land leveling or contour bench leveling. In areas irrigated by sprinklers, terraces, contour farming, and conservation tillage practices that leave crop residue on the surface help to control erosion and conserve moisture. Including a maximum of close-grown crops in the cropping sequence also helps to control erosion. Efficient water use and control of runoff are important considerations.

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

This soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides. Erosion can be controlled by planting on the contour and terracing and by establishing strips of sod or a cover crop between the rows. Irrigation can provide the supplemental moisture needed during periods of insufficient rainfall.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by lining or sealing the lagoon. The soil is suited to dwellings. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is dark gray, very friable silt loam about 6 inches thick. The subsurface layer also is dark gray, friable silt loam. It is about 4 inches thick. The subsoil is very friable silt loam about 12 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is stratified, very pale brown silt loam. In some areas the surface layer has been altered by land leveling. Buried soils are common. In some areas the surface layer and subsoil are dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Holdrege soils. These soils have more clay in the subsoil than the Cozad soil. Also, they are higher on the landscape. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Cozad soil. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate.

Most of the acreage is used for irrigated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. A lack of sufficient moisture during dry periods is the principal concern of management. Conservation tillage practices that leave crop residue on the surface are effective in conserving moisture.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa (fig. 7). It is suited to both gravity and sprinkler irrigation systems. Land leveling is commonly needed to establish a suitable grade for gravity systems. Efficient water use and control of runoff are important considerations. Reuse systems improve efficiency and conserve water.

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

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, indiangrass, sideoats grama, and switchgrass. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by Kentucky bluegrass, tall dropseed, western wheatgrass, and numerous annual and perennial weeds. Also, woody plants, including snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive

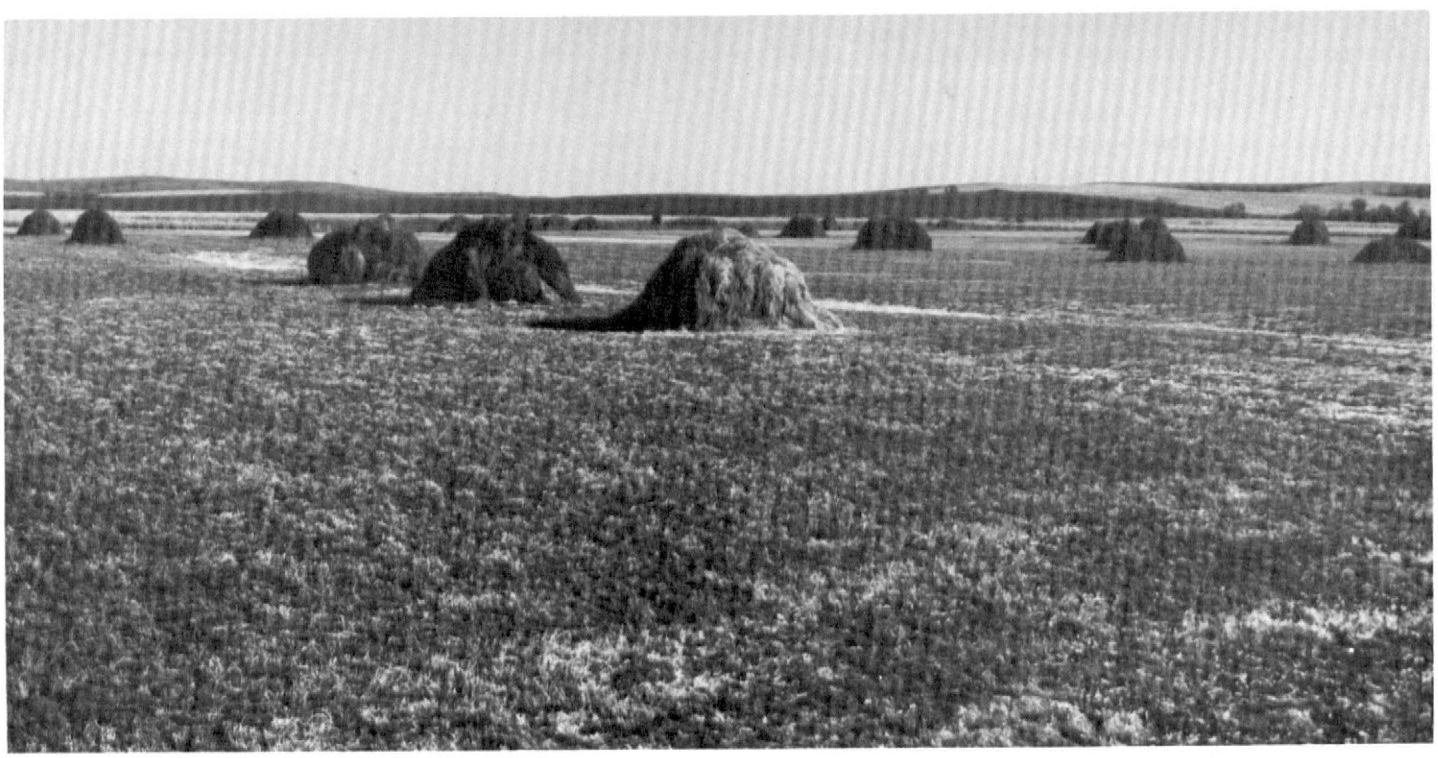

Figure 7.—Stacks of alfalfa hay on Cozad silt loam, terrace, 0 to 1 percent slopes.

and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides.

Septic tank absorption fields function well in this soil if they are protected from floodwater. Sewage lagoons should be diked, so that they are protected from floodwater. Sealing or lining the lagoon helps to prevent seepage. The soil is suited to dwellings constructed on elevated, well compacted fill above flood levels.

Constructing local roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. Installing a good surface drainage system helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is dark gray, very friable silt loam about 6 inches thick. The subsurface layer also is dark gray, very friable silt loam about 6 inches thick. The subsoil is light brownish gray, very friable silt loam about 11 inches thick. The underlying material to a depth of 60 inches is light gray silt loam. In some areas the surface layer has been altered by land leveling. Buried soils are common. In places the surface layer and subsoil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Holdrege soils. These soils have more clay in the subsoil than the Cozad soil. Also, they are higher on the landscape. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Cozad soil. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard unless the surface is protected by vegetation or crop residue. Terraces, contour farming, and conservation tillage practices that leave crop residue on the surface help to control erosion and conserve moisture.

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

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

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, indiangrass, sideoats grama, and switchgrass. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by Kentucky bluegrass, tall dropseed, western wheatgrass, and numerous annual and perennial weeds. Also, woody plants, primarily snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods.

Septic tank absorption fields function well in this soil if they are protected from flooding. Sewage lagoons should be diked, so that they are protected from flooding. Sealing or lining the lagoon helps to prevent seepage. Buildings can be constructed on elevated, well compacted fill above flood levels.

Constructing local roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. Installing a good surface drainage system helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

De—Detroit silt loam, 0 to 1 percent slopes. This deep, moderately well drained, nearly level soil is on stream terraces. It formed in silty alluvium. Areas range from 20 to 200 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 6 inches thick. The subsurface layer also is very dark gray, friable silt loam. It is about 4 inches thick. The subsoil is about 38 inches thick. It is very dark gray, firm silty clay loam in the upper part; dark grayish brown, firm silty clay in the next part; and grayish brown and brown, firm silty clay loam in the lower part. The underlying material to a depth of 60 inches is pale brown silt loam. In some areas the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Butler and Hord soils. Butler soils are characterized by an abrupt textural change between the surface layer and the subsoil. They are somewhat poorly drained and are in the slightly lower areas. Hord soils have less clay in the subsoil than the Detroit soil. Also, they are higher on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is slow in the Detroit soil. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is low. The shrink-swell potential is high in the subsoil.

Most of the acreage is used for cultivated crops. Many areas are irrigated. Some small areas support native grass and are used for grazing.

If used for dryland farming, this soil is suited to grain sorghum, wheat, and alfalfa. The main concern of management is a lack of sufficient moisture during the growing season. Conservation tillage practices that keep crop residue on the surface conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is suited to both gravity and sprinkler systems. The low water intake rate is the main concern of management. It can be overcome by timely water applications and controlled application rates.

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

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, indiangrass, sideoats grama, and switchgrass. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by Kentucky bluegrass, tall dropseed, western wheatgrass, and numerous annual and perennial weeds. Also, woody plants, including snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Competition from grasses and weeds is the principal management concern. Seedlings generally survive and grow if the competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides. Irrigation can provide the supplemental moisture needed for establishing seedlings during periods of insufficient rainfall.

The slow permeability is a limitation if this soil is used as a septic tank absorption field. It generally can be overcome, however, by increasing the size of the absorption field. Otherwise, an alternative system can be installed. Sewage lagoons can be used for waste disposal. Strengthening the foundations of buildings and backfilling with coarse material help to prevent the damage caused by shrinking and swelling.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Mixing the base material with additives, such as hydrated lime, helps to prevent shrinking and swelling.

The capability units are IIc-1, dryland, and I-2, irrigated; Silty Lowland range site; windbreak suitability group 3.

Fm—Fillmore Variant silt loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is in depressions in the uplands. It is ponded for short periods after heavy rains. It formed in loess covered by stratified recent alluvium. Areas are oval and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The next layer is dark grayish brown, stratified silt loam about 16 inches thick. Below this is a buried soil. The upper part of the buried surface soil is dark gray, friable silt loam about 12 inches thick, and the lower part is light gray silt loam about 6 inches thick. The subsoil of the buried soil to a depth of 60 inches is firm. It is dark gray silty clay in the upper part and gray silty clay loam in the lower part. In some areas the surface layer is silty clay loam. In other areas the buried soil is closer to the surface or deeper. Some areas have been drained by open drainage ditches.

Included with this soil in mapping are small areas of Scott soils. These soils are not stratified and have a surface soil that is thinner than that of the Fillmore Variant soil. Also, they are ponded for longer periods and are lower on the landscape. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the upper part of the Fillmore Variant soil and slow in the buried subsoil. Available water capacity is high. The soil receives runoff from the higher adjacent areas. A perched seasonal high water table is 0.5 foot above the surface to 3.0 feet below. Organic matter content is moderate and natural fertility is high. The water intake rate is moderate.

Most of the acreage is used for cultivated crops. Some areas of grasses are used for grazing. During wet periods when cultivation is not possible, the vegetation is commonly smartweed and annual grasses.

If used for dryland farming, this soil is suited to corn and grain sorghum. It is not suited to alfalfa and wheat because of the ponding. The wetness often delays planting. Ponding and deposition of silt from the surrounding soils may cause surface crusting and damage newly seeded crops. The ponding causes considerable crop losses during about 4 years in 10 unless the soil is drained. Weeds are a problem when the surface is too wet for timely cultivation. The susceptibility to ponding can be reduced by applying good conservation measures in the surrounding areas. Examples of these measures are terraces, contour farming, grassed waterways, and minimum tillage.

If irrigated, this soil is poorly suited to corn and grain sorghum. Either gravity or spinkler irrigation systems are used. Land leveling can improve surface drainage. Reuse pits remove excess irrigation water and improve irrigation efficiency. Terraces, contour farming, and conservation tillage on the surrounding soils help to control runoff and reduce the susceptibility to ponding on this soil. During very wet periods, the wheels of center-pivot systems can become mired in mud. Grading ridges for the wheels to travel on may help to prevent miring.

This soil is poorly suited to pasture and hay. The ponding is the main hazard. Deposition of silt may damage the grasses. A surface drainage system may be needed to maintain satisfactory stands of grasses. Grazing or haying should be delayed until the surface is firm and the grasses have reached a suitable height. Forage production can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to irrigation.

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. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Also, woody plants, primarily snowberry and buckbrush, invade the site. Brush management may be needed to control these plants.

This soil generally is a good site for the trees and shrubs grown as windbreaks if the species selected for planting are those that can withstand the occasional wetness. Establishing dikes or terraces on the adjacent soils helps to control ponding on this soil. Land leveling also improves surface drainage. Competition from weeds and grasses is a management concern. Seedlings generally survive and grow if the competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides.

This soil is unsuited to septic tank absorption fields and sewage lagoons because of the ponding and the slow permeability. It is unsuited to sewage lagoons and dwellings because of the ponding. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Constructing the roads on suitable, well compacted fill material above ponded water levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by ponding. Installing a good surface drainage system helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

The capability unit is IIIw-2, dryland and irrigated; Silty Overflow range site; windbreak suitability group 2W.

GfC2—Gates very fine sandy loam, 3 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on side slopes and ridges on uplands and stream terraces. It formed in recent loess. Areas range from 10 to 75 acres in size.

Typically, the surface layer is grayish brown, friable very fine sandy loam about 5 inches thick. The transitional layer is light brownish gray, very friable fine sandy loam about 4 inches thick. The underlying material to a depth of 60 inches is very pale brown and light gray, calcareous very fine sandy loam. In some areas the surface layer is calcareous.

Included with this soil in mapping are a few small areas of Cozad and Hersh soils. Cozad soils have a surface layer that is darker than that of the Gates soil. Also, they are lower on the landscape. Hersh soils are fine sandy loam throughout. They are higher on the landscape than the Gates soil. Included soils make up 2 to 10 percent of the map unit.

Permeability is moderate in the Gates soil, and available water capacity is high. Runoff is medium. Organic matter content and natural fertility are low. The water intake rate is moderate.

Most of the acreage is used for cultivated crops. Some small areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion and soil blowing are hazards unless the surface is adequately protected by vegetation or crop residue. Conservation tillage practices that leave crop residue on the surface are effective in controlling erosion and soil blowing and in conserving moisture. In areas where the slopes are suitable, terraces and contour farming also help to control water erosion. Returning crop residue and green manure crops to the soil helps to maintain or improve the organic matter content and fertility.

If irrigated by sprinkler systems, this soil is suited to corn, grain sorghum, and alfalfa. It is not suited to gravity irrigation because of the excessive slope. Conservation tillage practices that leave crop residue on the surface help to control water erosion and conserve moisture. In areas where the slopes are suitable, terraces and contour farming also help to control erosion. Efficient management of irrigation water and control of runoff are management concerns.

This soil is suited to pasture and hay. Forage production can be increased or maintained by proper stocking rates and a planned grazing system. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after irrigation until the surface is firm and the grasses have reached a suitable height.

This soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled and an adequate supply of moisture is available during periods when seedlings are becoming established. Competing vegetation can be controlled by good site preparation, timely cultivation, or applications of approved herbicides. Erosion can be controlled by planting on the contour and terracing and by establishing cover crops between the rows. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods.

This soil generally is suited to septic tank absorption fields and dwellings. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

GfD—Gates very fine sandy loam, 6 to 11 percent slopes. This deep, strongly sloping, well drained soil is on narrow ridges and side slopes in the uplands. It formed in recent loess. Areas range from 20 to 150 acres in size.

Typically, the surface layer is dark grayish brown, very friable very fine sandy loam about 4 inches thick. The transitional layer is brown, very friable very fine sandy loam about 3 inches thick. The underlying material to a depth of 60 inches is very fine sandy loam. It is pale brown in the upper part and very pale brown in the lower part. It is calcareous below a depth of 24 inches. In some areas the surface layer is darker. In other areas it is calcareous.

Included with this soil in mapping are small areas of Hersh soils. These soils are fine sandy loam throughout. They are higher on the landscape than the Gates soil. They make up 2 to 10 percent of the map unit.

Permeability is moderate in the Gates soil, and available water capacity is high. Organic matter content and natural fertility are low. The water intake rate is moderate. Runoff is rapid.

Most of the acreage supports native grasses and is used for grazing. A few areas are used for cultivated crops.

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

If irrigated by sprinkler systems, this soil is poorly suited to corn, alfalfa, and grasses. It is not suited to gravity irrigation systems because of the slope. Terracing, farming on the contour, applying conservation tillage practices that leave crop residue on the surface, and including a maximum of close-grown crops, such as alfalfa and grasses, in the cropping sequence help to control erosion. Conservation tillage practices are effective in controlling runoff. Examples are stubble mulching in areas of small grain and no-till planting in areas of row crops.

This soil is poorly suited to pasture and hay. Water erosion is a hazard unless an adequate plant cover is maintained. Forage production can be increased or maintained by proper stocking rates and a planned grazing system. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to sprinkler irrigation. Grazing should be delayed in the spring and after irrigation until the surface is firm and the grasses have reached a suitable height.

This soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is suited to the trees and shrubs grown as windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled and an adequate supply of moisture is available during periods when seedlings are becoming established. Competing vegetation can be controlled by good site preparation, timely cultivation, or applications of approved herbicides. Erosion can be controlled by planting on the contour and terracing and by establishing cover crops between the rows. Irrigation can provide the supplemental moisture needed for establishing seedings during dry periods.

The slope is a limitation if this soil is used as a septic tank absorption field. It can be overcome by land shaping and by installing the absorption field on the contour. Alternative sites for sewage lagoons should be considered because this soil is strongly sloping and is subject to seepage. If a sewage lagoon is established on this soil, extensive grading is needed to modify the slope and shape the lagoon. Also, seepage should be controlled by sealing or lining the lagoon. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage. Cutting and filling generally are needed to provide a suitable grade.

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

Gn—Gibbon silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom land. It is subject to rare flooding. It formed in alluvium. Areas range from 20 to 200 acres in size.

Typically, the surface layer is dark grayish brown, calcareous, friable silt loam about 5 inches thick. The subsurface layer is dark gray, calcareous, friable silt loam about 9 inches thick. The transitional layer is light brownish gray, friable silt loam about 6 inches thick. The upper part of the underlying material is light gray silt loam. The next part is light gray very fine sandy loam. The lower part to a depth of 60 inches is white fine sand. In some areas the surface layer is silty clay loam. In other areas the carbonates are below a depth of 10 inches.

Included with this soil in mapping are small areas of Saltine soils. These soils are high in content of soluble salts. They are in positions on the landscape similar to those of the Gibbon soil. They make up 5 to 15 percent of the map unit.

Permeability is moderate in the Gibbon soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is medium. The soil has free calcium carbonates at the surface or within a depth of 10 inches. The seasonal high water table is at a depth of 1.5 to 3.0 feet. The water intake rate is moderate. Tilth is good.

Most areas are used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, wheat, grain sorghum, and alfalfa. Because of the seasonal high water table, tillage may be delayed and the soil warms up slowly in the spring. Maintaining fertility is a concern of management. Deep-rooted crops may receive beneficial moisture through subirrigation.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. Because of the seasonal high water table, tillage may be delayed and the soil warms up slowly in the spring. In areas where suitable outlets are available, tile drains or open ditches can keep the water table below detrimental levels. The high content of calcium carbonates in the soil may limit the availability of some elements, such as phosphorus. In row cropped fields, applying phosphate fertilizer in bands rather than broadcasting, reduces the exposure to calcium carbonates and helps to maintain higher concentrations of phosphorus.

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

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 bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by timothy, redtop, foxtail barley, ironweed, clovers, sedges, and rushes.

This soil is a good site for the trees and shrubs grown as windbreaks. The species that can withstand the occasional wetness survive and grow well. Competition from weeds and grasses can be controlled by timely cultivation or by applications of approved herbicides.

This soil is not suitable as a site for septic tank absorption fields, sewage lagoons, or dwellings because of the flooding and the wetness. Also, seepage is a limitation on sites for sewage lagoons. Constructing local roads on suitable, well compacted fill material above flood levels helps to prevent the damage caused by flooding. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is dark brown, very friable fine sandy loam about 6 inches thick. The transitional layer is brown, very friable fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light brownish gray fine sandy loam. In some areas the lower part of the underlying material is loamy fine sand.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils are very fine sandy loam throughout. They are on landscape positions similar to those of the Hersh soil. Valentine soils contain more sand and less clay and silt throughout than the Hersh soil. Also, they are higher on the landscape. Included soils make up 5 to 20 percent of the map unit.

Permeability is moderately rapid in the Hersh soil. Available water capacity is moderate. Runoff is slow. Organic matter content and natural fertility are low. The water intake rate is moderately high.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Soil blowing is the major hazard unless the surface is protected by crop residue or vegetation. Applying conservation tillage practices that leave crop residue on the surface and including a maximum of close-grown crops in the cropping sequence help to control soil blowing and conserve moisture. Stripcropping and field windbreaks also help to control soil blowing. Returning crop residue to the soil helps to maintain or improve the organic matter content and fertility.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Conservation tillage practices that leave crop residue on the surface help to control soil blowing and conserve moisture. Because this soil commonly is slightly hummocky and the adjacent soils commonly are hummocky, sprinkler irrigation is the best means of applying water uniformly at the desired rate. Some areas have been leveled for gravity irrigation systems. If gravity systems are used, relatively short runs are needed because of the moderately high intake rate. Because of the moderate available water capacity, a relatively short time between water applications is needed during peak use periods.

This soil is suited to pasture and hay. Forage production can be increased or maintained and soil blowing controlled by proper stocking rates and rotation grazing. Applying fertilizer and seeding a mixture of suitable grasses and legumes also increase production.

This soil is suited to range. A cover of range plants is very effective in controlling soil blowing. The natural plant community is dominated by blue grama, little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. After the plants are continuously overgrazed, the site is dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if soil blowing and competition from weeds and grasses are controlled and if the supply of moisture is adequate. If available, irrigation water can provide supplemental moisture during dry periods. Growing cover crops between the rows helps to control soil blowing. Timely cultivation or applications of approved herbicides help to control weeds and grasses in the rows.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving. The soil is suited to dwellings. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

HeC—Hersh fine sandy loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil is on uplands and stream terraces. It formed in mixed sandy and loamy eolian material. Areas range from 10 to 200 acres in size.

Typically, the surface layer is grayish brown, very friable fine sandy loam about 6 inches thick. The transitional layer is pale brown, very friable fine sandy loam about 6 inches thick. The underlying material to a depth of 60 inches is light gray fine sandy loam. In some areas the lower part of the underlying material is loamy fine sand.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils are very fine sandy loam throughout. Their positions on the landscape are similar to those of the Hersh soil. Valentine soils have more sand throughout than the Hersh soil. Also, they are higher on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderately rapid in the Hersh soil, and available water capacity is moderate. Runoff is slow. Organic matter content and natural fertility are low. The water intake rate is moderately high.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

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

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

This soil is suited to pasture and hay. Forage production can be increased or maintained and soil blowing and water erosion controlled by proper stocking rates and rotation grazing. Applying fertilizer and seeding a mixture of suitable grasses and legumes also increase production.

This soil is suited to range. A cover of range plants 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. After the plants are continuously overgrazed, the site is dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. The survival and growth rates of adapted species are fair. Lack of sufficient moisture, soil blowing, and competition from weeds and grasses are the principal management concerns. If available, irrigation water can provide supplemental moisture during dry periods. Growing cover crops between the rows helps to control soil blowing. Cultivating or mowing between the rows or applying approved herbicides helps to control weeds and grasses.

Septic tank absorption fields function well in this soil. Seepage and slope are limitations on sites for sewage lagoons. Seepage can be controlled by sealing or lining the lagoon. Grading helps to modify the slopes. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving. The soil is suited to dwellings. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is grayish brown, very friable fine sandy loam about 6 inches thick. The transitional layer is brown, very friable fine sandy loam about 8 inches thick. The underlying material to a depth of 60 inches is pale brown fine sandy loam. In some areas the lower part of the underlying material is loamy fine sand.

Included with this soil in mapping are small areas of Gates and Valentine soils. Gates soils are very fine sandy loam throughout. Their positions on the landscape are similar to those of the Hersh soil. Valentine soils have more sand throughout than the Hersh soil. Also, they are higher on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderately rapid in the Hersh soil, and available water capacity is moderate. Runoff is rapid. Organic matter content and natural fertility are low. The water intake rate is moderately high.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

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

This soil is unsuited to gravity irrigation and poorly suited to sprinkler irrigation of areas used for corn or for alfalfa and grasses for hay or pasture. In areas where slopes are suitable, terraces and contour farming help to control water erosion. Conservation tillage practices, such as minimum tillage, that leave crop residue on the surface help to control soil blowing and water erosion and conserve moisture. Growing row crops only on a limited basis and including a maximum of close-grown crops, such as alfalfa and grasses, in the cropping sequence also help to control erosion. Efficient water use is an important consideration.

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

This soil is suited to range. A cover of range plants 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. After the plants are continuously overgrazed, the site is dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if the amount of moisture is adequate and if soil blowing, water erosion, and competition from weeds and grasses are controlled. If available, irrigation water can provide supplemental moisture during dry periods. Growing cover crops between the rows helps to control soil blowing. Planting on the contour and terracing help to control water erosion. Timely cultivation or applications of approved herbicides help to control weeds and grasses in the rows.

This soil generally is suited to septic tank absorption fields. Land shaping and installing the absorption field on the contour help to ensure better performance. Seepage and slope are limitations on sites for sewage lagoons. Sealing or lining the lagoon helps to prevent seepage. Measures that modify the slope are needed. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage. Cutting and filling generally are needed to provide a suitable grade.

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

HeE—Hersh fine sandy loam, 11 to 17 percent slopes. This deep, moderately steep, well drained soil is on upland side slopes. It formed in sandy and loamy eolian material. Areas range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 5 inches thick. The transitional layer is brown fine sandy loam about 9 inches thick. The underlying material to a depth of 60 inches is pale brown fine sandy loam. In some areas the lower part of the underlying material is loamy fine sand or fine sand.

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

Permeability is moderately rapid in the Hersh soil, and available water capacity is moderate. Runoff is rapid. Organic matter content and natural fertility are low. The water intake rate is moderately high.

Most of the acreage supports native grasses and is used for grazing. Because of the slope and the hazard of erosion, this soil is not suited to dryland or irrigated crops or to pasture or hay. It is suited to range. A cover of range plants 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. After the plants are continuously overgrazed, the site is dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a fair site for the trees and shrubs grown as farmstead and feedlot windbreaks and as plantings that enhance recreation areas and wildlife habitat. Drought and soil blowing are the principal hazards. Windblown sand can cover the seedlings. Soil blowing can be controlled by planting cover crops between the rows. Irrigation can provide the supplemental moisture needed for establishing seedlings.

This soil is poorly suited to septic tank absorption fields because of the slope. Before the absorption fields can operate properly, the surface should be reshaped and the lines should be installed on the contour. Slope and seepage are limitations on sites for sewage lagoons. Lining or sealing the lagoon helps to prevent seepage. Measures that modify the slope are needed. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. Installing a good surface drainage system helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage. Cutting and filling generally are needed to provide a suitable grade.

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

Hf—Histosols, wet. These deep, nearly level, very poorly drained soils are on bottom land along the North Loup River. They formed in well decomposed plant residue overlying a mineral soil layer. They are frequently flooded and are ponded for long periods. The one area of these soils is about 50 acres in size.

Typically, the surface layer is black undecomposed organic material (sapric material) about 6 inches thick. The next 26 inches is dark brown undecomposed organic material (sapric material). The upper part of the underlying material is very dark gray silt loam. The lower part to a depth of 60 inches is black loamy fine sand. The depth to the underlying mineral soil layer ranges from 2 to more than 5 feet.

Included with these soils in mapping are small areas of Barney soils. These included soils formed in mineral material. They are in positions on the landscape similar to those of the Histosols. They make up 2 to 5 percent of the map unit.

The seasonal high water table in the Histosols is 0.5 foot above the surface to 1.0 foot below. Available water capacity is high. Organic matter content is very high, and natural fertility is low.

All areas support native vegetation consisting of sedges, reeds, cattails, and grasses. They are occasionally grazed by cattle. These soils are suited to wetland wildlife habitat. They are unsuitable for cultivated crops, range, and windbreaks because of the excessive wetness. They are unsuitable as sites for buildings, local roads and sanitary facilities because of the wetness and the flooding.

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

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

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The underlying material to a depth of 60 inches is stratified grayish brown and light brownish gray silt loam. In areas that support native grasses, the surface layer is stratified. In places the soil is stratified with sandy or loamy material.

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

Permeability is moderate in the Hobbs soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate. Tilth is good.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Flooding in the spring can delay cultivation, but it rarely causes severe damage to crops. Deposition of silt can damage newly seeded crops. Diversions and drainage ditches can intercept and divert runoff from adjacent soils. Applying good conservation measures on the adjacent soils helps to control runoff and flooding on this soil.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Sprinkler or gravity irrigation systems can be used. In areas where the adjacent soils are gently sloping, center pivot irrigation systems commonly are used. Diversions, drainage ditches, and good conservation measures on the adjacent soils reduce the susceptibility to flooding and crop damage on this soil.

This soil is suited to pasture and hay. Forage production is reduced by deposition of silt and overgrazing. It can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to irrigation. Grazing should be delayed in the spring and after irrigation until the surface is firm.

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. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Also woody plants, primarily snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

This soil is a good site for the trees and shrubs grown as windbreaks. Competition for moisture from weeds and grasses can be controlled by timely cultivation or by applications of approved herbicides.

This soil is not suitable as a site for septic tank absorption fields, sewage lagoons, or dwellings because of the flooding. A suitable alternative site is needed. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Constructing the roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding.

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

HmB—Hobbs silt loam, channeled, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on long, narrow bottom land cut by meandering stream channels. Some areas are characterized by escarpments or the very steep sides of stream terraces. The soil is frequently flooded. It formed in silty alluvium. Areas range from 10 to 200 acres in size.

Typically, the surface layer is grayish brown, friable, stratified silt loam about 7 inches thick. The subsurface layer also is grayish brown, friable, stratified silt loam. It is about 17 inches thick. The underlying material to a depth of 60 inches is stratified dark gray and pale brown silt loam. In some areas the soil is stratified with sandy or loamy material. In other areas it is calcareous at the surface.

Included with this soil are small areas of silty soils that are only occasionally flooded. These soils are not cut by meandering stream channels and are on the slightly higher parts of the landscape. They make up 5 to 15 percent of the map unit.

Permeability is moderate in the Hobbs soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. Runoff is medium.

Most areas support native grasses, trees, and shrubs. They are used for grazing and provide good habitat for many types of wildlife. Some small areas are used for cultivated crops. This soil is unsuited to dryland and irrigated crops and to pasture and hay because of the rough terrain, inaccessibility, and the frequent flooding.

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. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by blue grama, buffalograss, Kentucky bluegrass, western wheatgrass, sedges, and numerous annual and perennial weeds. Also, woody plants, primarily snowberry and buckbrush, invade the site. Brush management may be needed to control these plants.

This soil generally is not suited to the trees and shrubs grown as windbreaks because of the meandering, entrenched stream channels and the frequent flooding. The trees and shrubs that enhance wildlife habitat can be planted by hand.

This soil is not suitable as a site for septic tank absorption fields, sewage lagoons, or dwellings because of the flooding. A suitable alternative site is needed. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Constructing the roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing bridges or culverts help to prevent the damage caused by flooding.

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

Ho—Holdrege silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on uplands. It formed in loess. Areas range from 10 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 silt loam about 6 inches thick. The subsoil is firm silty clay loam about 19 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In some areas the depth to lime is more than 38 inches.

Included with this soil in mapping are areas of Hord soils. These soils have less clay in the subsoil than the Holdrege soil and are dark to a depth of more than 20 inches. They are in the lower areas. They make up 2 to 10 percent of the map unit.

Permeability is moderate in the Holdrege soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderately low. The shrink-swell potential is moderate in the subsoil.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. A lack of sufficient moisture limits crop yields during dry periods. Conservation tillage practices that keep crop residue on the surface conserve moisture.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. If a gravity system is used, some land leveling and a tailwater recovery system generally are needed. In areas where the adjacent soils are more sloping, center pivot sprinkler systems commonly are used. These systems allow for good control of application rates and a uniform distribution of water.

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

This soil is suited to range. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass. When the plants are continuously overgrazed, 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 desirable plants, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides.

This soil generally is suited to septic tank absorption fields. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. Strengthening the foundations of buildings and backfilling with less clayey material help to prevent the damage caused by shrinking and swelling.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength and shrink-swell potential of the soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsoil is about 19 inches thick. It is dark grayish brown, firm silty clay loam in the upper part; grayish brown, firm silty clay loam in the next part; and pale brown, friable silt loam in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam. In some areas the dark colors extend to a depth of more than 20 inches. In other areas the depth to lime is more than 38 inches.

Included with this soil in mapping are areas of Hord and Uly soils. These soils have less clay in the subsoil than the Holdrege soil. Also, they are lower on the landscape. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Holdrege soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderately low. Runoff is medium.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is the main hazard. Conservation tillage practices that leave crop residue on the surface are effective in controlling erosion and in conserving moisture. Examples are no-till planting and stubble mulching. Terraces, grassed waterways, and contour farming also help to control erosion.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is suited to gravity and sprinkler irrigation systems. Conservation tillage practices, terraces, grassed waterways, and contour farming help to control erosion. Conservation tillage practices, such as no-till planting in areas of row crops, help to keep crop residue on the surface and help to control runoff. In most areas some land leveling and a tailwater recovery system are needed for efficient gravity irrigation. In areas where the adjacent soils are more sloping, center pivot sprinkler systems are commonly used. These systems allow for good control of application rates and a uniform distribution of water. Land leveling or contour bench leveling helps to establish nonerosive grades and allows for efficient use of irrigation water.

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

This soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides.

This soil generally is suited to septic tank absorption fields. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. Strengthening the foundations of buildings and backfilling with less clayey material help to prevent the damage caused by shrinking and swelling.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength and shrink-swell potential of the soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is very dark 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 about 22 inches thick. It is grayish brown, firm silty clay loam in the upper part and pale brown, friable silt loam in the lower part. The underlying material to a depth of 60 inches is very pale brown, calcareous silt loam. In some areas the surface layer is thicker.

Included with this soil in mapping are small areas of Hobbs and Uly soils. Hobbs soils are occasionally flooded and stratified and are lower on the landscape than the Holdrege soil. Uly soils have less clay in the subsoil than the Holdrege soil. Also, they are generally lower on the landscape. In Mira Valley, however, they are higher on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Holdrege soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderately low. Runoff is medium.

Most areas are used for cultivated crops. Some support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard unless the surface is adequately protected by vegetation or crop residue. Conservation tillage practices that keep crop residue on the surface are effective in controlling erosion and runoff and in conserving moisture. Examples are stubble mulching in areas of small grain and no-till planting in areas of row crops. Terraces, grassed waterways, and contour farming also help to control erosion and conserve moisture.

If irrigated, this soil is suited to corn, and grain sorghum and to alfalfa and grasses for hay or pasture. It is not suited to gravity irrigation systems unless the slope can be reduced to a nonerosive grade by contour bench leveling. It is best suited to sprinkler irrigation systems. Water erosion can be controlled by terraces, grassed waterways, contour farming, and conservation tillage practices. Including a maximum of close-grown crops, such as alfalfa and grasses, in the cropping sequence also helps to control erosion. Efficient water use and control of runoff are important considerations. Returning crop residue to the soil maintains or improves the organic matter content and fertility.

This soil is suited to pasture and hay. Water erosion is the major hazard. It can be controlled by terracing and by maintaining an adequate plant cover. Forage production can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to sprinkler irrigation. The rate of water application should not exceed the intake rate of the soil. Grazing should be delayed in the spring and after irrigation until the surface is firm and the grasses have reached a suitable height.

This soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Lack of sufficient moisture and erosion are the main concerns in establishing seedlings. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation, or by applications of approved herbicides. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods. Planting on the contour and terracing help to control erosion.

This soil generally is suited to septic tank absorption fields. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. Strengthening the foundations of buildings and backfilling with less clayey material help to prevent the damage caused by shrinking and swelling.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength and shrink-swell potential of the soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

HoC2—Holdrege silty clay loam, 3 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil is on uplands. It formed in loess. Areas range from 10 to several hundred acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 7 inches thick. Some or all of the original surface layer has been removed by erosion, and the present surface layer may be mixed with the subsoil by cultivation. The subsoil is silty clay loam about 13 inches thick. It is grayish brown and firm in the upper part and pale brown and friable in the lower part. The underlying material to a depth of 60 inches is very pale brown silt loam. In some of the less sloping areas, the surface layer is not eroded and is thicker.

Included with this soil in mapping are small areas of Hobbs and Uly soils. Hobbs soils are occasionally flooded and stratified and are along intermittent drainageways. Uly soils have less clay in the subsoil than the Holdrege soil. Also, they are generally lower on the landscape. In Mira Valley, however, they are higher on the landscape. Included soils make up 10 to 15 percent of the map unit.

Permeability is moderate in the Holdrege soil, and available water capacity is high. Organic matter content is moderately low, and natural fertility is medium. The water intake rate is moderately low. Runoff is medium.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard unless the surface is adequately protected by vegetation or crop residue. Terraces, grassed waterways, contour farming, and conservation tillage practices help to control erosion and conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or improve the organic matter content and fertility.

If irrigated, this soil is suited to corn and grain sorghum and to alfalfa and grasses for hay or pasture. It is not suited to gravity irrigation systems unless the slope can be reduced to a nonerosive grade by contour bench leveling. It is suited to sprinkler irrigation systems. Water erosion can be controlled by terraces, grassed waterways, contour farming, and conservation tillage practices. Including a maximum of close-grown crops, such as alfalfa and grasses in the cropping sequence also helps to control erosion. Efficient water use and control of runoff are important considerations. Returning crop residue to the soil maintains or improves the organic matter content and fertility.

This soil is suited to pasture and hay. Water erosion is the major hazard. It can be controlled by maintaining an adequate plant cover. Forage production can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to sprinkler irrigation. The rate of water application should not exceed the intake rate of the soil. Grazing should be delayed in the spring and after irrigation until the surface is firm and the grasses have reached a suitable height.

This soil is suited to range. A cover of range plants is very effective in controlling water erosion. The natural plant community is mixed prairie grasses dominated by big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Lack of sufficient moisture and erosion are the main concerns in establishing seedlings. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation, or by applications of approved herbicides. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods. Planting on the contour and terracing help to control erosion.

This soil generally is suited to septic tank absorption fields. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. Strengthening the foundations of buildings and backfilling with less clayey material help to prevent the damage caused by shrinking and swelling.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength and shrink-swell potential of the soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

Hr—Hord silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is in upland valleys. It formed in silty colluvium and alluvium. Areas range from 10 to 150 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 7 inches thick. The subsurface layer is very dark gray, friable silt loam about 15 inches thick. The subsoil is friable silt loam about 22 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material to a depth of 60 inches is light gray silt loam. In some areas the surface layer is thinner. In other areas the subsoil is silty clay loam.

Included with this soil in mapping are small areas of Detroit, Holdrege, and Hobbs soils. Detroit soils have more clay in the subsoil than the Hord soil. They are on stream terraces. Holdrege soils have more clay in the subsoil than the Hord soil. Also, they are generally higher on the landscape. Hobbs soils are stratified and are along intermittent drainageways on the lower parts of the landscape. Included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in the Hord soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate. Tilth is good.

Nearly all of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. This is one of the more productive soils in Valley County. Overcoming the lack of sufficient moisture during dry periods and maintaining fertility are concerns of management. Conservation tillage practices that leave residue on the surface conserve moisture. An example is no-till planting.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. Both gravity and sprinkler irrigation systems can be effective. Efficient water use is a concern of management. Land leveling is commonly needed to establish a suitable grade for gravity systems. Irrigation water should be applied in sufficient amounts to meet the needs of the crop and at a rate that permits maximum absorption and minimum runoff.

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

This soil is suited to range. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. The soil is suitable as a site for dwellings. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

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

HrB—Hord silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil is in upland valleys. It formed in silty colluvium and alluvium. Areas range from 10 to 100 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark gray, friable silt loam about 16 inches thick. The subsoil is friable silt loam about 21 inches thick. It is dark grayish brown in the upper part, grayish brown in the next part, and pale brown in the lower part. The underlying material to a depth of 60 inches is light brownish gray silt loam. In some areas the surface layer is thinner. In other areas the subsoil is silty clay loam.

Included with this soil in mapping are small areas of Hobbs and Holdrege soils. Hobbs soils are stratified and are along intermittent drainageways. Holdrege soils have more clay in the subsoil than the Hord soil. Also, they are generally higher on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Hord soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate. Tilth is good.

Nearly all of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard unless the surface is protected by vegetation or crop residue. Conservation tillage practices, such as no-till planting help to control erosion and conserve moisture. Terraces, grassed waterways, and contour farming also help to control erosion.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. The principal concern is efficient water management. Water erosion is a hazard. Land leveling or contour bench leveling is commonly needed to establish a suitable grade for gravity irrigation. Irrigation water should be applied in sufficient amounts to meet the needs of the crop and at a rate that permits maximum absorption and minimum runoff. Leaving crop residue on the surface helps to control erosion.

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

This soil is suited to range. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, sideoats grama, switchgrass, and western wheatgrass. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. The soil is suitable as a site for dwellings. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

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

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

Typically, the surface layer is very dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is dark gray, very friable silt loam about 12 inches thick. The subsoil is friable silty clay loam about 24 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of 60 inches is light gray silt loam. In some areas the surface layer is thinner. In other areas the subsoil is silt loam.

Included with this soil in mapping are small areas of Detroit and Hobbs soils. Detroit soils have more clay in the subsoil than the Hord soil. Also, they are lower on the landscape. Hobbs soils are stratified and are along intermittent drainageways. Included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in the Hord soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate. Tilth is good.

Nearly all of the acreage is used for cultivated crops and is irrigated. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. This is one of the more productive soils in Valley County. Overcoming the lack of sufficent moisture during dry periods and maintaining fertility are concerns of management. Conservation tillage practices that leave residue on the surface conserve moisture. An example is no-till planting.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. Both gravity and sprinkler irrigation systems can be effective. Efficient water use is a concern of management. Land leveling is commonly needed to establish a suitable grade for gravity systems. Irrigation water should be applied in sufficient amounts to meet the needs of the crop and at a rate that permits maximum absorption and minimum runoff.

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

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, indiangrass, sideoats grama, and switchgrass. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by Kentucky bluegrass, tall dropseed, western wheatgrass, and numerous annual and perennial weeds. Also, woody plants, including snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. The soil is suitable as a site for dwellings. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

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

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

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer also is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is friable silt loam about 22 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of 60 inches is light gray silt loam. In some areas the subsoil is silty clay loam. In other areas the surface layer is thinner.

Included with this soil in mapping are small areas of Hobbs soils. These soils are stratified and are along intermittent drainageways on the lower parts of the landscape. They make up 5 to 15 percent of the map unit.

Permeability is moderate in the Hord soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is high. The water intake rate is moderate. Tilth is good.

Nearly all of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a hazard unless the surface is protected by vegetation or crop residue. Conservation tillage practices that leave residue on the surface help to control erosion and conserve moisture. An example is no-till planting. Terraces, grassed waterways, and contour farming also help to control erosion.

If irrigated, this soil is suited to corn, grain sorghum, introduced grasses, and alfalfa. It is suited to both gravity and sprinkler irrigation systems. The principal concern is efficient water management. Land leveling or contour bench leveling is commonly needed to establish a suitable grade for gravity systems. Irrigation water should be applied in sufficient amounts to meet the needs of the crop and at a rate that permits maximum absorption and minimum runoff. Terraces, grassed waterways, contour farming, and conservation tillage practices help to control water erosion in areas irrigated by sprinklers. Leaving crop residue on the surface also helps to control erosion.

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

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses dominated by big bluestem, little bluestem, indiangrass, sideoats grama, and switchgrass. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by Kentucky bluegrass, tall dropseed, western wheatgrass, and numerous annual and perennial weeds. Also, woody plants, including snowberry and buckbrush, invade the site. Brush management and prescribed burning may be needed to control these plants.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides. Irrigation can provide the supplemental moisture needed for establishing seedlings during dry periods.

Septic tank absorption fields function well in this soil. Seepage is a limitation on sites for sewage lagoons. It can be controlled by sealing or lining the lagoon. The soil is suitable as a site for dwellings. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

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

IpB—Ipage loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, moderately well drained soil is on stream terraces and in upland swales. It formed in eolian and alluvial sand. Areas are generally irregular in shape and are parallel to the major rivers. They range from 20 to 300 acres in size.

Typically, the surface soil is dark grayish brown, very friable loamy fine sand about 7 inches thick. The underlying material to a depth of 60 inches is fine sand. It is light brownish gray in the upper part and light gray in the lower part. In some areas the surface layer is fine sandy loam or fine sand.

Included with this soil in mapping are small areas of Hersh and Valentine soils on the higher parts of the landscape. Hersh soils are fine sandy loam throughout. Valentine soils are excessively drained. Included soils make up 5 to 10 percent of the map unit.

Permeability is rapid in the Ipage soil. Available water capacity is low. Organic matter content and natural fertility also are low. The depth to the seasonal high water table ranges from about 3 feet in wet years to 6 feet in dry years. Runoff is very slow because most of the rainfall enters the soil. The water intake rate is very high.

Most of the acreage supports native grasses and is used for grazing. A few areas are used for cultivated crops and are irrigated.

If used for dryland farming, this soil is poorly suited to grain sorghum, wheat, and alfalfa. After it is established, alfalfa can obtain moisture from the underlying water table. Soil blowing and drought are the main hazards affecting cultivated crops. Stripcropping, field windbreaks, and conservation tillage practices that keep crop residue on the surface help to control erosion. Returning crop residue to the soil helps to maintain or improve the organic matter content and fertility. Growing row crops only on a limited basis and including a maximum of close-growing crops in the cropping sequence help to control soil blowing.

If irrigated by sprinkler systems, this soil is suited to corn and grain sorghum and to grasses and legumes for hay or pasture. The very high intake rate, the low available water capacity, and soil blowing are the main management concerns. Carefully selected application rates and timely application of irrigation water help to overcome the very high water intake rate and low available water capacity. Conservation tillage practices that leave crop residue on the surface help to control soil blowing and conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or improve the organic matter content and fertility.

This soil is poorly suited to pasture and hay. Forage production can be increased or maintained and soil blowing controlled by proper stocking rates and rotation grazing. Forage production also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to irrigation.

This soil is suited to range and native hay. A cover of range plants is effective in controlling soil blowing. The natural plant community is mostly mid and tall grasses dominated by little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. After the plants are continuously overgrazed, the site is dominated by blue grama, hairy grama, sand dropseed, prairie sandreed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a fair site for the trees and shrubs grown as farmstead and feedlot windbreaks. The survival and growth rates of adapted species are fair. Lack of sufficient moisture, soil blowing, and competition for moisture from weeds and grasses are the main management concerns. Irrigation can provide the supplemental moisture needed for establishing seedlings. Soil blowing can be controlled by establishing strips of sod or a cover crop between the rows. Weeds and grasses can be controlled by cultivating between the rows or by applying approved herbicides.

This soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity can result in the pollution of the underground water table. The absorption fields should be constructed on fill material that raises them a sufficient distance above the seasonal high water table. Seepage and wetness are limitations on sites for sewage lagoons. Seepage can be controlled by lining or sealing the lagoon. Constructing dwellings with basements on raised, well compacted fill material helps to overcome the wetness caused by the high water table. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage to local roads caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

Le—Leshara silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom land. It is occasionally flooded. It formed in alluvium. Areas range from 10 to 80 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 8 inches thick. The transitional layer is grayish brown silt loam about 5 inches thick. The upper part of the underlying material is light brownish gray silt loam. The next part is light grayish brown, stratified very fine sandy loam. The lower part to a depth of 60 inches is light gray, stratified fine sand and sand. In some areas fine sand and sand are closer to the surface or at a greater depth. In other areas the surface layer is silty clay loam. In places the soil is calcareous at the surface.

Included with this soil in mapping are small areas of Cozad and Hord soils. These soils are well drained and are on the slightly higher parts of the landscape. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Leshara soil, and available water capacity is high. Runoff is slow. Organic matter content is moderate, and natural fertility is medium. The depth to the seasonal high water table ranges from about 1.5 feet in wet years to 3.0 feet in dry years. The water intake rate is moderate. Tilth is good.

Most of the acreage is used for cultivated crops. Some areas support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, wheat, grain sorghum, and alfalfa. Because of the seasonal high water table, tillage may be delayed and the soil warms up slowly in the spring. Deep-rooted crops may receive beneficial moisture through subirrigation.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. It is suited to both gravity and sprinkler irrigation. Land leveling is generally needed to establish a suitable grade for gravity systems. In some years tillage is delayed in the spring because of excessive wetness. Irrigation water should be applied in sufficient amounts to meet the needs of the crop and at a rate that permits maximum absorption and minimum runoff.

This soil is suited to pasture but is seldom used for that purpose. It is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants dominated by big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by timothy, redtop, foxtail barley, ironweed, clovers, sedges, and rushes.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. The species that can withstand occasional wetness survive and grow well. Competition from weeds and grasses can be controlled by cultivating between the rows or by applying approved herbicides.

This soil generally is not suited to septic tank absorption fields, sewage lagoons, or dwellings because of the flooding and the wetness. Septic tank absorption fields can be constructed on fill material that raises them a sufficient distance above the seasonal high water table and the level of flooding. Temporarily shoring the sides of shallow excavations during dry periods helps to prevent sloughing or caving.

Constructing local roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

Lo—Loup loam, 0 to 2 percent slopes. This deep, nearly level, poorly drained soil is on bottom land adjacent to the major rivers. It is occasionally flooded. It formed in sandy and loamy alluvium. Areas range from 20 to 300 acres in size.

Typically, the surface layer is dark gray, very friable loam about 5 inches thick. The subsurface layer is dark gray, friable loam about 5 inches thick. The underlying material to a depth of 60 inches is light gray. It is fine sand in the upper part and sand in the lower part. In some areas the surface layer is silt loam or fine sandy loam and is less than 10 inches thick.

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

Permeability is moderate in the surface soil of the Loup soil and rapid in the underlying material. Available water capacity is low, but the seasonal high water table provides additional water during the growing season. The seasonal high water table is at the surface in most wet years and is within a depth of 1.5 feet in most dry years. Organic matter content is moderate, and natural fertility is medium. The soil has carbonates at or near the surface.

Most of the acreage supports native grasses and is used for grazing. Because of the excessive wetness, this soil is generally not suited to cultivated crops or to pasture or hay. It is suited to range and native hay. The natural plant community is mostly tall grasses and grasslike plants dominated by switchgrass, indiangrass, big bluestem, prairie cordgrass, bluejoint reedgrass, northern reedgrass, and various sedges. After the plants are continuously overgrazed or improperly harvested for hay, the site is dominated by timothy, redtop, foxtail barley, Kentucky bluegrass, clovers, sedges, and rushes. When the surface soil is wet, overgrazing causes surface compaction and the formation of small mounds, making grazing or harvesting for hay difficult.

This soil is suited to farmstead and feedlot windbreaks and to the trees and shrubs that enhance recreation areas and wildlife habitat. The species that can withstand the excessive wetness survive and grow well. Floodwater can damage the seedlings. Planting should be delayed in the spring because of the wetness. Weeds and undesirable grasses can be controlled by timely cultivation or by applications of approved herbicides.

This soil is not suitable as a site for septic tank absorption fields, sewage lagoons, or dwellings because of the flooding and the wetness. A suitable alternative site is needed. Constructing local roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding and by wetness.

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

Pg—Pits and Dumps. This miscellaneous area consists of water-filled pits and the surrounding mounds of gravel, sand, and overburden. It is on bottom land along the Middle Loup and North Loup Rivers where the water table is 1 to 4 feet below the surface. Sand and gravel are mined in these areas for construction material. They are pumped along with the water and are sorted and stockpiled. The water and the finer textured material are returned to the pit. Some are occasionally flooded. Areas range from 10 to 40 acres in size.

Typically, the material in these areas consist of a mixture of fine sand, sand, and coarse sand and varying amounts of gravel. The original soil profiles have been destroyed by mining.

The soil properties can be determined by onsite investigation. Many of the waste areas support no vegetation, but idle areas may have a sparse cover of weeds, grasses, or trees and shrubs.

Most areas are used for commercial mining of sand and gravel. A few are abandoned or are only occasionally mined. This map unit is not suited to cultivated crops, range, or windbreaks. Some areas provide wildlife habitat or can be developed for recreation uses.

This map unit is not suited to septic tank absorption fields or sewage lagoons because of rapid permeability. The material in these areas does not adequately filter the effluent from waste disposal systems. Alternative sites that are suited to these uses should be considered. The hazard of flooding also should be considered if the unit is used as a site for buildings or sanitary facilities. Roads that provide access to lakes and picnic areas can be built in these areas.

The capability unit is VIIIs-8, dryland; windbreak suitability group 10. No range site is assigned.

Sa—Saltine-Leshara silt loams, 0 to 1 percent slopes. These deep, nearly level, somewhat poorly drained soils are on bottom land. They are occasionally flooded. They formed in silty alluvium. The Saltine soil is strongly alkaline or very strongly alkaline. Areas range from 100 to 800 acres in size. They are 50 to 75 percent Saltine soil and 25 to 50 percent Leshara soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Saltine soil is grayish brown, friable, calcareous silt loam about 7 inches thick. The upper part of the underlying material is light brownish gray, calcareous silt loam. The lower part to a depth of 60 inches is stratified light brownish gray and light gray, calcareous silt loam and very fine sandy loam. In some areas the surface layer is silty clay loam. In other areas fine sand is below a depth of 48 inches.

Typically, the surface layer of the Leshara soil is very dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is dark gray, friable silt loam about 3 inches thick. The transitional layer is dark grayish brown, friable silt loam about 3 inches thick. The underlying material is light brownish gray and light gray, friable, calcareous silt loam about 33 inches thick. Below this to a depth of 60 inches is a buried surface layer of gray, friable silt loam. In some areas the surface layer is silty clay loam. In other areas fine sand is below a depth of 48 inches.

Included with these soils in mapping are small areas of Gibbon soils. These included soils are in positions on the landscape similar to those of the Saltine and Leshara soils. They are less alkaline than the Saltine soil. They have free carbonates within a depth of 10 inches and are not affected by salts. They make up 5 to 15 percent of the map unit.

Permeability is moderately slow in the Saltine soil and moderate in the Leshara soil. Available water capacity is high in both soils. Organic matter content is moderately low in the Saltine soil and moderate in the Leshara soil. The depth to the seasonal high water table in both soils ranges from about 2 feet in wet years to 3 feet in dry years. The degree and depth of the strongly alkaline condition in the Saltine soil are not uniform from area to area. Commonly, the soil is most strongly affected between depths of 10 and 20 inches. Tilth is very poor in this soil because of the high concentration of sodium salts, which results in puddling.

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

If used for dryland farming, these soils are poorly suited to cultivated crops. Salt-tolerant crops, such as milo, alfalfa, and barley, should be selected for planting. Applying sulfur or gypsum according to the results of soil tests can reduce the alkalinity of the Saltine soil and improve soil structure and crop growth. Adding manure also can improve soil structure and reduce the effects of excess sodium.

These soils are poorly suited to irrigation because of the excess sodium and moderately slow permeability in the Saltine soil. Adding sulfur or gypsum to the Saltine soil and using water to flush out the excess sodium salts after the sulfur or gypsum is added help to overcome these limitations. The irrigation water should be free of sodium salts but may contain calcium and magnesium carbonates. Timely irrigation is extremely important on salty soils, particularly during the planting season. Since young seedlings are especially sensitive to salts, timing irrigation so that it precedes or follows planting helps to move the salts downward. Frequent, light irrigation commonly is necessary to keep the salts sufficiently dilute and thus to allow normal plant growth. Yields in irrigated areas of the Saltine soil can be improved by growing salt-tolerant crops, such as milo or alfalfa, until the excess sodium is removed and the moderately slow permeability is improved.

If managed properly, these soils are suited to pasture and hay. They are best suited to salt-tolerant grasses, such as tall wheatgrass, western wheatgrass, and switchgrass. In areas where cultivated crops cannot grow well because of the excessive sodium salts, the best alternative use may be grasses for hay or pasture. Continuously overgrazing or grazing when the soil is wet causes deterioration of the pasture. Proper grazing use, rotation grazing, and timely deferment of grazing help to maintain or improve the pasture.

These soils are suited to range and native hay. Continuously overgrazing and late haying reduce plant vigor and cause deterioration of the native plants. Also, overgrazing when the soil is wet causes surface compaction and the formation of small mounds, making grazing or harvesting for hay difficult. Proper grazing use, timely deferment of grazing or haying, and restricted use during very wet periods help to keep the native plants in good condition. The species that are suited to alkaline conditions should be used to revegetate the Saltine soil.

The Saltine soil is a poor site for the trees and shrubs that enhance recreation areas and wildlife habitat because of excess sodium salts. It generally is unsuited to farmstead, feedlot, and field windbreaks. The Leshara soil is a good site for windbreaks.

These soils are not suited to septic tank absorption fields because of the wetness and flooding in areas of both soils and the moderately slow permeability in the Saltine soil. They are not suited to sewage lagoons because of the wetness and the flooding. Alternative sites for dwellings should be considered because of the flooding.

Local roads constructed across areas of these soils should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the Saltine soil. Providing coarser grained base material helps to ensure better performance. Constructing the roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

The capability units are IVs-1, dryland, and IVs-6, irrigated. The Saltine soil is in windbreak suitability group 9S and in Saline Subirrigated range site. The Leshara soil is in windbreak suitability group 2S and in Subirrigated range site.

Sc—Scott silt loam, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil is in depressions in the uplands. It is commonly ponded in the spring and after heavy rains. It formed in loess. Areas range from 5 to 100 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsurface layer is light gray, friable silt loam about 5 inches thick. The subsoil is about 45 inches thick. It is dark gray, very firm silty clay in the upper part and grayish brown, very firm silty clay loam in the lower part. The underlying material to a depth of 60 inches is light brownish gray silty clay loam. In some areas the surface layer is silty clay loam. A few areas have been drained and are not ponded or are ponded for shorter periods.

Included with this soil in mapping are small areas of Fillmore Variant soils. These soils are poorly drained, are stratified, and are in landscape positions similar to those of the Scott soil. They make up 5 to 10 percent of the map unit.

Permeability is very slow in the Scott soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is medium. A perched seasonal high water table is 6 inches above the surface to about 1 foot below, mainly during the period March through June. Runoff is ponded. The shrink-swell potential is high in the subsoil.

Most of the acreage is pastured along with the adjacent soils or is idle land. The vegetation generally is smartweed, sedges, and other annual weeds and grasses. A few areas have been drained by open ditches and are used for cultivated crops.

If used for dryland farming, this soil is poorly suited to cultivated crops. Seedbed preparation is often delayed or cannot be performed because of the wetness. Because of the very slow permeability, most of the surface water is lost through evaporation. Wheat is often destroyed because of ponding early in spring or lodging during wet harvest periods. Corn and grain sorghum also are damaged by excessive wetness, and seed emergence is difficult because of surface crusting and the poor seedbed. In undrained areas the ponding causes severe crop losses in 7 out of 10 years. It can be controlled mainly by applying good conservation measures on the gently and strongly sloping adjacent soils. If outlets are available, a surface drainage system can help to prevent crop losses. Competition from weeds is a problem. Controlling the weeds by timely cultivation is difficult because of the excessive wetness and the poor tilth.

This soil is not suited to irrigated crops or to hay and pasture, range, windbreaks, septic tank absorption fields, sewage lagoons, or dwellings because of the ponding. A suitable alternative site for sanitary facilities and dwellings is needed.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Constructing the roads on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by ponding. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is dark grayish brown loamy sand about 6 inches thick. The transitional layer is grayish brown loamy sand about 5 inches thick. The underlying material to a depth of 60 inches is coarse sand in which the content of gravel is 5 to 15 percent. The upper part is pale brown, and the lower part is light gray. In some areas the surface layer is loamy fine sand or fine sandy loam.

Included with this soil in mapping are small areas of Blendon and Ipage soils. Blendon soils are well drained and are in landscape positions similar to those of the Simeon soil. They contain less sand than the Simeon soil. Ipage soils are moderately well drained and are lower on the landscape than the Simeon soil. Included soils make up 5 to 15 percent of the map unit.

Permeability is rapid in the Simeon soil. Available water capacity is low. Organic matter content and natural fertility also are low. The water intake rate is very high.

Most areas are used as range. Some are used as wildlife habitat. This soil generally is not suited to dryland farming or to pasture and hay because of a lack of sufficient available moisture and the hazard of soil blowing. Because it is droughty, it generally is not suited to the trees and shrubs grown as windbreaks or as plantings that enhance recreation areas and wildlife habitat.

If irrigated by sprinkler systems, this soil is poorly suited to corn and alfalfa. It is not suited to gravity irrigation because of the very high water intake rate and the low available water capacity. Also, soil blowing is a hazard unless the surface is adequately protected by crops or crop residue. Conservation tillage practices, such as no-till planting, leave residue on the surface and thus help to control soil blowing and conserve moisture. Carefully selected application rates and timely application of irrigation water through the sprinkler systems are needed. Applying fertilizer through the sprinklers eliminates the need for one larger application, which can result in losses of plant nutrients through leaching. After irrigation water and fertilizer have been applied for many years, the surface layer may become acid. Additions of lime are needed to overcome this limitation.

This soil is suited to range. A cover of range plants is effective in controlling soil blowing. The natural plant community is mostly blue grama, sand bluestem, little bluestem, needleandthread, prairie sandreed, and sand dropseed. When the plants are continuously overgrazed, sand bluestem, little bluestem, and prairie sandreed decrease in abundance and blue grama, sand dropseed, and needleandthread increase. If overgrazing continues for many years, the less desirable plants, including sand dropseed, sand paspalum, hairy grama, plains pricklypear, and clubmoss, increase in abundance. Forage production is severely reduced during droughty years because of the low available water capacity.

This soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water table. The soil is not suited to sewage lagoons because of seepage. It is suited to dwellings and to local roads. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving.

The capability units are VIs-4, dryland, and IVs-14, irrigated; Shallow to Gravel range site; windbreak suitability group 10.

SmE—Simeon loamy sand, 3 to 30 percent slopes. This deep, gently sloping to steep, excessively drained soil is on stream terraces and on side slopes between stream terraces and bottom land. It formed in sandy alluvium. Areas are 20 to 150 acres in size.

Typically, the surface layer is dark grayish brown loamy sand about 3 inches thick. The transitional layer is brown loamy sand about 6 inches thick. The underlying material to a depth of 60 inches is coarse sand in which the content of gravel is about 10 percent. The upper part is pale brown, and the lower part is light gray. In some areas the surface layer is fine sand or sand.

Included with this soil in mapping are small areas of Blendon soils. These soils have less sand and more silt throughout than the Simeon soil. Also, they are higher on the landscape. They make up 5 to 15 percent of the map unit.

Permeability is rapid in the Simeon soil. Available water capacity is low. Organic matter content and natural fertility also are low. The water intake rate is very high.

Most areas support native grasses and are used for grazing. A few areas are used for cultivated crops. This soil generally is not suited to dryland or irrigated crops or to pasture or windbreaks because of the low available water capacity, the hazard of soil blowing, and the slope.

This soil is suited to range. A cover of range plants is effective in controlling soil blowing and water erosion. The natural plant community is mostly blue grama, sand bluestem, little bluestem, needleandthread, prairie sandreed, and sand dropseed. When the plants are continuously overgrazed, sand bluestem, little bluestem, and prairie sandreed decrease in abundance and blue grama, sand dropseed, and needleandthread increase. If overgrazing continues for many years, the less desirable plants, including sand dropseed, sand paspalum, hairy grama, plains pricklypear, and clubmoss, increase in abundance. Forage production is severely reduced during droughty years because of the low available water capacity.

This soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water table. The soil is not suited to sewage lagoons because of seepage and slope. Alternative sites for sanitary facilities should be considered. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. Cutting and filling generally are needed to provide a suitable grade on sites for local roads.

The capability unit is VIs-4, dryland; Shallow to Gravel range site; windbreak suitability group 10.

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

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is friable silt loam about 12 inches thick. It is grayish brown in the upper part, light brownish gray in the next part, and light gray in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Included with this soil in mapping are small areas of Coly and Holdrege soils. Coly soils are calcareous at or near the surface. They are lower on the landscape than the Uly soil. Holdrege soils have more clay in the subsoil than the Uly soil. Also, they are generally higher on the landscape. Included soils make up 5 to 20 percent of the map unit.

Permeability is moderate in the Uly soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is medium. The water intake rate is moderate.

Most of the acreage supports native grasses and is used for grazing. Some areas are used for cultivated crops.

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is a severe hazard unless the surface is adequately protected by vegetation or crop residue. Terraces, grassed waterways, contour farming, and conservation tillage practices that leave crop residue on the surface help to control erosion and conserve moisture. Returning crop residue or green manure crops to the soil helps to maintain or improve the organic matter content and fertility.

If irrigated, this soil is poorly suited to corn, grain sorghum, and alfalfa. It is not suited to gravity irrigation systems, but sprinkler systems can be used if careful management is applied. Center pivot sprinklers are the most commonly used systems on this soil. Erosion in the wheel tracks can be a problem. Adjusting the rate of water application to the moderate intake rate of the soil helps to control runoff and water erosion. Growing row crops only on a limited basis and including a maximum of close-grown crops, such as alfalfa and grasses, in the cropping sequence also help to control runoff and erosion. Terraces, contour farming, and conservation tillage practices that leave crop residue on the surface help to control erosion and conserve moisture.

This soil is suited to pasture and hay. Overgrazing increases the susceptibility to water erosion. Forage production can be increased and erosion controlled by proper stocking rates and rotation grazing. Forage production also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to sprinkler irrigation. The rate of water application should not exceed the intake rate of the soil. Grazing should be delayed in the spring and after irrigation until the surface is firm and the grasses have reached a suitable height.

This soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Water erosion is the main hazard in establishing seedlings. It can be controlled by planting on the contour and terracing and by establishing strips of sod or a cover crop between the rows. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation, or by application of approved herbicides. Supplemental water may be needed to help establish seedlings during dry periods.

The slope is a limitation if this soil is used as a site for sanitary facilities or dwellings. Installing septic tank absorption fields on the contour and land shaping help to ensure better performance. On sites for sewage lagoons, extensive grading is needed to modify the slope and shape the lagoon. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

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

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is friable silt loam about 19 inches thick. It is grayish brown in the upper part, light brownish gray in the next part, and light gray and calcareous in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Included with this soil in mapping are small areas of Coly, Hobbs, and Holdrege soils. Coly soils have carbonates at or near the surface. Hobbs soils are stratified and are on the lower parts of the landscape. Holdrege soils have more clay in the subsoil than the Uly soil. Included soils make up 10 to 20 percent of the map unit.

Permeability is moderate in the Uly soil, and available water capacity is high. Organic matter content is moderate, and natural fertility is medium.

Nearly all of the acreage supports native grasses and is used for grazing. Some areas are used for cultivated crops. Because of the slope and a very severe erosion hazard, this soil generally is unsuited to dryland and irrigated crops. It is suited to range. A cover of range plants 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. When the plants are overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

This soil is a good site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Water erosion is the main hazard in establishing seedlings. It can be controlled by planting on the contour and terracing and by establishing strips of sod or a cover crop between the rows. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation, or by application of approved herbicides.

This soil generally is suited to septic tank absorption fields and dwellings, but the slope is a limitation. Installing the septic tank absorption fields on the contour and land shaping help to ensure better performance. Alternative sites for sewage lagoons should be considered because of the slope. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. Otherwise, alternative sites should be selected.

Local roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage.

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

UcD2—Uly-Coly silt loams, 6 to 11 percent slopes, eroded. These deep, strongly sloping, well drained soils are on side slopes and ridgetops in the uplands. They formed in loess. Areas range from 10 to several hundred acres in size. They are 40 to 55 percent Uly soil and 25 to 40 percent Coly soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Uly soil is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is friable silt loam about 10 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. In some areas the dark surface layer has been removed by erosion. The surface layer in these areas may be mixed with the subsoil by cultivation.

Typically, the surface layer of the Coly soil is grayish brown, very friable silt loam about 3 inches thick. The transitional layer is light brownish gray, calcareous silt loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. In some areas the soil is calcareous at the surface.

Included with these soils in mapping are small areas of Hobbs and Holdrege soils. Hobbs soils are stratified, are occasionally flooded, and are on narrow bottom land. Holdrege soils have more clay in the subsoil than the Uly and Coly soils. Also, they are generally higher on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Coly and Uly soils, and available water capacity is high. Runoff is medium. Organic matter content is moderately low in the Uly soil and low in the Coly soil. Natural fertility is medium in the Uly soil and low in the Coly soil.

Most of the acreage is used for cultivated crops. Some areas have been reseeded to grasses and are used for grazing (fig. 8).

Figure 8.—Bromegrass pasture and terraced cropland in an area of Uly-Coly silt loams, 6 to 11 percent slopes, eroded.

If used for dryland farming, these soils are poorly suited to corn, grain sorghum, wheat, and alfalfa. Water erosion is the principal hazard. It can be controlled by terraces, grassed waterways, contour farming, and conservation tillage practices, such as no-till planting and stubble mulching, that leave crop residue on the surface. Returning crop residue or green manure crops to the soil improves the organic matter content and fertility.

These soils are poorly suited to sprinkler irrigation and are not suited to gravity irrigation. Terraces, grassed waterways, contour farming, and conservation tillage practices that leave residue on the surface help to control erosion. Including a maximum of close-grown crops, such as alfalfa and grasses, in the cropping sequence also helps to control erosion. Returning crop residue to the soil improves the organic matter content and fertility. If center pivot irrigation systems are used, erosion and the formation of small gullies can be problems in the wheel tracks. Adjusting the application rate to the moderate intake rate of the soil allows most of the water to be absorbed and helps to control runoff.

These soils are suited to pasture and hay. Water erosion is a hazard. It can be controlled by maintaining an adequate plant cover. Forage production can be increased or maintained by proper stocking rates and rotation grazing. It also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer and to sprinkler irrigation. The rate of water application should not exceed the intake rate of the soil. Grazing should be delayed in the spring and after irrigation until the surface is firm and the grasses have reached a suitable height.

These soils are suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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 desirable plants, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

These soils are good sites for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Erosion and competition from weeds and grasses are the principal management concerns. Erosion can be controlled by planting on the contour and terracing and by establishing strips of sod or a cover crop between the rows.

Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation, by timely cultivation between the rows, or by applications of approved herbicides. Supplemental water may be needed to help establish seedlings during dry periods.

These soils generally are suited to sanitary facilities and dwellings, but the slope is a limitation. Installing the septic tank absorption field on the contour and land shaping help to ensure better performance. On sites for sewage lagoons, extensive grading is needed to modify the slope and shape the lagoon. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient.

Local roads constructed across areas of these soils should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the Uly soil. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system and a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Crowning the road by grading and establishing adequate side ditches help to provide the needed surface drainage. Cutting and filling generally are needed to provide a suitable grade.

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

UcF—Uly-Coly silt loams, 15 to 30 percent slopes. These deep, steep, somewhat excessively drained soils are on narrow ridgetops and side slopes on dissected uplands. They formed in loess. Areas range from 50 to several hundred acres in size. They are 35 to 55 percent Uly soil and 30 to 45 percent Coly soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Uly soil is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer also is dark grayish brown, friable silt loam. It is about 4 inches thick. The subsoil is friable silt loam about 10 inches thick. It is grayish brown in the upper part and pale brown in the lower part. The underlying material to a depth of 60 inches is light gray, calcareous silt loam.

Typically, the surface layer of the Coly soil is grayish brown, very friable silt loam about 3 inches thick. The transitional layer is light brownish gray, calcareous silt loam about 4 inches thick. The underlying material to a depth of 60 inches is light gray, calcareous silt loam. In some areas the soil is calcareous at the surface.

Included with these soils in mapping are small areas of Hobbs and Holdrege soils. Hobbs soils are stratified, are occasionally flooded, and are on narrow bottom land. Holdrege soils have more clay in the subsoil than the Uly and Coly soils. Also, they are generally higher on the landscape. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Uly and Coly soils, and available water capacity is high. Runoff is very rapid. Organic matter content is moderate in the Uly soil and moderately low in the Coly soil. Natural fertility is medium in the Uly soil and low in the Coly soil.

Most of the acreage is range. Some areas are used for cultivated crops. These soils are not suited to dryland or irrigated crops because of the steep slope and the hazard of water erosion.

The Uly soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, 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, especially pricklypear, buckbrush, western snowberry, and annual and perennial weeds, increase in abundance.

The Coly soil is suited to range. A cover of range plants 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. When the plants are continuously overgrazed, big bluestem and little bluestem decrease in abundance and sideoats grama, blue grama, tall dropseed, western wheatgrass, and annual and perennial weeds increase. Also, woody plants, including bur oak, eastern redcedar, buckbrush, snowberry, and sumac, invade the site. Brush management may be needed to control these plants.

These soils are unsuited to the trees and shrubs grown as windbreaks. The survival and growth rates of adapted species are poor. The trees and shrubs that enhance wildlife habitat can be planted by hand.

These soils generally are unsuitable as sites for dwellings and sanitary facilities because of the steep slope. A suitable alternative site should be selected. Suitable sites generally are available in areas of the included Holdrege soils and in some of the smoother, less sloping adjacent areas.

Local roads constructed across areas of these soils should be designed so that the surface pavement and base material are thick enough to compensate for low soil strength. Providing coarser grained base material helps to ensure better performance. Cutting and filling generally are needed to provide a suitable grade. If a suitable grade cannot be established, a less sloping alternative site should be selected.

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

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

Typically, the surface layer is grayish brown, loose loamy fine sand about 5 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand. In some areas the surface layer is fine sand.

Included with this soil in mapping are small areas of Hersh and Ipage soils. Hersh soils have less sand than the Valentine soil. Their positions on the landscape are similar to those of the Valentine soil. Ipage soils are moderately well drained and are on the slightly lower parts of the landscape. Included soils make up 10 to 15 percent of the map unit.

Permeability is rapid in the Valentine soil, and available water capacity is low. Runoff is very slow. Organic matter content and natural fertility are low. The water intake rate is very high.

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

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, and wheat and to alfalfa and grasses for hay because of the hazard of soil blowing and the low moisture supply. Conservation tillage practices that leave crop residue on the surface help to control soil blowing and conserve moisture. Growing row crops only on a limited basis and including a maximum of close-grown crops in the cropping sequence also help to control soil blowing.

If irrigated, this soil is poorly suited to corn, grain sorghum, and alfalfa. Soil blowing is the principal management concern. It can be controlled by field windbreaks and conservation tillage practices. The soil is not suited to gravity irrigation systems because of the very high intake rate. Center pivot sprinklers are the most commonly used systems because controlled application rates and a uniform distribution of water are easily attained in areas irrigated by these systems. Nutrients are easily leached below the root zone in this sandy soil. Applying small quantities of fertilizer through the sprinklers throughout the growing season minimizes the loss of nutrients. Because of the low available water capacity, the water should be applied in relatively small amounts and at regular intervals.

If irrigated by sprinklers, this soil is poorly suited to pasture and hay. Soil blowing is a severe hazard unless an adequate plant cover is maintained. Forage production can be increased and the surface protected by proper stocking rates and rotation grazing. Forage production also can be increased by seeding a mixture of suitable grasses and legumes. Introduced grasses respond well to applications of fertilizer, which can be effectively applied through the sprinkler system.

This soil is suited to range. A cover of range plants is very effective in controlling soil blowing. The natural plant community is dominated by blue grama, little bluestem, needleandthread, prairie sandreed, sand bluestem, and switchgrass. After the plants are continuously overgrazed, the site is dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a fair site for the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas and wildlife habitat. Soil blowing and drought are the major hazards in establishing a windbreak. Windblown sand can cover the seedlings. Soil blowing can be controlled by planting in shallow furrows with as little disturbance of the surface as possible. Irrigation can provide the moisture needed for establishing seedlings during dry periods.

This soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water table. Alternative sites for sewage lagoons should be considered because of seepage. The soil is suited to dwellings and to local roads. Temporarily shoring shallow excavations helps to prevent sloughing or caving.

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

VaD—Valentine loamy fine sand, 3 to 9 percent slopes. This deep, undulating, excessively drained soil is on uplands. It formed in eolian sand. Areas range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, loose loamy fine sand about 5 inches thick. The transitional layer is grayish brown, loose fine sand about 4 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand. In some areas the surface layer is fine sand.

Included with this soil in mapping are small areas of Hersh soils. These soils are finer textured than the Valentine soil. They are in positions on the landscape similar to those of the Valentine soil. They make up 5 to 15 percent of the map unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Organic matter content and natural fertility also are low. The water intake rate is very high.

Most of the acreage supports native grasses and is used for grazing or hay. A few areas are used for cultivated crops. This soil generally is not suited to dryland crops or to pasture and hay because of the low available water capacity and the hazard of soil blowing.

If irrigated by sprinkler systems, this soil is poorly suited to corn, grain sorghum, and alfalfa. It is not suited to gravity irrigation. Conservation tillage practices that leave crop residue on the surface help to control soil blowing. Efficient water use and controlled application rates are very important considerations. Applying small amounts of plant nutrients through the sprinklers throughout the cropping season eliminates the need for larger applications. If large amounts are applied, some of the plant nutrients may be lost through leaching. Returning crop residue to the soil helps to maintain or improve the organic matter content and fertility.

This soil is suited to range. A cover of range plants 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. After the plants are continuously overgrazed, the site is dominated by blue grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds.

This soil is a fair site for the trees and shrubs grown as farmstead and feedlot windbreaks and as plantings that enhance recreation areas and wildlife habitat. It generally is unsuited to field windbreaks. Drought and soil blowing are the principal management concerns. Windblown sand can cover the seedlings. Soil blowing can be controlled by planting in shallow furrows with as little disturbance of the surface as possible. Irrigation can provide the supplemental moisture needed for establishing seedlings. Only coniferous species should be selected for planting.

Alternative sites for septic tank absorption fields should be considered because this soil has a poor filtering capacity. Alternative sites for sewage lagoons should be considered because of seepage. Temporarily shoring shallow excavations helps to prevent sloughing or caving. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. The soil is suitable as a site for local roads.

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

VaE—Valentine fine sand, rolling. This deep, excessively drained soil is on hummocky sandhills in the uplands. It formed in eolian sand. Slope ranges from 9 to 17 percent. Areas range from 40 to 2,000 acres in size.

Typically, the surface layer is dark grayish brown, loose fine sand about 6 inches thick. The underlying material to a depth of 60 inches is pale brown fine sand.

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

Permeability is rapid in the Valentine soil. Available water capacity is low. Organic matter content and natural fertility also are low.

Nearly all of the acreage supports native grasses and is used for grazing. This soil is not suited to dryland or irrigated crops, pasture, or hay because of a severe erosion hazard. It is suited to range. A cover of range plants is very effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses dominated by little bluestem, sand bluestem, prairie sandreed, sand lovegrass, needleandthread, and switchgrass. When the plants are continuously overgrazed or improperly harvested for hay, sand bluestem, little bluestem, switchgrass, and sand lovegrass decrease in abundance and needleandthread, prairie sandreed, blue grama, sand dropseed, sandhill muhly, and annual and perennial weeds increase. If overgrazing continues for many years, the less desirable plants increase in abundance and blowouts form. Providing an adequate number of water and salt facilities and carefully locating those facilities help to achieve a uniform distribution of grazing. They also help to eliminate long livestock paths, along which blowouts can form.

This soil is a fair site for the trees and shrubs grown as farmstead and feedlot windbreaks and as plantings that enhance recreation areas and wildlife habitat. It generally is unsuited to field windbreaks. Drought and soil blowing are the principal management concerns. Windblown sand can cover the seedlings. Soil blowing can be controlled by planting in shallow furrows with as little disturbance of the surface as possible. Irrigation can provide the supplemental moisture needed for establishing seedlings. Only coniferous species should be selected for planting.

Alternative sites for septic tank absorption fields should be selected because this soil has a poor filtering capacity. Alternative sites for sewage lagoons should be selected because of seepage and slope. Dwellings should be designed so that they conform to the natural slope of the land, or the soil should be graded to an acceptable gradient. Temporarily shoring shallow excavations helps to prevent sloughing or caving. Cutting and filling generally are needed to provide a suitable grade on sites for local roads.

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

VaF—Valentine fine sand, rolling and hilly. This deep, excessively drained soil is on rolling and hilly sand dunes in the uplands. It formed in eolian sand. The rolling part is on smooth ridgetops, on the lower side slopes, and in swales. It has a slope of 9 to 17 percent. The hilly part has a slope of 17 to 45 percent. It commonly is characterized by a succession of short, vertical exposures, or catsteps, which expose the sandy parent material. Areas range from 20 to 200 acres in size. They are 20 to 50 percent Valentine fine sand, rolling, and 45 to 75 percent Valentine fine sand, hilly. The rolling and hilly slopes occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer is light grayish brown, loose fine sand about 2 inches thick. The underlying material to a depth of 60 inches is light brownish gray fine sand. In some areas the surface layer has been removed by soil blowing. In other areas the soil is less sloping or steeper.

Included with this soil in mapping are small areas of Hersh soils. These soils are fine sandy loam throughout. They are lower on the landscape than the Valentine soil. They make up 2 to 5 percent of the map unit.

Permeability is rapid in the Valentine soil, and available water capacity is very low. Runoff is slow. Organic matter content and natural fertility are low.

All of the acreage supports native grasses and is used for grazing. Because of the rolling and hilly slopes and a very severe erosion hazard, this soil is not suited to dryland or irrigated crops, pasture, hay, or windbreaks. It is suited to range. A cover of range plants is very effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses dominated by little bluestem, needleandthread, sand bluestem, switchgrass, prairie sandreed, indiangrass, and sand lovegrass. When the plants are continuously overgrazed, plant vigor is reduced. Further overgrazing can result in a sparse plant cover, an increased susceptibility to soil blowing, and the formation or enlargement of blowouts. The blowouts that are becoming stabilized are dominated by blowout grass, sandhill muhly, lemon scurfpea, and other perennial broadleaf plants. The vegetation is generally more sparse on the hilly part than on the rolling part because the very steep slopes are more susceptible to damage by livestock and to erosion. Proper grazing use, timely deferment of grazing, and a planned grazing system help to maintain or improve the range condition. Providing an adequate number of water and salt facilities and carefully locating those facilities help to achieve a uniform distribution of grazing. They also help to eliminate long livestock paths, along which blowouts can form.

Alternative sites for septic tank absorption fields should be considered because this soil has a poor filtering capacity and an excessive slope. Alternative sites for sewage lagoons should be considered because of seepage and the slope. Alternative sites for dwellings and for local roads should be considered because of the slope. Temporarily shoring the sides of shallow excavations helps to prevent sloughing or caving.

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

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; for 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, 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.

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

Crops and Pasture

Prepared by William E. Reinsch, conservation agronomist, Soil Conservation Service.

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

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

Most of the acreage in Valley County is farmland. About 47 percent of the farmland is used for cultivated crops, pasture, and hay (*6*). Nearly 50 percent of the cultivated cropland is irrigated. Corn and alfalfa are the main crops.

Dryland Farm Management

Good management of areas used for dryland crops reduces the runoff rate and the hazard of erosion, conserves moisture, and improves tilth.

Terraces, contour farming, and conservation tillage systems that keep crop residue on the surface help to control water erosion. Keeping crop residue on the surface or establishing a protective plant cover helps to prevent crusting during and after heavy rains. In winter, the stubble holds snow on the field and thus increases the moisture supply.

Soil blowing is not a serious problem in Valley County if crop residue is left on the surface throughout the winter, or until spring planting. Conservation tillage practices that leave residue on the surface help to control soil blowing. The overall hazard of erosion could be reduced if areas of 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, or for hay and pasture.

The kinds and amounts of fertilizer to be applied to the soils used for dryland crops should be based on the results of soil tests. Nitrogen and phosphorus are the elements added in most cultivated areas. In some areas trace elements are needed.

Irrigation Management

About 48 percent of the cropland in Valley County is irrigated. Corn is grown on 88 percent of the irrigated cropland. A smaller acreage is used for alfalfa hay, grain sorghum, and soybeans. The irrigation water is obtained from wells and canals (fig. 9). Gravity or sprinkler systems are suitable in areas used for corn, grain sorghum, and soybeans. Alfalfa is generally irrigated by border or sprinkler systems.

The cropping system on soils that are well suited to irrigation consists mostly of row crops. A cropping sequence that includes different row crops, such as soybeans, corn, and sorghum, helps to control the diseases and insects that are common if the same crop is grown year after year.

Gently sloping soils, such as Holdrege silt loam, 3 to 6 percent slopes, are subject to water erosion if they are furrow irrigated down the slope. If furrow irrigated, these soils can be contour bench leveled or contour furrows can be used in combination with parallel terraces. Land leveling increases the efficiency of irrigation because it results in an even distribution of water. The efficiency of a furrow irrigation system can be improved by installing a tailwater recovery system.

Terraces, contour farming, and conservation tillage practices that keep crop residue on the surface help to control water erosion on soils irrigated by a sprinkler system. The water is applied by the sprinklers at a controlled rate, so that it is absorbed by the soil and does not run off the surface. Sprinklers can be used on the more sloping soils as well as the nearly level ones. Some soils, such as Hersh fine sandy loam, 3 to 6 percent slopes, are suited to sprinkler irrigation only if erosion is controlled. Because the water can be carefully controlled, sprinklers can be used for special purposes, such as establishing a new pasture on moderately steep soils. The most common types of sprinkler irrigation in Valley County are the center-pivot and towline systems (fig. 10).

Irrigation is most efficient if it is started when about half of the available water in the soil has been used by the plants. Thus, if a soil holds 8 inches of available water, irrigation should be started when about 4 inches has been removed by the crop.

A tailwater recovery pit can be installed to trap excess irrigation tailwater. This water can then be pumped back onto the field and used again. This practice increases the efficiency of the irrigation system and conserves the supply of underground water.

All of the soils in Nebraska are assigned to irrigation design groups. These groups are described in the Irrigation Guide for Nebraska, which is part of the technical specifications for conservation in Nebraska (*10*). If applicable, an irrigation capability unit is specified at the end of the map unit descriptions under the heading "Detailed Soil Map Units." The Arabic number at the end of the irrigation capability unit indicates the irrigation design group to which the soil is assigned.

Assistance in planning and designing an irrigation system can be obtained from the local office of the Soil Conservation Service or from the Cooperative Extension Service. Estimates concerning the cost of irrigation equipment can be obtained from local dealers and manufacturers.

Weed Control

Weeds can be controlled by suitable cropping sequences or by herbicides. Rotating different crops in a planned sequence not only helps to control weeds but also increases productivity and the organic matter content. The kinds and amounts of herbicide applied to the soil should be carefully controlled. The colloidal clay and humus fraction of the soil is responsible for most of the chemical activity in the soil. Applications of an excessive amount of herbicide result in crop damage on sandy soils, which have a low content of colloidal clay, and on soils that have a moderately low or low organic matter content.

Pasture and Hayland Management

Hayland or pasture should be managed for maximum production. Once the pasture is established, the grasses should be kept productive. In Valley County pastures of introduced grasses consist mainly of cool-season grasses, which start to grow early in spring and reach their peak growth in May or June. Unless the pasture is irrigated, these grasses are dormant during July and August and start to grow again in the fall. For this reason, the grasses grown in the pastured areas should include warm-season grasses or temporary pastures of sudangrass. These grasses attain their peak growth during July and August. A combination of cool-season and warm-season grasses provides green plants during the entire growing season.

Rotation grazing allows for regrowth of the grasses and legumes used for pasture. A planned grazing system in which pastures of cool-season grasses are grazed in rotation extends the grazing season and increases production. The most commonly grown introduced grasses on cool-season pastures are smooth bromegrass and intermediate wheatgrass. Other cool-season grasses and legumes that are adapted to the soils and climate in Valley County are orchardgrass, creeping foxtail, meadow bromegrass, reed canarygrass, alfalfa, birdsfoot trefoil, and cicer milkvetch. When planted as a single species on nonirrigated land, some native warm-season grasses can be grown with the cool-

Figure 9.—An irrigation canal in an area of the Cozad-Hord association.

season grasses. Examples are switchgrass, indiangrass, and big bluestem. If a planned grazing system is applied, growing these warm-season grasses can provide high quality forage during the summer.

Introduced pasture grasses can be grazed in spring and fall, after they reach a height of 5 or 6 inches. Until they reach this height, they grow on food reserves stored in their roots and rhizomes. Grazing too early in spring or too late in fall reduces the vigor of the plants.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be

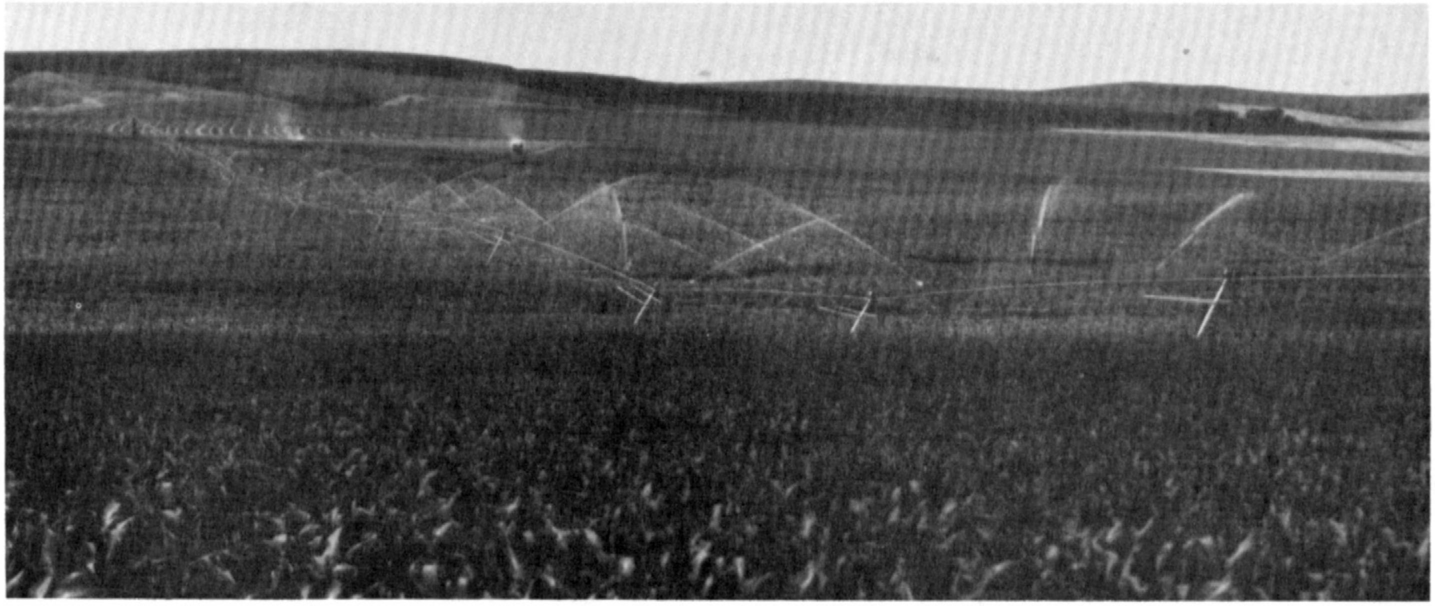

Figure 10.—A center-pivot irrigation system in an area of the Holdrege-Uly-Cozad association.

higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, 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 quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, 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, alkaline, or droughty; 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-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Prime Farmland

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

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

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

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

About 117,340 acres in the survey area, or about 32 percent of the total acreage, meets the soil requirement for prime farmland. The map units that are considered prime farmland are listed in table 7. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Soils that have limitations, such as a seasonal high water table, frequent flooding during the growing season, or inadequate rainfall, qualify for prime farmland only in areas where these limitations have been overcome by such measures as drainage, flood control, or irrigation. The need for these measures is indicated after the map unit name in table 7. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Rangeland

Prepared by Peter N. Jensen, range conservationist, Soil Conservation Service.

Rangeland makes up about 45 percent of the total agricultural land in Valley County. It is in scattered areas throughout the county. The greatest concentration is in the loess hills and sandhills. The soil associations dominantly used for grazing or native hay are Coly-Uly and Valentine (fig. 11). These associations are described under the heading "General Soil Map Units." Center-pivot systems irrigate corn, alfalfa, or hay in some areas of rangeland in the Valentine-Hersh-Gates, Valentine, and Coly-Uly associations. The average size of livestock farms in Valley County is about 1,280 acres.

The raising of livestock is an important agricultural industry in the county. The livestock are mainly cow and calf herds. The calves are sold in the fall as feeders. The range is generally grazed from late in spring to early in fall. Livestock graze in the fall on corn residue from irrigated cropland or on the regrowth of native meadows. They are fed native or alfalfa hay during the winter and early spring. Also, the forage from rangeland is supplemented by protein in the fall and winter.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for nearly all the soils, the range site and the potential annual production of vegetation in favorable, normal, and unfavorable years. Only those soils that are used as rangeland or are suited to use as rangeland are listed. An explanation of the column headings in table 8 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

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,

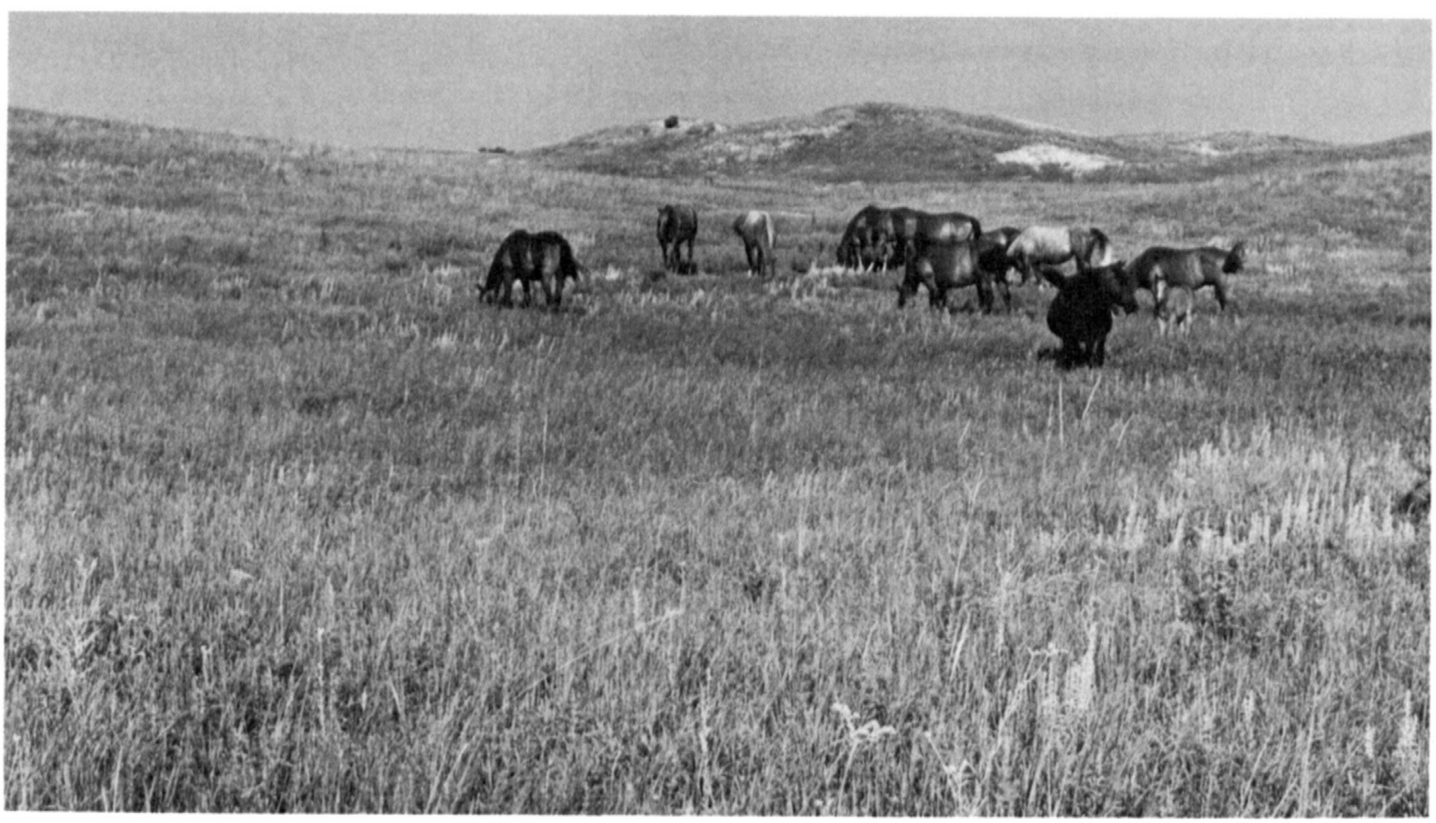

Figure 11.—Horses grazing in an area of Valentine fine sand, rolling, in the Valentine association.

average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Some of the rangeland in Valley County has been overgrazed. Approximately 50 percent of the rangeland is producing less than half of its potential in kind or amount of native plants. This decreased production is largely the result of the overuse caused by overstocking and poor livestock distribution.

Range management that maintains or improves the range condition is needed on all rangeland used for grazing. It includes (1) proper grazing use that leaves an adequate cover of vigorous plants, (2) deferred grazing, or resting grazing land during the carbohydrate storage period of the key management plants, (3) a planned grazing system, whereby the pastures are alternately grazed and rested in a planned sequence. Also, properly locating fences, providing livestock watering facilities, such as wells, pipelines, and stock ponds, and moving salt to areas where grazing is desired help to achieve a better distribution of grazing.

On certain Sandy and Sands range sites, production on abandoned cropland, dryland or irrigated, can be improved by planting a mixture of adapted native grasses. After establishment, production can be maintained by proper management.

Native meadows are important along the North Loup and Middle Loup Rivers. Most are used for the production of native hay. The rangeland is generally used for meadow, however, in areas where the water table is high. These areas are assigned to the Wetland and Subirrigated range sites. The dominant vegetation is big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, reedgrasses, and various sedges. Mowing has reduced the formerly large population of wildflowers.

Windbreaks and Environmental Plantings

Prepared by Keith A. Ticknor, forester, Soil Conservation Service.

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, help to keep 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 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

At the end of each map unit description, the soil has been assigned to a windbreak suitability group. These groups are based primarily on suitability of the soil for the locally adapted species, as is indicated by their growth and vigor. Detailed interpretations for each windbreak suitability group in the county are provided in the Technical Guide, which is available in the local office of the Soil Conservation Service.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Trees have been planted at various times on most farmsteads and ranch headquarters in Valley County. Windbreaks that protect livestock also are important. Siberian elm is the dominant species. Other common species are eastern redcedar, eastern cottonwood, green ash, honeylocust, and lilac.

New windbreaks and environmental plantings are continually needed because old trees pass maturity and deteriorate and because some trees are destroyed by insects, diseases, or storms. Also, new windbreaks are needed in areas where farming or ranching is expanding. Many of the Siberian elms in the county have passed maturity and should be replaced or supplemented by additional plantings.

Only a few field windbreaks or shelterbelts are established in the county. They typically consist of 8 to 10 rows of trees and shrubs that were planted under the Prairie States Tree Planting Program in the 1930's and 1940's. Some of the species in these windbreaks or shelterbelts are Russian-olive, eastern redcedar, hackberry, green ash, honeylocust, Siberian and American elms, ponderosa pine, eastern cottonwood, American plum, Siberian peashrub, and common chokecherry. Because these windbreaks generally have one or more rows of dead or deteriorating trees, renovation through thinning, removal, and replanting is needed.

Some newly planted trees and shrubs are used as living snow fences in the county. These windbreaks replace slatted snow fences. They provide wildlife habitat. They generally consist of three or more rows of trees and shrubs planted along the roads or highways (fig. 12).

In order for windbreaks and environmental plantings to fulfill their intended purpose, the species for planting should be suited to the soil on the site. Selecting suitable species is the first step toward ensuring survival and maximum growth rates. Permeability, available water capacity, fertility, soil texture, and soil depth greatly affect the growth of trees and shrubs.

Establishing trees and shrubs is somewhat difficult in Valley County because of dry conditions and competition from other vegetation. Preparing the site properly before planting and controlling competition from weeds and grasses after planting are important management concerns. Supplemental watering is needed when the seedlings are becoming established.

Native Woodland

Prepared by Keith A. Ticknor, forester, Soil Conservation Service.

Woodland makes up less than 1 percent of the land area in Valley County. The wooded areas are on steep breaks and on bottom land along the rivers and streams. The steep breaks in areas of the Coly-Uly soil association, which is described under the heading "General Soil Map Units," support green ash, eastern redcedar, and common chokecherry. Eastern cottonwood and black willow also are evident, but they are only in pockets where extra water is available. The north- and east-facing slopes on the breaks in the

Figure 12.—A living snow fence consisting of three rows of redcedar and one row of shrubs.

Figure 13.—Fort Hartsuff State Historical Park. The fort was a frontier military post.

northeastern part of the county support nearly pure stands of bur oak. Small numbers of green ash and eastern redcedar are associated with the bur oak.

The bottom land in the Hord-Hobbs and Boel-Loup-Leshara associations generally is wooded, but only a few areas are heavily wooded. Black willow and eastern cottonwood are the dominant species along the North and Middle Loup Rivers. Green ash and boxelder are abundant along the smaller streams. Other associated species are American elm, common chokecherry, dogwood, mulberry, and silver maple.

Some of the trees are cut for firewood and lumber, but the production of commercial wood products is very limited. The wooded areas are not in large enough concentrations to be of commercial value.

Recreation

Prepared by Robert O. Koerner, biologist, Soil Conservation Service.

Valley County provides opportunities for various kinds of recreation, including hunting for both big and small game, and fishing in the private farm ponds and the Middle and North Loup Rivers. The fish species include catfish, largemouth bass, bluegill, crappies, and sauger. Largemouth bass, bluegill, and catfish are stocked in the ponds.

Fort Hartsuff State Historical Park is located in northern Valley County. This is one of the few frontier military posts that still has some of the original buildings (fig. 13). The fort was established in 1874 to protect the settlers. It was abandoned in 1881. It was a farmstead for many years, until the site was presented to the Nebraska Game and Parks Commission, which owns and operates it.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public 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 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table

13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils 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

Prepared by Robert O. Koerner, biologist, Soil Conservation Service.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, grain sorghum, wheat, and oats.

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, Kentucky bluegrass, smooth bromegrass, 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 big and little bluestems, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, green ash, honeylocust, willow, hackberry, dogwood, eastern cottonwood, and sumac.

Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are common chokecherry, Russian-olive, autumn-olive, and American plum.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, 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 western sandcherry, honeysuckle, western snowberry, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, prairie cordgrass, rushes, sedges, and reedgrass.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are 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 rabbit, and coyote.

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, thrushes, woodpeckers, squirrels, coyote, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, great blue heron, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include deer, sharp-tailed grouse, prairie chicken, meadowlark, and lark bunting.

The paragraphs that follow describe the kinds of wildlife and wildlife habitat in areas of the soil associations described under the heading "General Soil Map Units."

The Holdrege-Uly-Cozad, Holdrege-Hord-Uly, Hord-Hobbs, and Cozad-Hord associations, which are dominantly cropland, provide openland wildlife habitat (fig. 14). The main crops are irrigated or dryland corn and alfalfa and dryland wheat. The steeper areas support grasses and provide nesting cover. The landscape is cut by many drainageways. Trees and shrubs, such as redcedar, green ash, boxelder, cottonwood, willow, hackberry, Russian mulberry, sumac, native plum, and chokecherry, are along the drainageways. The wildlife species inhabiting these associations are bobwhite quail, cottontail rabbit, pheasant, fox squirrel, whitetail deer, and numerous nongame birds and mammals.

The Coly-Uly, Valentine, and Valentine-Hersh-Gates associations are dominantly rangeland. Solid stands of bur oak are on the north- and east-facing slopes in the areas of the Coly-Uly association in the northeast part of the county. These stands provide escape cover for deer, grouse, and other wildlife species. Deciduous trees and shrubs, such as ash, elm, boxelder, Russian-olive, hackberry, Russian mulberry, chokecherry, dogwood, American plum, and sumac are in scattered clumps along the draws.

The Valentine and Valentine-Hersh-Gates associations support dominantly warm-season grasses, such as big and little bluestems, switchgrass, sand bluestem, buffalograss, and sideoats and blue gramas. These grasses provide nesting habitat for prairie grouse and many songbirds. Coyote, whitetail and mule deer, badgers, hawks, owls, and eagles inhabit these associations during migration periods. Proper grazing use and a planned grazing system improve the habitat.

The North and Middle Loup Rivers flow through the Boel-Loup-Leshara association (fig. 15). A good diversity of cover types, including grasses and legumes, corn, and alfalfa, is along these rivers. Scattered trees and shrubs furnish food and cover for many wildlife species, including deer, bobwhite quail, pheasant, fox squirrel, cottontail rabbit, and songbirds. The major soils have a seasonal high water table. Some of the higher or better drained areas are farmed. The lower, wetter areas generally support grasses, such as prairie cordgrass, switchgrass, and reedgrass; sedges; and trees, such as cottonwood and willow. Wetland and openland species inhabit the association.

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, 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

Figure 14.—An area of the Cozad-Hord association, which provides habitat for openland wildlife. Corn and alfalfa are the most common crops.

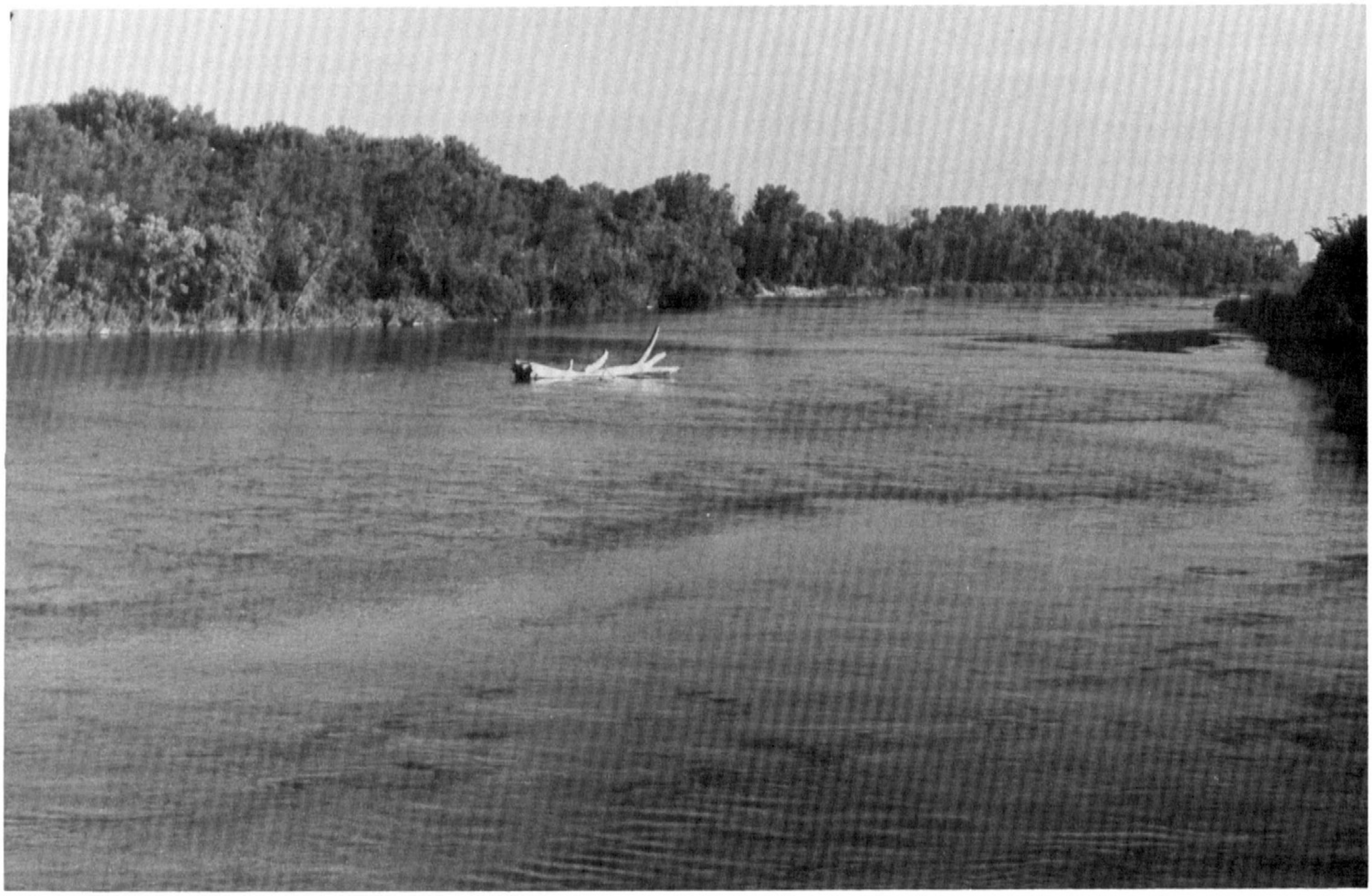

Figure 15.—An area of the Boel-Loup-Leshara association used as wildlife habitat. The North and Middle Loup Rivers flow through this association.

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 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by a very firm dense layer, gravel content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and 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, large stones, slope, 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. 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, the available water capacity in the upper 40 inches, and the content of salts and sodium affect plant growth. Flooding, wetness, slope, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent. Sandy areas may interfere with installation because of the tendency of cutbanks to cave.

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 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, and content of organic matter.

Excessive seepage 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 can cause construction problems, and gravel can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 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, gravel content, 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, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over 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 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help 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 gravel content, 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, 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 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil) and the thickness of suitable material. Acidity and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that 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 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, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They have little or no gravel and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of gravel, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil.

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 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 or sodium. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, gravel content, and slope. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, and gravel content affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Wetness and slope affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some representative profiles and tested in the laboratory to determine grain-size distribution and plasticity. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help 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.

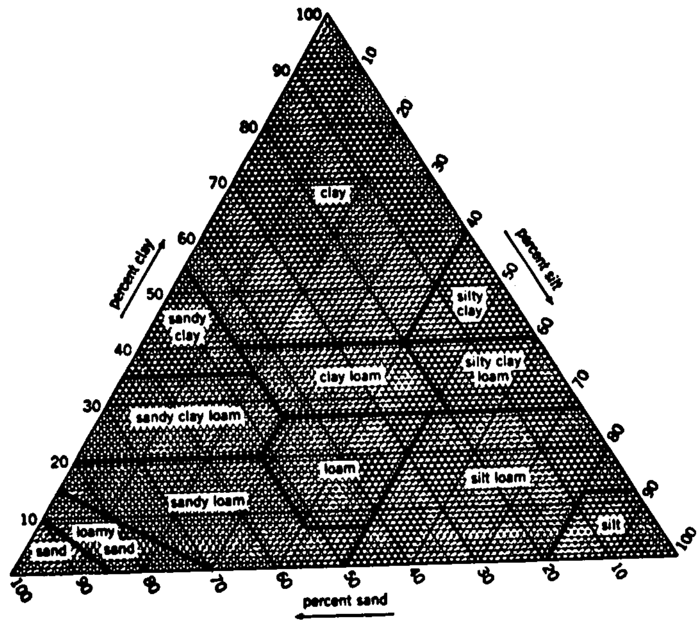

Figure 16.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 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 (fig. 16). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. 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 19.

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.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to absorb 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 earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 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.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. 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 soil blowing 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 soil blowing are used.

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

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

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

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. 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 soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter 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 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils 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 or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, not 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 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their

Morphology." The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Specific gravity—T 100 (AASHTO). The group index number that is part of AASHTO classification is computed by the Nebraska modified system.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*9*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. 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 Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

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

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with 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* (*8*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*9*). 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."

Barney Series

The Barney series consists of deep, poorly drained soils on bottom land. These soils formed in a thin layer of loamy alluvium over sandy and gravelly alluvium. Permeability is moderate in the upper part of the profile and rapid in the underlying sand. Slopes range from 0 to 2 percent.

Barney soils are commonly adjacent to Boel and Loup soils. These adjacent soils are slightly higher on the landscape than the Barney soils. Boel soils are somewhat poorly drained. Loup soils have a mollic epipedon.

Typical pedon of Barney loam, channeled, 0 to 2 percent slopes, 2,000 feet west and 500 feet north of the southeast corner of sec. 8, T. 17 N., R. 16 W.

A1—0 to 6 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, friable; few thin strata of finer and coarser textured material; strong effervescence; mildly alkaline; abrupt wavy boundary.

A2—6 to 9 inches; gray (10YR 5/1) loamy fine sand, very dark gray (10YR 3/1) moist; single grain; loose; few thin strata of finer textured material; mildly alkaline; abrupt smooth boundary.

C—9 to 60 inches; light gray (10YR 7/1) sand, gray (10YR 6/1) moist; single grain; loose; few thin strata of loamy fine sand; neutral.

The solum is 7 to 10 inches thick. The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly loam, but the range includes silt loam, very fine sandy loam, fine sandy loam, and loamy fine sand. This horizon ranges from neutral to moderately alkaline. The C horizon has hue of 2.5Y or 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 3. It typically is sand that has thin strata of loamy fine sand, fine sand, coarse sand, and gravel.

Blendon Series

The Blendon series consists of deep, well drained soils that formed in sandy and loamy alluvium on stream terraces. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Blendon soils are commonly adjacent to Hord, Cozad, and Simeon soils. Hord and Cozad soils contain less sand and more silt in the subsoil and underlying material than the Blendon soils. Their positions on the landscape are similar to those of the Blendon soils. Simeon soils have more sand and less silt and clay throughout than the Blendon soils. They are generally on the steeper slopes.

Typical pedon of Blendon fine sandy loam, 0 to 2 percent slopes, 1,320 feet west and 2,540 feet north of the southeast corner of sec. 23, T. 19 N., R. 14 W.

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

A—6 to 16 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to weak fine granular; slightly hard, friable; slightly acid; gradual smooth boundary.

Bw—16 to 23 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to weak fine subangular blocky; slightly hard, friable; slightly acid; gradual smooth boundary.

BC—23 to 31 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C1—31 to 48 inches; very pale brown (10YR 7/3) fine sand, yellowish brown (10YR 5/4) moist; single grain; loose; neutral; clear smooth boundary.

C2—48 to 60 inches; very pale brown (10YR 7/3) fine sand, light yellowish brown (10YR 6/4) moist; single grain; loose; neutral.

The thickness of the solum ranges from 30 to 40 inches. The thickness of the mollic epipedon ranges from 20 to 36 inches.

The A horizon has hue of 10YR, value of 3 or 4 (2 or 3 moist), and chroma of 1 or 2. It is typically fine sandy loam but in some pedons is loam. It is neutral to medium acid. The Bw horizon has hue of 10YR, value of 3 or 4 (2 or 3 moist), and chroma of 1 or 2. It is dominantly fine sandy loam, but in some pedons is sandy loam or loam. The BC horizon has hue of 10YR, value of 4 or 5 (3 or 4 moist), and chroma of 2 or 3. It is dominantly fine sandy loam but in some pedons is sandy loam. The B horizon is slightly acid or neutral. The C horizon has hue of 10YR, value of 5 to 7 (5 or 6 moist), and chroma of 2 to 4.

Boel Series

The Boel series consists of deep, somewhat poorly drained soils that formed in loamy and sandy alluvium on bottom land. Permeability typically is moderately rapid in the upper part of the profile and rapid in the lower part. In many pedons, however, it is rapid throughout the profile. Slopes range from 0 to 2 percent.

Boel soils are commonly adjacent to Barney and Loup soils. These adjacent soils are poorly drained and are lower on the landscape than the Boel soils.

Typical pedon of Boel fine sandy loam, 0 to 2 percent slopes, 1,750 feet west and 2,000 feet south of the northeast corner of sec. 8, T. 17 N., R. 16 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

AC—7 to 11 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C—11 to 60 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; few fine distinct strong brown (7.5YR 5/6) mottles; loose; neutral.

The thickness of the solum ranges from 10 to 16 inches. Some pedons have free carbonates in the A horizon.

The A horizon has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It is typically fine sandy loam or loamy fine sand but in some pedons is very fine sandy loam or loam. It is neutral or mildly alkaline. The AC horizon, if it occurs, has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 2. It is typically fine sandy loam but in some pedons is loamy fine sand. It is neutral to moderately alkaline. The C horizon has hue of 10YR, value of 6 to 8 (5 to 7 moist), and chroma of 2. It is typically fine sand, but the range includes loamy fine sand.

Butler Series

The Butler series consists of deep, somewhat poorly drained, slowly permeable soils on stream terraces. These soils formed in alluvium. Slopes are 0 to 1 percent.

Butler soils are similar to Detroit soils and are commonly adjacent to Cozad and Hord soils. Cozad and Hord soils are well drained and have less clay in the B horizon than the Butler soils. Also, they are slightly higher on the landscape. Detroit soils are moderately well drained.

Typical pedon of Butler silt loam, 0 to 1 percent slopes, 700 feet north and 600 feet east of the southwest corner of sec. 24, T. 18 N., R. 14 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; medium acid; abrupt smooth boundary.

A—7 to 11 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak very fine subangular blocky structure; slightly hard, friable; medium acid; abrupt smooth boundary.

E—11 to 12 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak very fine subangular blocky structure; soft, friable; slightly acid; abrupt smooth boundary.

Bt1—12 to 22 inches; dark grayish brown (10YR 4/2) silty clay, very dark gray (10YR 3/1) moist; strong coarse prismatic structure parting to strong fine subangular blocky; very hard, very firm; neutral; gradual smooth boundary.

Bt2—22 to 38 inches; gray (10YR 5/1) silty clay, very dark grayish brown (10YR 3/2) moist; strong coarse prismatic structure parting to strong medium and fine subangular blocky; very hard, very firm; slight effervescence; mildly alkaline; gradual smooth boundary.

BC—38 to 48 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; moderate coarse prismatic structure parting to moderate fine subangular blocky; hard, firm; few fine masses of calcium carbonates; strong effervescence; mildly alkaline; gradual smooth boundary.

C—48 to 60 inches; light gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; massive; slightly hard, friable; common fine masses of calcium carbonates; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 24 to 50 inches. The mollic epipedon extends into the B horizon.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is typically silt loam but in some pedons is silty clay loam. It ranges from medium acid to neutral. The E horizon has hue of 10YR, value of 4 or 5 (3 moist), and chroma of 1. The Bt horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. The B horizon ranges from medium acid to moderately alkaline. The BC horizon has hue of 10YR or 2.5Y, value of 4 to 6, (3 or 4 moist), and chroma of 1 or 2. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 or 2.

Coly Series

The Coly series consists of deep, well drained to excessively drained, moderately permeable soils on uplands. These soils formed in calcareous loess (fig. 17). Slopes range from 6 to 60 percent.

Coly soils are commonly adjacent to Hobbs, Holdrege, and Uly soils. Hobbs soils formed in stratified alluvium on bottom land along intermittent drainageways. Holdrege soils have a mollic epipedon and contain more clay in the subsoil than the Coly soils. Also, they are generally less sloping and are higher on the landscape. Uly soils have a mollic epipedon and are higher on the landscape than the Coly soils.

Typical pedon of Coly silt loam, in an area of Coly-Hobbs silt loams, 2 to 60 percent slopes, 1,940 feet north and 100 feet west of the southeast corner of sec. 29, T. 19 N., R. 16 W.

A—0 to 4 inches; grayish brown (10YR 5/2) silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

AC—4 to 10 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; weak fine granular structure; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C—10 to 60 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable; few soft masses of lime; violent effervescence; moderately alkaline.

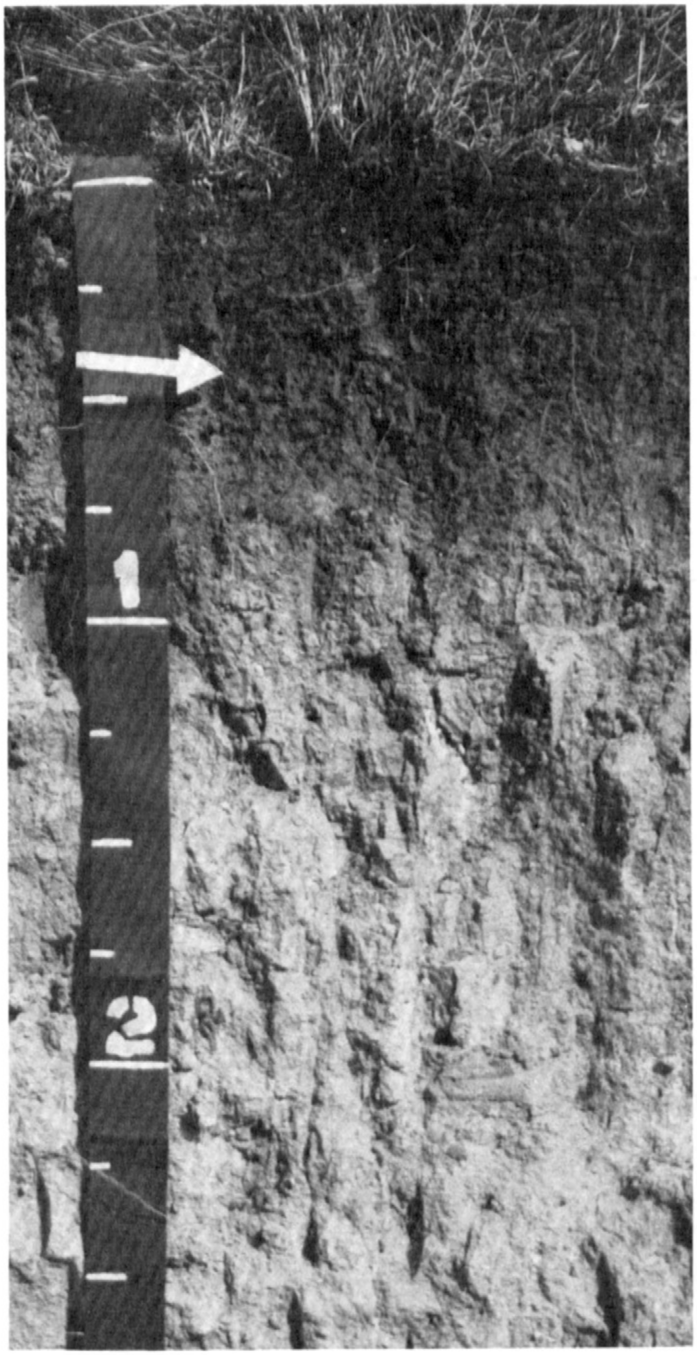

Figure 17.—Profile of a Coly silt loam. This soil formed in loess. The marker indicates the lower boundary of the thin, calcareous surface layer. Depth is marked in feet.

The solum ranges from 3 to 14 inches in thickness. It is mildly or moderately alkaline. The depth to free carbonates ranges from 0 to 10 inches.

The A horizon has hue of 10YR, value of 5 to 7 (3 to 5 moist), and chroma of 2 or 3. The AC horizon, if it occurs, and the C horizon have hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. They are dominantly silt loam. In some pedons, however, the lower part of the C horizon is very fine sandy loam.

Cozad Series

The Cozad series consists of deep, well drained, moderately permeable soils on stream terraces, on foot slopes, and in valleys. These soils formed in alluvium and colluvium. Slopes range from 0 to 6 percent.

Cozad soils are similar to Hord soils and are commonly adjacent to Butler, Detroit, Hobbs, and Hord soils. Butler and Detroit soils have more clay in the subsoil than the Cozad soils. Also, they are slightly lower on the landscape. Hobbs soils are lower on the landscape than the Cozad soils and are occasionally flooded. Hord soils have a mollic epipedon more than 20 inches thick.

Typical pedon of Cozad silt loam, 1 to 3 percent slopes, 300 feet east and 2,700 feet north of the southwest corner of sec. 16, T. 18 N., R. 15 W.

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

Bw—8 to 20 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, very friable; slightly acid; gradual smooth boundary.

BC—20 to 25 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable; neutral; gradual smooth boundary.

C—25 to 60 inches; light gray (10YR 7/2) very fine sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; thinly stratified; very slight effervescence; mildly alkaline.

The thickness of the solum ranges from 15 to 30 inches, and the depth to free carbonates is more than 15 inches. The thickness of the mollic epipedon ranges from 7 to 20 inches.

The A horizon has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It is dominantly silt loam, but the range includes loam and very fine sandy loam. This horizon is slightly acid or neutral. The B horizon has hue of 10YR, value of 5 or 6 (3 or 4 moist), and chroma of 2. It is silt loam or very fine sandy loam. It ranges from slightly acid to mildly alkaline. The C horizon has hue of 10YR, value of 6 or 7 (5 or 6 moist), and chroma of 2 or 3. It is dominantly very fine sandy loam, but the range includes silt loam. A buried soil and stratification are common in the C horizon.

Cozad silt loam, terrace, 0 to 1 percent slopes, and Cozad silt loam, terrace, 1 to 3 percent slopes, are taxadjunct to the Cozad series because the solum contains more clay than is defined as the range for the series.

Detroit Series

The Detroit series consists of deep, moderately well drained, slowly permeable soils on stream terraces. These soils formed in silty alluvium. Slopes are 0 to 1 percent.

Detroit soils are similar to Butler soils and are commonly adjacent to Butler, Cozad, and Hord soils. Butler soils are characterized by an abrupt textural change between the E and Bt horizons. They are slightly lower on the landscape than the Detroit soils. Cozad and Hord soils have less clay in the control section than the Detroit soils. Also, they are higher on the landscape.

Typical pedon of Detroit silt loam, 0 to 1 percent slopes, 500 feet north and 2,300 feet east of the southwest corner of sec. 8, T. 19 N., R. 14 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable; slightly acid; gradual smooth boundary.

A—6 to 10 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable; neutral; gradual smooth boundary.

BA—10 to 15 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; moderate fine and very fine subangular blocky structure; hard, firm; neutral; gradual smooth boundary.

Bt1—15 to 24 inches; dark grayish brown (10YR 4/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate fine subangular blocky; very hard, firm; neutral; gradual smooth boundary.

Bt—24 to 40 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, firm; neutral; clear smooth boundary.

BC—40 to 48 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable; mildly alkaline; gradual smooth boundary.

C—48 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; slight effervescence; moderately alkaline.

The thickness of the solum and the depth to free carbonates range from 30 to 50 inches. The mollic epipedon ranges from 20 to 50 inches in thickness and includes the upper part of the B horizon.

The A horizon has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. It is typically silt loam but in some pedons is silty clay loam. It is slightly acid or neutral. The BA and Bt horizons have hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2. The Bt horizon is typically silty clay, but the range includes silty clay loam. This horizon is neutral or mildly alkaline. The BC and C horizons have hue of 10YR or 2.5YR, value of 4 to 6 (3 to 5 moist), and chroma of 2 to 4. The C horizon is typically silt loam, but the range includes silty clay loam.

Fillmore Variant

The Fillmore Variant consists of deep, poorly drained soils in upland depressions. These soils formed in loess covered with stratified recent alluvium. Permeability is moderate in the uppper part of the profile and slow in the lower part. Slopes are 0 to 1 percent.

Fillmore Variant soils are commonly adjacent to Holdrege, Hord, and Scott soils. Holdrege and Hord soils are well drained, have less clay in the subsoil than the Fillmore Variant soils, and are higher on the landscape. Scott soils are very poorly drained and are lower on the landscape than the Fillmore Variant soils.

Typical pedon of Fillmore Variant silt loam, 0 to 1 percent slopes, 1,300 feet east and 300 feet north of the southwest corner of sec. 9, T. 19 N., R. 16 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.

C—6 to 22 inches; dark grayish brown (10YR 4/2) stratified silt loam, very dark grayish brown (10YR 3/2) moist; massive; slightly acid; abrupt smooth boundary.

Ab—22 to 34 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

Eb—34 to 40 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; moderate thin platy structure; slightly hard, friable; neutral; abrupt smooth boundary.

Btb1—40 to 45 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; strong coarse prismatic structure parting to strong fine subangular blocky; very hard, very firm; mildly alkaline; gradual smooth boundary.

Btb2—45 to 60 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate coarse prismatic structure parting to moderate fine subangular blocky; very hard, very firm; mildly alkaline.

The depth of the buried silty clay subsoil ranges from 30 to 50 inches. Reaction is slightly acid to mildly alkaline throughout the profile.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. The C horizon has hue of 10YR, value of 4 to 6 (3 to 5 moist), and chroma of 1 or 2. The Ab horizon is similar to the A horizon. The Eb horizon has hue of 10YR, value of 5 to 7 (3 to 5 moist), and chroma of 1. The Btb horizon has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2.

Gates Series

The Gates series consists of deep, well drained, moderately permeable soils on uplands and stream terraces. These soils formed in recent loess. Slopes range from 3 to 11 percent.

Gates soils are commonly adjacent to Cozad, Hersh, and Valentine soils. Cozad soils have a mollic epipedon. They are slightly lower on the landscape than the Gates soils. Hersh and Valentine soils have more sand in the control section than the Gates soils. Also, they are higher on the landscape.

Typical pedon of Gates very fine sandy loam, 6 to 11 percent slopes, 1,400 feet west and 150 feet north of the southeast corner of sec. 20, T. 18 N., R. 16 W.

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

AC—4 to 7 inches; brown (10YR 5/3) very fine sandy loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; soft, very friable; mildly alkaline; gradual smooth boundary.

C1—7 to 18 inches; pale brown (10YR 6/3) very fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable; mildly alkaline; clear smooth boundary.

C2—18 to 60 inches; very pale brown (10YR 7/3) very fine sandy loam, pale brown (10YR 6/3) moist; massive; soft, very friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 7 to 22 inches. The depth to carbonates typically is more than 18 inches but ranges from 12 to 30 inches.

The A horizon has hue of 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 1 to 3. It is dominantly very fine sandy loam, but the range includes fine sandy loam. The AC and C horizons have hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3.

Gates very fine sandy loam, 3 to 6 percent slopes, eroded, is a taxadjunct to the Gates series because it has carbonates within a depth of 12 inches.

Gibbon Series

The Gibbon series consists of deep, somewhat poorly drained, moderately permeable soils that formed in alluvium on bottom land. Slopes are 0 to 1 percent.

These soils are taxadjuncts because they have more carbonates in the subsoil than is definitive for the Gibbon series.

Gibbon soils are similar to Leshara soils and are commonly adjacent to Barney, Boel, Leshara, and Loup soils. Barney and Loup soils are poorly drained and lower on the landscape than the Gibbon soils. Barney, Boel, and Loup soils contain more sand in the control section than the Gibbon soils. Also, Boel soils are slightly lower on the landscape. Leshara soils are calcareous below a depth of 10 inches. They are in positions on the landscape similar to those of the Gibbon soils.

Typical pedon of Gibbon silt loam, 0 to 1 percent slopes, 1,150 feet south and 300 feet east of the northwest corner of sec. 23, T. 19 N., R. 14 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable; strong effervescence; mildly alkaline; abrupt smooth boundary.

A—5 to 14 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine granular structure; soft, friable; strong effervescence; mildly alkaline; clear smooth boundary.

AC—14 to 20 inches; light brownish gray (10YR 6/2) silt loam, dark gray (10YR 4/1) moist; moderate fine granular structure; soft, friable; soft lime masses; violent effervescence; mildly alkaline; gradual wavy boundary.

C1—20 to 30 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable; soft lime masses; violent effervescence; moderately alkaline; gradual smooth boundary.

C2—30 to 42 inches; light gray (5Y 7/2) very fine sandy loam, olive gray (5Y 5/2) moist; common medium prominent brownish yellow (10YR 6/6) mottles; massive; slightly hard, friable; soft lime masses; violent effervescence; moderately alkaline; gradual smooth boundary.

C3—42 to 58 inches; light gray (5Y 7/2) very fine sandy loam, olive gray (5Y 5/2) moist; few fine distinct light olive brown (2.5Y 5/4) mottles; massive; slightly hard, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

C4—58 to 60 inches; white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; single grain; loose; neutral.

The thickness of the solum ranges from 12 to 28 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is silt loam or loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 8 (4 to 6 moist), and chroma of 1 or 2. It is dominantly silt loam, very fine sandy loam, or silty clay loam. Below a depth of 40 inches, however, it has strata of coarser textured material.

Hersh Series

The Hersh series consists of deep, well drained, moderately rapidly permeable soils that formed in mixed sandy and loamy eolian material on uplands and stream terraces. Slopes range from 0 to 17 percent.

Hersh soils are commonly adjacent to Gates and Valentine soils. Gates soils have less sand in the control section than the Hersh soils. They are in landscape positions similar to those of the Hersh soils. Valentine soils have more sand in the control section than the Hersh soils. Also, they are higher on the landscape.

Typical pedon of Hersh fine sandy loam, 6 to 11 percent slopes, 1,300 feet east and 1,900 feet south of the northwest corner of sec. 10, T. 17 N., R. 16 W.

A—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

AC—6 to 14 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable; neutral; gradual smooth boundary.

C—14 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; soft, very friable; massive; neutral.

The thickness of the solum ranges from 4 to 20 inches. Typically, carbonates are below a depth of 40 inches.

The A horizon has hue of 10YR, value of 4 to 6 (3 or 4 moist), and chroma of 2 or 3. It is typically fine sandy loam but in some pedons is very fine sandy loam or loamy fine sand. It is slightly acid or neutral. The AC horizon has hue of 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3. It is slightly acid or neutral. The C horizon has hue of 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. It is dominantly fine sandy loam but in some pedons is loamy fine sand in the lower part. It is neutral or mildly alkaline. Some pedons are stratified with finer or coarser textured material below a depth of 40 inches.

Hobbs Series

The Hobbs series consists of deep, well drained, moderately permeable soils on bottom land along streams and drainageways. These soils formed in silty alluvium (fig. 18). Slopes range from 0 to 3 percent.

Hobbs soils are commonly adjacent to Coly, Cozad, Hord, Holdrege, and Uly soils. Coly, Holdrege, and Uly soils generally are on the steeper slopes and are higher on the landscape than the Hobbs soils. Also, they have more clay and are not stratified. Cozad and Hord soils have a mollic epipedon and have a weakly developed B horizon. They are higher on the landscape than the Hobbs soils.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes, 100 feet south and 1,320 feet east of the northwest corner of sec. 32, T. 18 N., R. 14 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

C—6 to 60 inches; stratified grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; slightly hard, friable; neutral.

Typically, the upper 40 inches has no free carbonates. Some pedons, however, have thin layers of recently deposited material that contains free carbonates.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is typically silt loam but in some pedons is silty clay loam. It is slightly acid to mildly alkaline. The C horizon typically has hue of 10YR or 2.5Y, value of 4 to 7 (3 to 6 moist), and chroma of 1 to 3. It has thin strata with higher or lower value. It is typically silt loam but in some pedons has thin strata of sandy material or more clayey material. It is slightly acid to moderately alkaline. A buried A horizon is common.

Holdrege Series

The Holdrege series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 0 to 6 percent.

Holdrege soils are similar to Uly soils and are commonly adjacent to Coly, Hobbs, Hord, and Uly soils. The adjacent soils are lower on the landscape than the Holdrege soils. Coly soils are on the steeper slopes. They do not have a mollic epipedon. Hobbs soils are stratified and do not have an argillic horizon. Hord soils have a mollic epipedon that is thicker than that of the Holdrege soils. Also, they are lower on the landscape. Uly soils do not have an argillic horizon. They are on the steeper slopes.

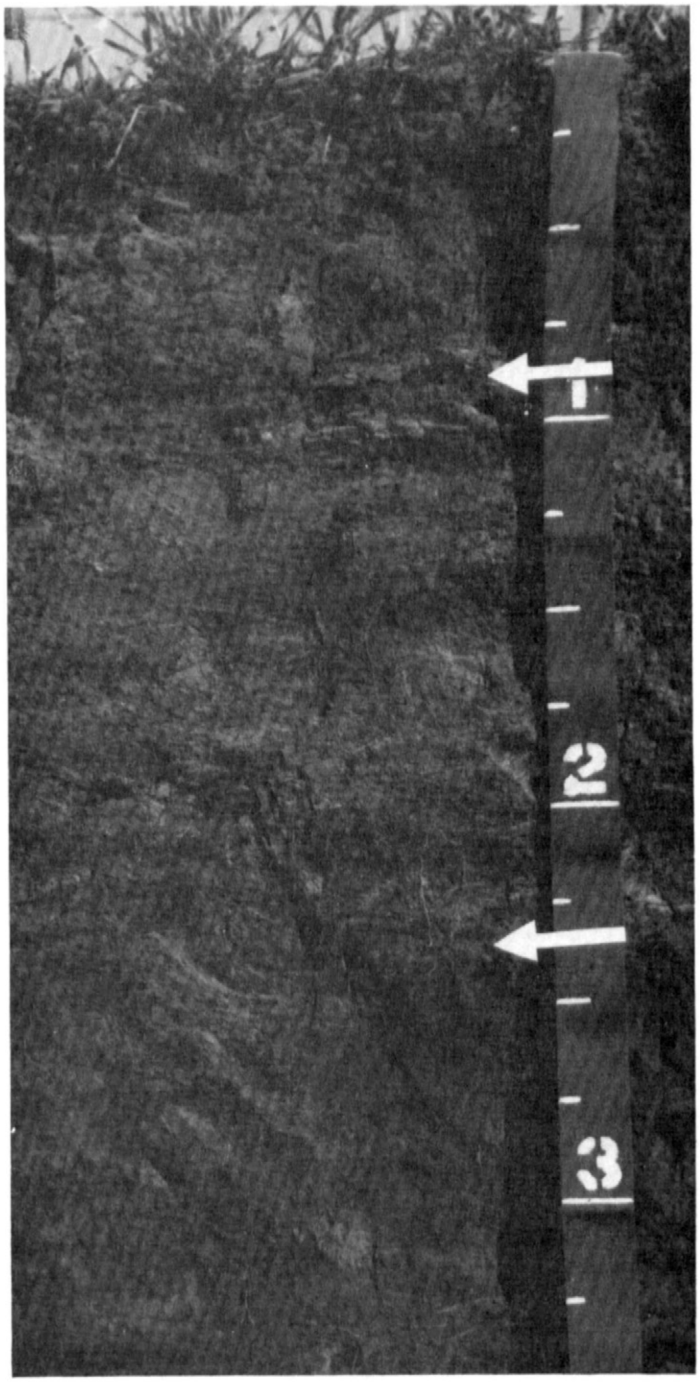

Figure 18.—Profile of a Hobbs silt loam. This soil formed in stratified alluvium. The markers indicate some of the strata. Depth is marked in feet.

Typical pedon of Holdrege silt loam, 1 to 3 percent slopes, 1,320 feet east and 400 feet north of the southwest corner of sec. 32, T. 18 N., R. 14 W.

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

A—8 to 12 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; slightly hard, very friable; neutral; clear smooth boundary.

Bt1—12 to 19 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to moderate medium and fine subangular blocky; hard, firm; slightly acid; clear smooth boundary.

Bt2—19 to 26 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; slightly acid; gradual smooth boundary.

BC—26 to 31 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; neutral; gradual smooth boundary.

C1—31 to 36 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; soft, friable; mildly alkaline; abrupt smooth boundary.

C2—36 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure; soft, friable; violent effervescence; mildly alkaline.

The thickness of the solum ranges from 20 to 38 inches. The thickness of the mollic epipedon ranges from 8 to 20 inches. The depth to free carbonates ranges from 30 to 38 inches.

The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 2. It is neutral or slightly acid. The Bt horizon has hue of 10YR, value of 4 to 7 (3 to 5 moist), and chroma of 2 to 4. It is neutral or mildly alkaline. The BC horizon has hue of 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is silt loam or silty clay loam. The C horizon has hue of 10YR, value of 6 or 7 (5 or 6 moist), and chroma of 2 to 4. It is mildly or moderately alkaline.

Hord Series

The Hord series consists of deep, well drained, moderately permeable soils that formed in silty colluvium and alluvium on stream terraces in upland swales and valleys. Slopes range from 0 to 3 percent.

Hord soils are similar to Cozad soils and are commonly adjacent to Cozad, Detroit, Hobbs, and Holdrege soils. Cozad soils are not cumulic. Detroit soils have more clay in the subsoil than the Hord soils. Also, they are lower on the landscape. Hobbs soils are stratified, are occasionally flooded, and are lower on the landscape than the Hord soils. Holdrege soils have an argillic horizon. They are higher on the landscape than the Hord soils.

Typical pedon of Hord silt loam, terrace, 0 to 1 percent slopes, 2,000 feet east and 35 feet north of the southwest corner of sec. 31, T. 20 N., R. 14 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A—8 to 20 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, very friable; neutral; clear smooth boundary.

Bw—20 to 34 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable; neutral; gradual smooth boundary.

BC—34 to 44 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable; neutral; gradual smooth boundary.

C—44 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 30 to 60 inches. The thickness of the mollic epipedon ranges from 20 to 40 inches. The depth to free carbonates ranges from 30 to 48 inches.

The A horizon has hue of 10YR, and value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is slightly acid or neutral. The Bw horizon has hue of 10YR, and value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is typically silty clay loam, but the range includes silt loam. The BC horizon has hue of 10YR, value of 4 to 6 (3 to 5 moist), and chroma of 2 or 3 (dry or moist). It is silty clay loam or silt loam. The C horizon has hue of 10YR, value of 5 to 7 (3 to 5 moist), and chroma of 2 or 3. It is typically silt loam but in some pedons is very fine sandy loam. It is mildly alkaline or moderately alkaline.

Ipage Series

The Ipage series consists of deep, moderately well drained, rapidly permeable soils on stream terraces and in upland swales. These soils formed in eolian and alluvial sand. Slopes range from 0 to 3 percent.

Ipage soils are commonly adjacent to Boel, Hersh, and Valentine soils. Boel soils are on bottom land and are somewhat poorly drained. Hersh and Valentine soils are higher on the landscape than the Ipage soils. Hersh soils are fine sandy loam throughout. Valentine soils are excessively drained.

Typical pedon of Ipage loamy fine sand, 0 to 3 percent slopes, 150 feet east and 250 feet north of the southwest corner of sec. 19, T. 18 N., R. 16 W.

A—0 to 7 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; clear smooth boundary.

C1—7 to 24 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; neutral; gradual smooth boundary.

C2—24 to 60 inches; light gray (10YR 7/2) fine sand, pale brown (10YR 6/3) moist; few fine distinct brownish yellow (10YR 6/6) mottles; single grain; loose; neutral.

The A horizon has hue of 10YR, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2. It is typically loamy fine sand, but the range includes fine sand. Some pedons have an AC horizon. The A and AC horizons are neutral to medium acid. The AC horizon has colors that are intermediate between those of the A and C horizons. It is loamy fine sand or fine sand. The C horizon has hue of 10YR, value of 6 or 7 (4 to 6 moist), and chroma of 2 or 3. Few or common, fine or medium, distinct or prominent, gray to brownish yellow mottles are within a depth of 40 inches.

Leshara Series

The Leshara series consists of deep, somewhat poorly drained, moderately permeable soils that formed in alluvium on bottom land. Slopes are 0 to 1 percent.

Leshara soils are similar to Gibbon soils and are commonly adjacent to Barney, Boel, Gibbon, and Loup soils. Barney and Loup soils are poorly drained. Barney, Boel, and Loup soils have more sand in the control section than the Leshara soils. Also, they are lower on the landscape. Gibbon soils are calcareous within a depth of 10 inches. Their positions on the landscape are similar to those of the Leshara soils.

Typical pedon of Leshara silt loam, 0 to 1 percent slopes, 1,900 feet north and 600 feet east of the southwest corner of sec. 32, T. 20 N., R. 14 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A—6 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

AC—14 to 19 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

C1—19 to 30 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; few fine faint yellowish brown (10YR 5/6) mottles; massive; slightly hard, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

C2—30 to 48 inches; light brownish gray (2.5Y 6/2) very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; many coarse prominent dark red (2.5YR 3/6) mottles; massive; slightly hard, friable; violent effervescence; moderately alkaline; abrupt smooth boundary.

2C3—48 to 60 inches; light gray (2.5Y 7/2) stratified fine sand and sand, grayish brown (2.5Y 5/2) moist; single grain; loose; neutral.

The thickness of the mollic epipedon ranges from 10 to 20 inches. The depth to free carbonates ranges from 10 to 26 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is slightly acid to moderately alkaline. It is typically silt loam, but the range includes loam and silty clay loam. Some pedons have a thin layer of lighter colored overwash on the surface. The AC horizon has hue of 2.5Y, value of 4 to 7 (3 or 4 moist), and chroma of 1 or 2. The C horizon has hue of 2.5Y, value of 5 to 7 (4 or 5 moist), and chroma of 1 or 2. It is silt loam or very fine sandy loam. The AC and C horizons are neutral to moderately alkaline.

Loup Series

The Loup series consists of deep, poorly drained soils on bottom land. These soils formed in sandy and loamy alluvium. Permeability is moderate in the upper part of the profile and rapid in the lower part. Slopes range from 0 to 2 percent.

Loup soils are commonly adjacent to Barney, Boel, Gibbon, and Leshara soils. Barney soils are slightly lower on the landscape than the Loup soils. They do not have a mollic epipedon. Boel, Gibbon, and Leshara soils are somewhat poorly drained and are slightly higher on the landscape than the Loup soils.

Typical pedon of Loup loam, 0 to 2 percent slopes, 2,300 feet west and 2,000 feet north of the southeast corner of sec. 26, T. 17 N., R. 16 W.

A1—0 to 5 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

A2—5 to 10 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; few fine distinct reddish yellow (7.5YR 6/6) mottles; weak medium granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

C1—10 to 16 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; few fine distinct strong brown (7.5YR 5/6) mottles; single grain; loose; mildly alkaline; gradual smooth boundary.

C2—16 to 60 inches; light gray (10YR 7/2) sand, light brownish gray (10YR 6/2) moist; common medium distinct dark brown (7.5YR 3/4) and strong brown (7.5YR 5/6) mottles; single grain; loose; mildly alkaline.

The mollic epipedon is 10 to 15 inches thick. The A horizon has hue of 10YR, value of 3 or 4 (2 or 3 moist), and chroma of 1 or 2. It is typically loam, but the range includes silt loam and fine sandy loam. This horizon is neutral to moderately alkaline. Some pedons have an AC horizon, which is similar to the A horizon. The C horizon has hue of 10YR or 2.5Y, value of 6 or 7 (5 or 6 moist), and chroma of 1 or 2. It is fine sand or sand. It has few or common, fine or medium, faint or distinct mottles, which are dark brown, strong brown, reddish brown, and brownish yellow.

Saltine Series

The Saltine series consists of deep, somewhat poorly drained moderately slowly permeable soils on bottom land. These soils formed in silty alluvium. They are strongly alkaline or very strongly alkaline. Slopes are 0 to 1 percent.

Saltine soils are commonly adjacent to Boel, Cozad, Gibbon, and Leshara soils. Boel soils have more sand than the Saltine soils. Also, they are lower on the landscape. Cozad soils are well drained and are higher on the landscape than the Saltine soils. Gibbon and Leshara soils are not affected by salts. Their positions on the landscape are similar to those of the Saltine soils.

Typical pedon of Saltine silt loam, in an area of Saltine-Leshara silt loams, 0 to 1 percent slopes, 375 feet west and 150 feet north of the southeast corner of sec. 25, T. 17 N., R. 16 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular structure; hard, firm; slight effervescence; moderately alkaline; abrupt smooth boundary.

C1—7 to 41 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; common fine faint yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; hard, friable; strong effervescence; strongly alkaline; abrupt smooth boundary.

C2—41 to 60 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) stratified very fine sandy loam and silt loam, dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) moist; many fine distinct strong brown (7.5YR 5/6) mottles; massive; hard, friable; strong effervescence; strongly alkaline.

The depth to carbonates ranges from 0 to 10 inches. The soils are saline within a depth of 20 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 (2 to 5 moist), and chroma of 1 or 2. It is silt loam or silty clay loam. It is moderately alkaline or strongly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (2 to 5 moist), and chroma of 1 to 3. It is silt loam or very fine sandy loam. It ranges from mildly alkaline to very strongly alkaline. It has common or many, fine, faint to prominent mottles, which have hue of 10YR or 7.5YR and value and chroma of 4 to 6.

Scott Series

The Scott series consists of deep, very poorly drained, very slowly permeable soils in upland depressions. These soils formed in loess. Slopes are 0 to 1 percent.

Scott soils are commonly adjacent to Fillmore Variant, Holdrege, and Hord soils. Fillmore Variant soils are slightly higher on the landscape than the Scott soils and are ponded for shorter periods. Holdrege and Hord soils are well drained and are higher on the landscape than the Scott soils. Also, they have less clay in the subsoil.

Typical pedon of Scott silt loam, 0 to 1 percent slopes, 2,000 feet north and 75 feet east of the southwest corner of sec. 10, T. 19 N., R. 16 W.

A—0 to 6 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; moderate medium granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

E—6 to 11 inches; light gray (10YR 6/1) silt loam, gray (10YR 5/1) moist; moderate medium and thin platy structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

Bt1—11 to 24 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; strong coarse prismatic structure parting to strong medium blocky; very hard, very firm; neutral; gradual smooth boundary.

Bt2—24 to 38 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong coarse prismatic structure parting to strong medium subangular blocky; very firm, very hard; neutral; gradual smooth boundary.

BC—38 to 56 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very firm, very hard; neutral; gradual smooth boundary.

C—56 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; firm, hard; mildly alkaline.

The thickness of the solum ranges from 27 to 60 inches. The A horizon has hue of 10YR, value of 4 or 5 (2 or 3 moist), and chroma of 1 or 2. It is typically silt loam, but the range includes silty clay loam. The E horizon, if it occurs, has hue of 10YR, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. The Bt horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 0 to 2. It is silty clay or clay in which the clay content ranges from 40 to 55 percent. The BC horizon has colors and textures intermediate between those of the Bt and C horizons. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4. It is typically silty clay loam, but the range includes silt loam.

Simeon Series

The Simeon series consists of deep, excessively drained, rapidly permeable soils that formed in sandy alluvium on stream terraces and on side slopes between the stream terraces and bottom land. Slopes range from 0 to 30 percent.

Simeon soils are commonly adjacent to Blendon, Cozad, and Hord soils on the stream terraces and to Gibbon, Leshara, and Loup soils on bottom land. Blendon, Cozad, and Hord soils are higher on the landscape than the Simeon soils. Also, Blendon soils have less sand in the solum, and Cozad and Hord soils are more clayey throughout. The somewhat poorly drained Gibbon and Leshara and poorly drained Loup soils are lower on the landscape than the Simeon soils.

Typical pedon of Simeon loamy sand, 3 to 30 percent slopes, 2,000 feet west and 2,600 feet north of the southeast corner of sec. 34, T. 19 N., R. 13 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

AC—3 to 9 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; loose; neutral; clear smooth boundary.

C1—9 to 16 inches; pale brown (10YR 6/3) coarse sand, brown (10YR 5/3) moist; single grain; loose; neutral; gradual smooth boundary.

C2—16 to 60 inches; light gray (10YR 7/2) coarse sand, pale brown (10YR 6/3) moist; single grain; loose; neutral.

The thickness of the solum ranges from 7 to 20 inches. The A horizon has hue of 10YR, value of 3 to 6 (2 or 5 moist), and chroma of 1 or 2. It is 5 to 8 inches thick. It is typically loamy sand, but the range includes loamy fine sand and fine sand. The AC horizon has hue of 10YR, value of 4 to 6 (4 or 5 moist), and chroma of 2 or 3. The C horizon has hue of 10YR, value of 6 to 8 (5 to 7 moist), and chroma of 2 or 4. It is coarse sand in which the content of medium and coarse sand is more than 35 percent and the content of gravel is, by volume, as much as 15 percent.

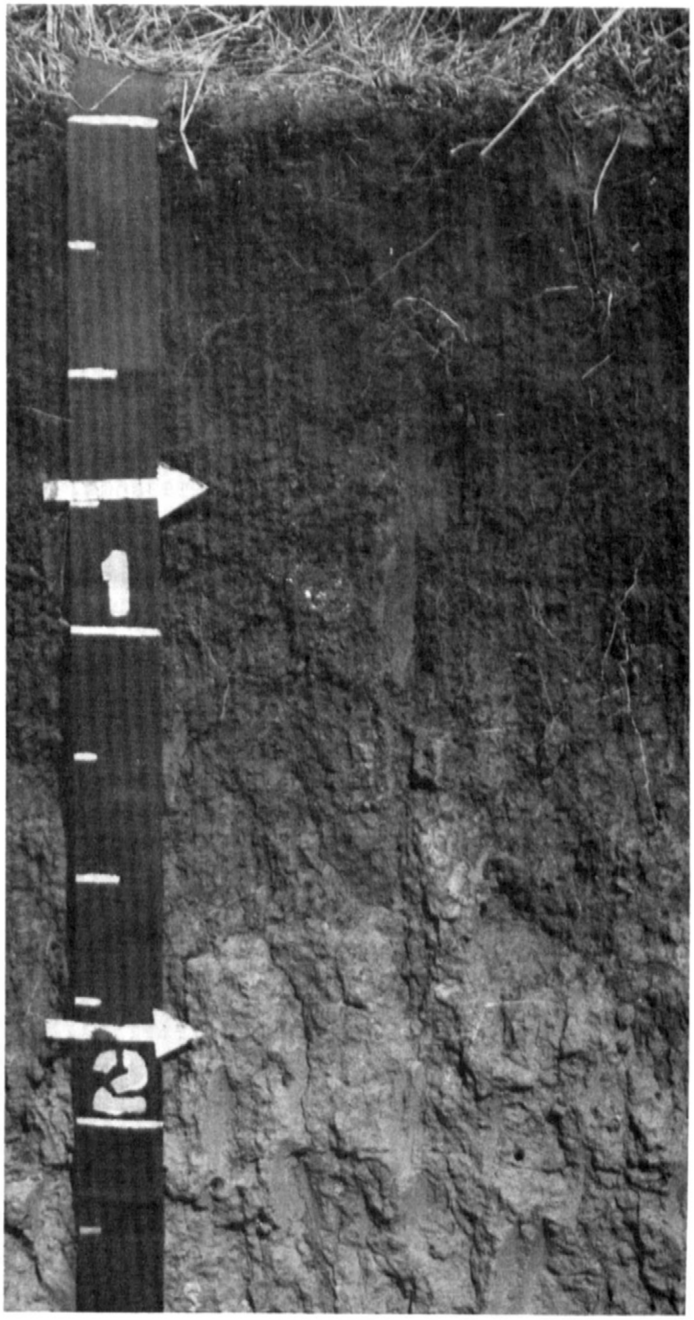

Figure 19.—Profile of a Uly silt loam. This soil formed in loess. The markers indicate the lower boundaries of the surface layer and the subsoil. Depth is marked in feet.

Uly Series

The Uly series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. These soils formed in loess (fig. 19). Slopes range from 6 to 30 percent.

Uly soils are similar to Holdrege soils and are commonly adjacent to Coly, Hobbs, and Holdrege soils. Coly soils do not have a mollic epipedon and have carbonates closer to the surface than those in the Uly soils. Hobbs soils are stratified and are on bottom land. Holdrege soils have an argillic horizon.

Typical pedon of Uly silt loam, 11 to 17 percent slopes, 1,320 feet west and 860 feet south of the northeast corner of sec. 26, T. 19 N., R. 15 W.

A—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

BA—10 to 14 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate fine subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

Bw—14 to 21 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

BC—21 to 29 inches; light gray (10YR 7/2) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; slight effervescence; mildly alkaline; gradual smooth boundary.

C—29 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; weak coarse prismatic structure; soft, very friable; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 12 to 36 inches. The thickness of the mollic epipedon ranges from 7 to 18 inches. The depth to free carbonates ranges from 10 to 25 inches.

The A horizon has hue of 10YR, value of 3 to 5 (2 or 3 moist), and chroma of 2. It is dominantly silt loam but in some pedons is silty clay loam or very fine sandy loam. It is slightly acid to mildly alkaline. The B horizon has value of 4 to 7 (3 to 5 moist) and chroma of 2 or 3. It is typically silt loam but in some pedons is silty clay loam. It is slightly acid to mildly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (4 to 6 moist), and chroma of 2 to 4. It is mildly alkaline or moderately alkaline.

The Uly soils in the map units Coly-Uly silt loams, 11 to 17 percent slopes, eroded, and Uly-Coly silt loams, 6 to 11 percent slopes, eroded, have a thinner surface soil than is defined as the range for the series.

Valentine Series

The Valentine series consists of deep, excessively drained, rapidly permeable soils on uplands. These soils

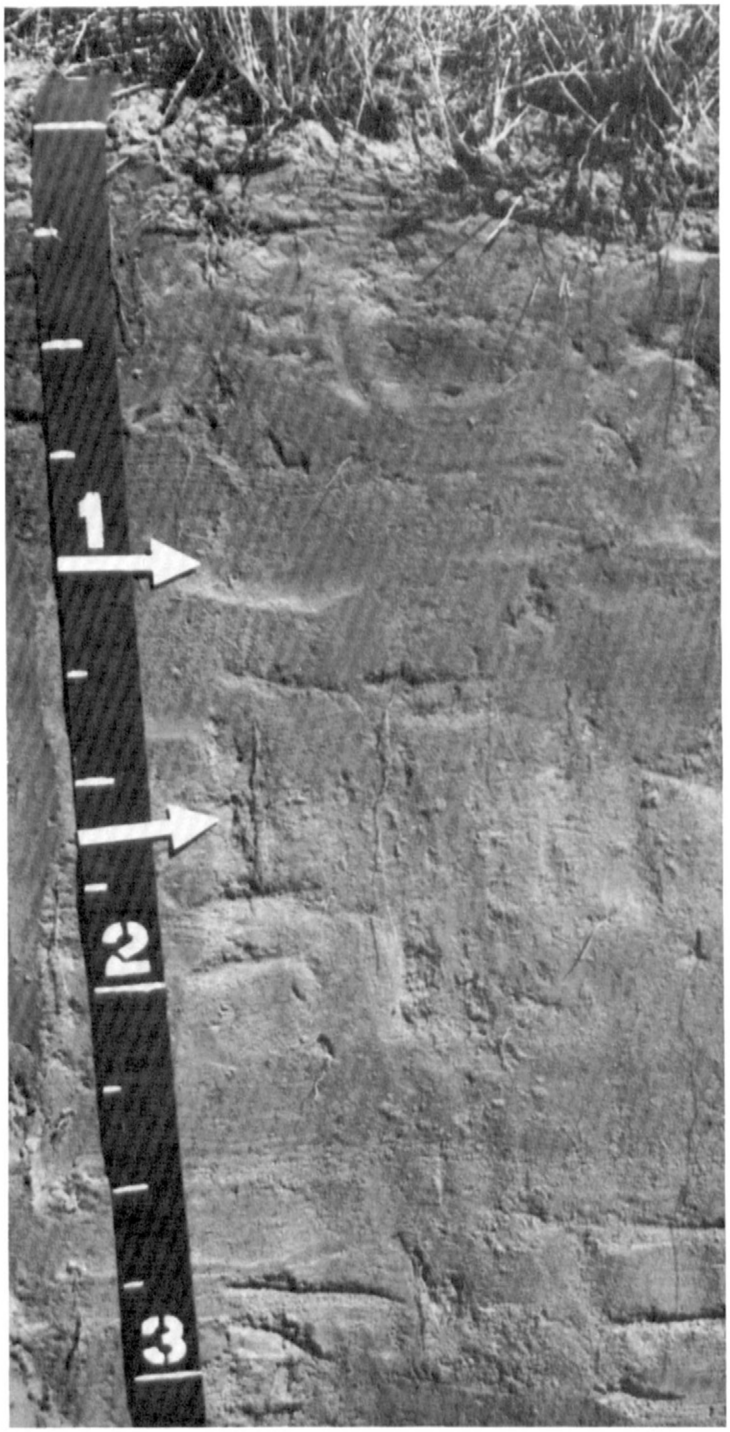

Figure 20.—Profile of a Valentine fine sand. This soil formed in eolian sand. Depth is marked in feet. The markers indicate the boundaries between soil layers.

formed in eolian sand (fig. 20). Slopes range from 0 to 45 percent.

Valentine soils are commonly adjacent to Gates, Hersh, and Ipage soils. The adjacent soils generally are lower on the landscape than the Valentine soils. Also, Gates and Hersh soils have more clay and silt. Ipage soils are moderately well drained.

Typical pedon of Valentine loamy fine sand, 3 to 9 percent slopes, 1,700 feet north and 2,350 feet east of the southwest corner of sec. 30, T. 18 N., R. 16 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose; neutral; clear smooth boundary.

AC—5 to 9 inches; brown (10YR 5/3) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; neutral; gradual smooth boundary.

C—9 to 60 inches; pale brown (10YR 6/3) fine sand, grayish brown (10YR 5/2) moist; single grain; loose; neutral.

The solum is 5 to 10 inches thick. It is slightly acid or neutral throughout.

The A horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2. It is loamy fine sand or fine sand. The AC horizon, if it occurs, has hue of 10YR, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3.

Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil 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, and (5) the length of time that 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 affects the kind of soil that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the differentiation of soil horizons. In general, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Human activities also affect soil formation. They have an immediate effect on the rate and the direction of the changes caused by the soil-forming processes. Conservation tillage practices and terraces have beneficial effects on the soil. Additions of fertilizer and irrigation water change the soil. Cultivation can result in soil loss unless erosion is controlled.

Parent Material

Parent material is the weathered or partly weathered rock in which a soil forms. It affects the chemical and mineralogical composition of the soil. The parent materials in which the soils in Valley County formed are loess, eolian sand, and alluvium.

Loess is wind-deposited silty material. Peoria Loess is the most extensive parent material in Valley County. It is a thick mantle on tablelands, in valleys, and on dissected uplands (fig. 21). It is generally grayish to brownish material ranging from a few feet to 100 feet in thickness. Coly, Holdrege, Scott, and Uly are the major soils formed in Peoria Loess. The Cozad, Hobbs, and Hord soils on stream terraces and bottom land formed in alluvial material derived mainly from Peoria Loess. Gates soils formed in the more recent deposits of Bignell Loess, which overlies the Peoria Loess in the loess-sand transitional areas adjacent to the sandhills in Valley County. Underlying the Peoria Loess is the Loveland Loess Formation, which ranges from silty to sandy and is reddish brown. No soils formed in Loveland Loess in Valley County. This loess is generally exposed only at the base of road cuts and deeply cut canyon sides.

Eolian sand covers a large area in the northeastern part of Valley County and scattered smaller areas. It is pale brown and very pale brown, wind-deposited sand. It ranges from a few feet to as much as 100 feet in thickness. The deposits occur as gently rolling to hilly uplands and valleys. Valentine soils are the dominant soils formed in this parent material. They show very little evidence of profile development because the eolian sand is resistant to weathering. Hersh soils formed in mixed sandy and loamy eolian material in the loess-sand transitional areas bordering the sandhills.

Alluvium is material deposited by water on bottom land and terraces in broad stream valleys or in narrow upland drainageways. It ranges widely in texture because of differences in the material from which it was derived and in the manner in which it was deposited. Cozad and Hord soils formed in alluvium on stream terraces. Barney, Boel, Hobbs, and Loup soils formed in the more recent alluvium on bottom land.

Climate

Climate has had an important effect on soil formation in Valley County. It affects soils directly through its effect on the parent material and indirectly through its effect on vegetation and micro-organisms.

The climatic factors that affect the weathering of parent material are rainfall, fluctuating temperatures, and wind. The climate of Valley County is characterized by cold winters and hot summers. Rainfall is heaviest late in spring and early in summer. The annual precipitation averages about 23 inches. Because the amount of rainfall is relatively low, the soils are generally not deeply leached. Runoff of rainwater removes, relocates, and sorts soil material. The wind also removes, sorts, and redeposits soil material. The extensive deposits of loess in the county are examples of the importance of wind as an agent of deposition. Drying aids in the development of granular structure in the surface layer common in many soils. Alternating periods of freezing and thawing

Figure 21.—An area of the dissected, loess-mantled uplands in Valley County.

hasten the physical disintegration of the parent material and enhance the development of soil structure.

Micro-organisms in the soil have a temperature range in which they are most active. Thus, the rate at which organic matter is decomposed into humus varies, depending on the climatic conditions. Changes in temperature and moisture activate the weathering of parent material, which results in chemical and physical changes in the soil.

Because the humidity in Valley County is generally low, a fairly high amount of water is lost through evaporation and transpiration. This loss reduces the amount of water available for leaching, plant growth, decomposition of organic matter, and chemical weathering.

Plant and Animal Life

Plants, burrowing animals, micro-organisms, earthworms, and other living organisms affect soil formation. The soils in Valley County formed mainly under a mixture of short, mid, and tall grasses. Each year, the grasses formed new growth above the ground and their fibrous roots penetrated the upper few feet of the soil. In time, a darkened layer developed at the surface. It gradually became thicker as more organic matter decayed into humus. Because of the additional humus, the soils developed granular structure and good tilth. Plant roots bring nutrients to the surface. Calcium, in particular, helps to keep the soils more porous. The decomposition of organic material forms organic acids that, in solution, hasten the leaching process.

The action of the micro-organisms helps to change undecomposed organic matter into humus. Some bacteria take in nitrogen from the air. When they die, the nitrogen becomes available for plant growth. Other bacteria oxidize sulphur, which then becomes available to plants. The plants, in turn, complete the cycle by producing more organic matter. Other living organisms, such as algae, fungi, protozoa, and actinomycetes, affect soil formation physically and chemically. Larger animals, such as gophers, moles, earthworms, millipedes, spiders, and other insects, help to mix the soil and add organic matter when they die.

Relief

Relief affects soil formation mainly through its effect on runoff, erosion, aeration, and drainage. Runoff is more rapid on steep and very steep soils than on less sloping soils. Consequently, plant growth generally is less vigorous on the steeper soils, less water penetrates the surface, soil horizons are thinner and less distinct, and lime is not so deeply leached. Also, erosion is more severe on the steeper soils if all other factors are equal.

Relief can cause differences in the color, thickness, and horizonation of soils that formed in the same kind of parent material. For example, differences among Coly, Uly, Holdrege, and Scott soils, all of which formed in Peoria Loess, can be attributed mainly to differences in relief. The gradient, shape, length, and direction of the slopes influence the amount of moisture in the soil. The steep and very steep Coly soils are weakly developed, have a thin surface layer, and have lime at or near the surface. In Uly soils, which are less steep than the Coly soils, the surface layer is thicker, lime is leached to a greater depth, and a thin subsoil has formed. In the nearly level to gently sloping Holdrege soils, the surface layer is dark and thick, the subsoil is well developed, and lime is leached to a greater depth than is typical in the Uly soils. Scott soils formed in depressional areas. They are the most strongly developed soils in Valley County.

Barney, Boel, Hobbs, and other soils on bottom land are characterized by low relief. They commonly receive new sediment during periods of flooding. Each flood provides new parent material and starts a new cycle of soil formation. An example of a soil that formed on bottom land and is frequently flooded is Hobbs silt loam, channeled, 0 to 3 percent slopes.

Time

Time enables relief, climate, and plant and animal life to change the parent material into a soil. If the parent material has been in place for only a short time, the soils are weakly developed. The degree of profile development depends on the intensity of the soil-forming factors. Differences in the length of time that geological material has been in place are commonly reflected in the distinctness of horizons in the soil profile.

The time needed for a soil to form depends mainly on the kinds of parent material and the climate. The resistance to weathering of the parent material partly determines the length of time that is needed. Generally, soils in warm, humid areas form faster than soils in cool, dry areas.

Soil maturity is related not only to time but also to the other four soil-forming factors. Soils that do not have a B horizon are commonly considered immature, and soils that have a well developed B horizon are considered mature. The maturity of a soil, however, depends on the interaction of all five soil-forming factors. Thus, a very steep Coly soil that does not have a B horizon might be as mature as it can be on its particular slope and under its particular climate.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

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

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

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

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 fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or 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.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

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.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

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.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

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.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

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.

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.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

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.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

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.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

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.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

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.)

Organic matter. The organic fraction of the soil. It includes plant and animal residue at various stages of decomposition, cells and tissues of soil organisms, and substances synthesized by the soil population. It is commonly identified as the organic material that accompanies the soil material when a soil sample is passed through a 2-millimeter sieve. In this survey area the classes of organic matter content are high, 4.0 to 8.0 percent; moderate, 2.0 to 4.0 percent; moderately low, 1.0 to 2.0 percent; and low 0.5 to 1.0 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.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

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.

Proper grazing use. The removal of not more than 50 percent, by weight, of the key management plants when an area of range or pasture is grazed. Proper grazing use protects the surface by maintaining an adequate plant cover. It also maintains or improves the quality and quantity of desirable vegetation.

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
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Root zone. The part of the soil that can be penetrated by plant roots.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables.) Water that is too salty for consumption by livestock.

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.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

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.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

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 classes of slope are—

	Percent
Nearly level	0 to 2
Very gently sloping	1 to 3
Gently sloping	3 to 6
Strongly sloping	6 to 11
Moderately steep	11 to 17
Steep	17 to 30

Very steep	30 to 60
Rolling	9 to 24
Hilly	17 to 45

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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

[Data were recorded in the period 1951-80 at North Loup, Nebraska]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	32.9	8.7	20.8	62	-21	0	0.43	0.10	0.69	2	5.5
February---	39.7	14.8	27.3	72	-17	12	.72	.23	1.11	2	6.5
March------	47.8	23.2	35.5	81	-6	27	1.34	.38	2.11	4	7.5
April------	63.5	35.8	49.7	88	15	84	2.31	1.10	3.37	6	.9
May--------	73.6	47.3	60.5	94	25	334	3.50	1.67	5.07	7	.2
June-------	83.2	57.5	70.4	101	38	612	3.65	2.02	5.07	7	.0
July-------	87.8	62.7	75.3	102	47	784	3.17	1.72	4.44	6	.0
August-----	86.0	60.5	73.3	100	45	722	3.24	1.39	4.81	6	.0
September--	77.3	50.2	63.8	98	29	414	2.29	.75	3.54	5	.0
October----	67.1	37.9	52.5	89	18	151	1.29	.36	2.04	3	.5
November---	50.1	24.1	37.1	76	1	0	.63	.08	1.04	2	2.8
December---	38.6	14.4	26.5	69	-16	0	.55	.19	.85	2	6.4
Yearly:											
Average--	62.3	36.4	49.4	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	-23	---	---	---	---	---	---
Total----	---	---	---	---	---	3,140	23.12	18.15	27.45	52	30.3

* 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

[Data were recorded in the period 1951-80 at North Loup, 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 28	May 13	May 19
2 years in 10 later than--	April 23	May 8	May 15
5 years in 10 later than--	April 14	April 28	May 8
First freezing temperature in fall:			
1 year in 10 earlier than--	October 12	September 29	September 15
2 years in 10 earlier than--	October 16	October 4	September 20
5 years in 10 earlier than--	October 23	October 13	October 1

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-80 at North Loup, Nebraska]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	176	146	129
8 years in 10	181	153	135
5 years in 10	191	167	145
2 years in 10	202	181	156
1 year in 10	207	188	161

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ba	Barney loam, channeled, 0 to 2 percent slopes	1,850	0.4
Be	Blendon fine sandy loam, 0 to 2 percent slopes	2,520	0.7
Bo	Boel loamy fine sand, 0 to 2 percent slopes	1,740	0.5
Bp	Boel fine sandy loam, 0 to 2 percent slopes	2,900	0.8
Bu	Butler silt loam, 0 to 1 percent slopes	1,500	0.4
CrE2	Coly-Hobbs silt loams, 2 to 17 percent slopes, eroded	5,700	1.6
CrG	Coly-Hobbs silt loams, 2 to 60 percent slopes	65,440	18.0
CuE2	Coly-Uly silt loams, 11 to 17 percent slopes, eroded	33,400	9.2
Cx	Cozad silt loam, 0 to 1 percent slopes	1,420	0.4
CxB	Cozad silt loam, 1 to 3 percent slopes	3,880	1.1
CxC	Cozad silt loam, 3 to 6 percent slopes	2,560	0.7
Cy	Cozad silt loam, terrace, 0 to 1 percent slopes	10,180	2.9
CyB	Cozad silt loam, terrace, 1 to 3 percent slopes	6,400	1.7
De	Detroit silt loam, 0 to 1 percent slopes	2,340	0.6
Fm	Fillmore Variant silt loam, 0 to 1 percent slopes	260	0.1
GfC2	Gates very fine sandy loam, 3 to 6 percent slopes, eroded	550	0.2
GfD	Gates very fine sandy loam, 6 to 11 percent slopes	410	0.1
Gn	Gibbon silt loam, 0 to 1 percent slopes	1,300	0.4
HeB	Hersh fine sandy loam, 0 to 3 percent slopes	1,070	0.3
HeC	Hersh fine sandy loam, 3 to 6 percent slopes	640	0.2
HeD	Hersh fine sandy loam, 6 to 11 percent slopes	1,220	0.3
HeE	Hersh fine sandy loam, 11 to 17 percent slopes	220	0.1
Hf	Histosols, wet	51	*
Hk	Hobbs silt loam, 0 to 2 percent slopes	6,740	1.9
HmB	Hobbs silt loam, channeled, 0 to 3 percent slopes	6,380	1.7
Ho	Holdrege silt loam, 0 to 1 percent slopes	620	0.2
HoB	Holdrege silt loam, 1 to 3 percent slopes	16,700	4.6
HoC	Holdrege silt loam, 3 to 6 percent slopes	16,600	4.6
HoC2	Holdrege silty clay loam, 3 to 6 percent slopes, eroded	14,400	3.9
Hr	Hord silt loam, 0 to 1 percent slopes	700	0.1
HrB	Hord silt loam, 1 to 3 percent slopes	2,300	0.6
Hy	Hord silt loam, terrace, 0 to 1 percent slopes	11,900	3.2
HyB	Hord silt loam, terrace, 1 to 3 percent slopes	8,200	2.2
IpB	Ipage loamy fine sand, 0 to 3 percent slopes	1,810	0.5
Le	Leshara silt loam, 0 to 1 percent slopes	4,820	1.3
Lo	Loup loam, 0 to 2 percent slopes	4,700	1.3
Pg	Pits and Dumps	130	*
Sa	Saltine-Leshara silt loams, 0 to 1 percent slopes	1,450	0.4
Sc	Scott silt loam, 0 to 1 percent slopes	420	0.1
SmB	Simeon loamy sand, 0 to 3 percent slopes	210	0.1
SmE	Simeon loamy sand, 3 to 30 percent slopes	990	0.3
UbD	Uly silt loam, 6 to 11 percent slopes	11,200	3.0
UbE	Uly silt loam, 11 to 17 percent slopes	19,500	5.4
UcD2	Uly-Coly silt loams, 6 to 11 percent slopes, eroded	31,400	8.6
UcF	Uly-Coly silt loams, 15 to 30 percent slopes	39,070	10.7
VaB	Valentine loamy fine sand, 0 to 3 percent slopes	2,360	0.6
VaD	Valentine loamy fine sand, 3 to 9 percent slopes	6,760	1.8
VaE	Valentine fine sand, rolling	5,720	1.5
VaF	Valentine fine sand, rolling and hilly	460	0.1
	Water areas	2,240	0.6
	Total area	365,331	100.0

* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability		Corn		Grain sorghum		Winter wheat		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
Ba------------------ Barney	VIw	---	---	---	---	---	---	---	---	---
Be------------------ Blendon	IIe	IIe	50	145	55	120	32	---	2.8	6.0
Bo------------------ Boel	IVw	IVw	34	80	36	70	21	---	2.0	4.8
Bp------------------ Boel	IIIw	IIIw	45	110	40	100	27	---	3.4	5.0
Bu------------------ Butler	IIw	IIw	50	120	60	110	40	---	3.2	5.2
CrE2---------------- Coly-Hobbs	VIe	---	---	---	---	---	---	---	---	---
CrG----------------- Coly-Hobbs	VIIe	---	---	---	---	---	---	---	---	---
CuE2---------------- Coly-Uly	VIe	---	---	---	---	---	---	---	---	---
Cx------------------ Cozad	IIc	I	51	145	57	120	42	---	3.0	6.5
CxB----------------- Cozad	IIe	IIe	47	140	55	115	38	---	3.0	6.3
CxC----------------- Cozad	IIIe	IIIe	42	130	50	110	36	---	2.6	6.0
Cy------------------ Cozad	IIc	I	53	150	60	125	43	---	4.0	6.5
CyB----------------- Cozad	IIe	IIe	49	140	55	115	40	---	3.6	6.3
De------------------ Detroit	IIc	I	54	145	62	120	42	---	3.6	6.3
Fm------------------ Fillmore Variant	IIIw	IIIw	34	105	41	90	27	---	2.6	5.0
GfC2---------------- Gates	IIIe	IIIe	32	125	44	100	33	---	2.4	5.0
GfD----------------- Gates	IVe	IVe	28	110	35	95	28	---	1.8	4.8
Gn------------------ Gibbon	IIw	IIw	65	130	70	115	40	---	4.3	6.1
HeB----------------- Hersh	IIIe	IIe	40	125	45	105	30	---	2.2	4.6
HeC----------------- Hersh	IIIe	IIIe	35	120	38	95	27	---	1.9	4.4
HeD----------------- Hersh	IVe	IVe	28	110	30	90	23	---	1.6	3.9
HeE----------------- Hersh	VIe	---	---	---	---	---	---	---	---	---

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Corn		Grain sorghum		Winter wheat		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
Hf: Histosols	VIIIw	---	---	---	---	---	---	---	---	---
Hk: Hobbs	IIw	IIw	66	140	65	120	38	---	3.6	6.5
HmB: Hobbs	VIw	---	---	---	---	---	---	---	---	---
Ho: Holdrege	IIc	I	52	145	56	120	41	---	2.8	6.5
HoB: Holdrege	IIe	IIe	48	140	53	115	39	---	2.6	6.3
HoC: Holdrege	IIIe	IIIe	44	130	50	110	36	---	2.5	5.8
HoC2: Holdrege	IIIe	IIIe	38	120	46	103	31	---	2.2	5.5
Hr: Hord	IIc	I	56	150	60	125	43	---	3.0	6.5
HrB: Hord	IIe	IIe	50	145	55	120	41	---	2.9	6.3
Hy: Hord	IIc	I	58	155	62	130	41	---	4.0	6.5
HyB: Hord	IIe	IIe	53	145	55	120	42	---	3.6	6.3
IpB: Ipage	IVe	IVe	---	105	31	90	22	---	1.5	4.0
Le: Leshara	IIw	IIw	68	130	75	115	38	---	4.5	6.1
Lo: Loup	Vw	---	---	---	---	---	---	---	---	---
Pg*: Pits and Dumps	VIIIs	---	---	---	---	---	---	---	---	---
Sa: Saltine-Leshara	IVs	IVs	35	75	45	77	20	---	3.0	4.5
Sc: Scott	IVw	---	20	---	30	---	15	---	---	---
SmB: Simeon	VIs	IVs	---	90	---	75	18	---	---	3.0
SmE: Simeon	VIs	---	---	---	---	---	---	---	---	---
UbD: Uly	IVe	IVe	33	115	38	100	29	---	2.1	5.6
UbE: Uly	VIe	---	---	---	---	---	---	---	---	---
UcD2: Uly-Coly	IVe	IVe	28	105	25	90	22	---	1.5	4.5
UcF: Uly-Coly	VIe	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability N	Land capability I	Corn N	Corn I	Grain sorghum N	Grain sorghum I	Winter wheat N	Winter wheat I	Alfalfa hay N	Alfalfa hay I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
VaB----------------- Valentine	IVe	IVe	---	100	---	95	15	---	1.3	3.6
VaD----------------- Valentine	VIe	IVe	---	90	---	75	---	---	---	3.0
VaE----------------- Valentine	VIe	---	---	---	---	---	---	---	---	---
VaF----------------- Valentine	VIIe	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass): Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	---	---	---	---	---
(I)	27,160	---	---	---	---
II (N)	81,530	40,010	14,360	---	27,160
(I)	54,410	40,050	14,360	---	---
III (N)	38,980	35,820	3,160	---	---
(I)	38,980	35,820	3,160	---	---
IV (N)	52,010	48,400	2,160	1,450	---
(I)	58,560	55,160	1,740	1,660	---
V (N)	4,700	---	4,700	---	---
VI (N)	119,730	110,300	8,230	1,200	---
VII (N)	65,960	65,960	---	---	---
VIII(N)	181	---	51	130	---

TABLE 7.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
Be	Blendon fine sandy loam, 0 to 2 percent slopes
Bu	Butler silt loam, 0 to 1 percent slopes (where drained)*
Cx	Cozad silt loam, 0 to 1 percent slopes
CxB	Cozad silt loam, 1 to 3 percent slopes
CxC	Cozad silt loam, 3 to 6 percent slopes
Cy	Cozad silt loam, terrace, 0 to 1 percent slopes
CyB	Cozad silt loam, terrace, 1 to 3 percent slopes
De	Detroit silt loam, 0 to 1 percent slopes
GfC2	Gates very fine sandy loam, 3 to 6 percent slopes, eroded
Gn	Gibbon silt 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
Hk	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 silty clay loam, 3 to 6 percent slopes, eroded
Hr	Hord silt loam, 0 to 1 percent slopes
HrB	Hord silt loam, 1 to 3 percent slopes
Hy	Hord silt loam, terrace, 0 to 1 percent slopes
HyB	Hord silt loam, terrace, 1 to 3 percent slopes
Le	Leshara silt loam, 0 to 1 percent slopes (where drained)*

* These soils generally have been adequately drained, either by the application of drainage measures or through the incidental drainage that results from farming, roadbuilding, and other kinds of land development.

TABLE 8.--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 Lb/acre	Average Lb/acre	Unfavorable Lb/acre
Ba: Barney	Wetland	2,800	2,600	2,400
Be: Blendon	Sandy	3,500	3,300	3,000
Bo, Bp: Boel	Subirrigated	5,200	4,900	4,600
Bu: Butler	Clayey	3,800	3,400	3,000
CrE2*:				
Coly	Limy Upland	3,300	3,000	2,250
Hobbs	Silty Overflow	5,000	4,300	3,000
CrG*:				
Coly	Thin Loess	2,800	2,600	2,400
Hobbs	Silty Overflow	5,000	4,300	3,000
CuE2*:				
Coly	Limy Upland	3,300	3,000	2,250
Uly	Silty	3,700	3,200	2,700
Cx, CxB, CxC: Cozad	Silty	3,700	3,200	2,700
Cy, CyB: Cozad	Silty Lowland	4,500	4,200	3,300
De: Detroit	Silty Lowland	4,500	4,200	3,800
Fm: Fillmore Variant	Silty Overflow	3,500	3,300	3,000
GfC2, GfD: Gates	Silty	3,700	3,200	2,700
Gn: Gibbon	Subirrigated	5,500	5,300	5,000
HeB, HeC, HeD, HeE: Hersh	Sandy	3,500	3,300	3,000
Hk, HmB: Hobbs	Silty Overflow	5,000	4,300	3,000
Ho, HoB, HoC, HoC2: Holdrege	Silty	4,000	3,600	3,300
Hr, HrB: Hord	Silty	4,000	3,600	3,300
Hy, HyB: Hord	Silty Lowland	4,500	4,200	3,800
IpB: Ipage	Sandy Lowland	3,500	3,200	3,000
Le: Leshara	Subirrigated	5,500	5,300	5,000

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY--Continued

Soil name and map symbol	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Lo------------------------ Loup	Wet Subirrigated------------------------	5,800	5,500	5,300
Sa*:				
Saltine------------------	Saline Subirrigated---------------------	3,800	3,400	3,000
Leshara------------------	Subirrigated----------------------------	5,500	5,300	5,000
SmB----------------------- Simeon	Shallow to Gravel-----------------------	1,800	1,600	1,500
SmE----------------------- Simeon	Shallow to Gravel-----------------------	1,800	1,600	1,500
UbD----------------------- Uly	Silty-----------------------------------	3,700	3,200	2,700
UbE----------------------- Uly	Silty-----------------------------------	3,700	3,200	2,700
UcD2*:				
Uly----------------------	Silty-----------------------------------	3,700	3,200	2,700
Coly---------------------	Limy Upland-----------------------------	3,300	3,000	2,250
UcF*:				
Uly----------------------	Silty-----------------------------------	3,700	3,200	2,700
Coly---------------------	Limy Upland-----------------------------	3,300	3,000	2,000
VaB----------------------- Valentine	Sandy-----------------------------------	3,500	3,300	3,000
VaD, VaE------------------ Valentine	Sands-----------------------------------	3,500	3,200	3,000
VaF:				
Valentine, rolling-------	Sands-----------------------------------	3,300	3,000	2,600
Valentine, hilly---------	Choppy Sands----------------------------	2,800	2,400	2,000

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ba. Barney					
Be----------------- Blendon	Silver buffaloberry, Peking cotoneaster, lilac, American plum.	Eastern redcedar, common chokecherry, Siberian peashrub, Manchurian crabapple, Russian-olive.	Green ash, hackberry, ponderosa pine.	---	---
Bo, Bp------------ Boel	Redosier dogwood, American plum.	Common chokecherry	Hackberry, green ash, Austrian pine, Russian mulberry, eastern redcedar.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
Bu----------------- Butler	Redosier dogwood, American plum.	Common chokecherry.	Eastern redcedar, ponderosa pine, hackberry, Austrian pine, green ash.	Golden willow, honeylocust, silver maple.	Eastern cottonwood.
CrE2*:					
Coly--------------	Siberian peashrub, fragrant sumac, silver buffalo-berry, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, Russian-olive, bur oak.	Ponderosa pine, honeylocust, green ash, Siberian elm.	---	---
Hobbs-------------	American plum-----	Amur honeysuckle, lilac.	Eastern redcedar, Austrian pine, ponderosa pine, green ash, Russian-olive, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
CrG*:					
Coly.					
Hobbs-------------	American plum-----	Amur honeysuckle, lilac.	Eastern redcedar, Austrian pine, ponderosa pine, green ash, Russian-olive, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
CuE2*:					
Coly--------------	Siberian peashrub, fragrant sumac, silver buffalo-berry, Tatarian honeysuckle.	Eastern redcedar, Rocky Mountain juniper, Russian-olive, bur oak.	Ponderosa pine, honeylocust, green ash, Siberian elm.	---	---
Uly---------------	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian-olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm------	---
Cx, CxB, CxC------ Cozad	Lilac, fragrant sumac, Amur honeysuckle.	Russian mulberry, Russian-olive.	Eastern redcedar, Austrian pine, green ash, honeylocust, bur oak, hackberry.	Siberian elm------	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Cy, CyB----------- Cozad	American plum-----	Lilac, Amur honeysuckle.	Eastern redcedar, Austrian pine, Russian-olive, ponderosa pine, green ash, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
De---------------- Detroit	American plum, lilac, Amur honeysuckle.	Russian mulberry	Eastern redcedar, Austrian pine, Russian-olive, ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm------	---
Fm---------------- Fillmore Variant	Redosier dogwood, American plum.	Common chokecherry	Russian mulberry, eastern redcedar, Austrian pine, hackberry, green ash.	Honeylocust, golden willow, silver maple.	Eastern cottonwood.
GfC2, GfD--------- Gates	Amur honeysuckle, fragrant sumac, lilac.	Russian mulberry	Green ash, honeylocust, Russian-olive, eastern redcedar, bur oak, Austrian pine, hackberry.	Siberian elm------	---
Gn---------------- Gibbon	Lilac-------------	Common chokecherry, American plum.	Eastern redcedar, hackberry, green ash, Austrian pine, Russian mulberry, Ponderosa pine, Manchurian crabapple.	Honeylocust, golden willow.	Eastern cottonwood.
HeB, HeC, HeD, HeE-------------- Hersh	Lilac, American plum.	Common chokecherry	Eastern redcedar, honeylocust, hackberry, ponderosa pine, green ash, Russian mulberry, Scotch pine, Austrian pine.	Siberian elm------	---
Hf. Histosols					
Hk---------------- Hobbs	American plum-----	Amur honeysuckle, lilac.	Eastern redcedar, Austrian pine, ponderosa pine, green ash, Russian-olive, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
HmB. Hobbs					
Ho, HoB, HoC, HoC2------------- Holdrege	Lilac, Amur honeysuckle, fragrant sumac.	Russian mulberry	Eastern redcedar, Austrian pine, green ash, honeylocust, hackberry, bur oak, Russian-olive.	Siberian elm------	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Hr, HrB: Hord	Lilac, Amur honeysuckle, fragrant sumac.	Russian mulberry	Eastern redcedar, ponderosa pine, hackberry, bur oak, Russian-olive, Austrian pine, green ash, honeylocust.	---	---
Hy, HyB: Hord	Peking cotoneaster	Lilac, Siberian peashrub, American plum.	Eastern redcedar, ponderosa pine, Manchurian crabapple, Austrian pine.	Golden willow, green ash, hackberry.	Eastern cottonwood.
IpB: Ipage	Tatarian honeysuckle, lilac, skunkbush sumac.	Eastern redcedar, Manchurian crabapple, Russian-olive, Siberian peashrub.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
Le: Leshara	American plum, fragrant sumac.	Common chokecherry	Eastern redcedar, Russian mulberry, hackberry, ponderosa pine, green ash, Russian-olive.	Golden willow, honeylocust.	Eastern cottonwood.
Lo: Loup	Redosier dogwood	---	---	Golden willow	Eastern cottonwood.
Pg*. Pits and Dumps					
Sa*:					
Saltine	Silver buffaloberry.	Russian-olive	Golden willow, Siberian elm.	---	Eastern cottonwood.
Leshara	American plum, fragrant sumac.	Common chokecherry	Eastern redcedar, Russian mulberry, hackberry, green ash, ponderosa pine, Russian-olive.	Golden willow, honeylocust.	Eastern cottonwood.
Sc. Scott					
SmB, SmE. Simeon					
UbD, UbE: Uly	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian-olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm	---
UcD2*:					
Uly	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian-olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
UcD2*:					
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.	---	---
UcF*:					
Uly.					
Coly.					
VaB--------------- Valentine	Lilac, Tatarian honeysuckle, skunkbush sumac.	Eastern redcedar, Russian-olive, Manchurian crabapple, Siberian peashrub.	Hackberry, ponderosa pine, green ash, honeylocust.	Siberian elm------	---
VaD, VaE---------- Valentine	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
VaF. Valentine					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ba: Barney	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Be: Blendon	Slight	Slight	Slight	Slight	Slight.
Bo, Bp: Boel	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, droughty, flooding.
Bu: Butler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CrE2*:					
Coly	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Hobbs	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: flooding.
CrG*:					
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Hobbs	Severe: flooding.	Slight	Moderate: slope, flooding.	Slight	Moderate: flooding.
CuE2*:					
Coly	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Uly	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Cx: Cozad	Slight	Slight	Slight	Slight	Slight.
CxB, CxC: Cozad	Slight	Slight	Moderate: slope.	Slight	Slight.
Cy: Cozad	Severe: flooding.	Slight	Slight	Slight	Slight.
CyB: Cozad	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
De: Detroit	Slight	Slight	Slight	Slight	Slight.
Fm: Fillmore Variant	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
GfC2: Gates	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GfD: Gates	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Gn: Gibbon	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
HeB: Hersh	Slight	Slight	Slight	Slight	Slight.
HeC: Hersh	Slight	Slight	Moderate: slope.	Slight	Slight.
HeD, HeE: Hersh	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Hf. Histosols					
Hk: Hobbs	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
HmB: 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.
Hr: Hord	Slight	Slight	Slight	Slight	Slight.
HrB: Hord	Slight	Slight	Moderate: slope.	Slight	Slight.
Hy: Hord	Severe: flooding.	Slight	Slight	Slight	Slight.
HyB: Hord	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
IpB: Ipage	Slight	Slight	Slight	Slight	Severe: droughty.
Le: Leshara	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.
Lo: Loup	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Pg*. Pits and Dumps					
Sa*:					
Saltine	Severe: flooding, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Slight	Severe: excess salt, excess sodium.
Leshara	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: wetness, flooding.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Sc----------------- Scott	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
SmB----------------- Simeon	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
SmE----------------- Simeon	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
UbD----------------- Uly	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
UbE----------------- Uly	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
UcD2*:					
Uly-----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Coly-----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
UcF*:					
Uly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Coly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
VaB----------------- Valentine	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
VaD----------------- Valentine	Slight----------	Slight----------	Severe: slope.	Slight----------	Moderate: droughty.
VaE----------------- Valentine	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
VaF----------------- Valentine	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ba----------------- Barney	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Be----------------- Blendon	Fair	Fair	Good	Fair	Very poor.	Fair	Very poor.	Very poor.	Fair	Very poor.	Poor	Fair.
Bo, Bp------------- Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Fair.
Bu----------------- Butler	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
CrE2*:												
Coly---------------	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Hobbs--------------	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
CrG*:												
Coly---------------	Very poor.	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Poor.
Hobbs--------------	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
CuE2*:												
Coly---------------	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Uly----------------	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Cx, CxB, CxC-------- Cozad	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Cy, CyB------------- Cozad	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
De----------------- Detroit	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Fm----------------- Fillmore Variant	Fair	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
GfC2, GfD----------- Gates	Fair	Good	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Gn----------------- Gibbon	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
HeB, HeC, HeD------- Hersh	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
HeE---------------- Hersh	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Hf. Histosols												
Hk----------------- Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
HmB---------------- Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ho, HoB------------- Holdrege	Good	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
HoC, HoC2---------- Holdrege	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Hr, HrB, Hy, HyB--- Hord	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
IpB---------------- Ipage	Poor	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Le----------------- Leshara	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Lo----------------- Loup	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Pg*. Pits and Dumps												
Sa*:												
Saltine-----------	Poor	Poor	Good	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	Poor.
Leshara-----------	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
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.
SmE---------------- Simeon	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
UbD---------------- Uly	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
UbE---------------- Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
UcD2*:												
Uly---------------	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Coly--------------	Fair	Good	Good	Good	Fair	Fair	Poor	Very poor.	Fair	Good	Very poor.	Good.
UcF*:												
Uly---------------	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Coly--------------	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
VaB---------------- Valentine	Fair	Good	Fair	Poor	Fair	Fair	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VaD---------------- Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VaE---------------- Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VaF---------------- Valentine	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ba: Barney	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Be: Blendon	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
Bo, Bp: Boel	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, droughty, flooding.
Bu: Butler	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
CrE2*:						
Coly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
CrG*:						
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
CuE2*:						
Coly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Cx, CxB: Cozad	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
CxC: Cozad	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Cy, CyB: Cozad	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
De: Detroit	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Fm: Fillmore Variant	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
GfC2: Gates	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GfD---------------- Gates	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Gn---------------- Gibbon	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness.
HeB---------------- Hersh	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
HeC---------------- Hersh	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
HeD, HeE---------- Hersh	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Hf. Histosols						
Hk---------------- Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
HmB---------------- 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.
Hr, HrB----------- Hord	Slight---------	Slight---------	Slight---------	Slight---------	Severe: low strength.	Slight.
Hy, HyB----------- Hord	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
IpB---------------- Ipage	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Severe: droughty.
Le---------------- Leshara	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Lo---------------- Loup	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness.
Pg*. Pits and Dumps						
Sa*: Saltine----------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: excess salt, excess sodium.
Leshara----------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Sc---------------- Scott	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SmB: Simeon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
SmE: Simeon	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UbD: Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
UbE: Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
UcD2*:						
Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Coly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
UcF*:						
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VaB: Valentine	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
VaD: Valentine	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
VaE: Valentine	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
VaF: Valentine	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ba: Barney	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Be: Blendon	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Bo, Bp: Boel	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Bu: Butler	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
CrE2*:					
Coly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
CrG*:					
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
CuE2*:					
Coly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Cx: Cozad	Slight	Moderate: seepage.	Slight	Slight	Fair: thin layer.
CxB, CxC: Cozad	Slight	Moderate: seepage, slope.	Slight	Slight	Fair: thin layer.
Cy, CyB: Cozad	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.	Good.
De: Detroit	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Fm: Fillmore Variant	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
GfC2: Gates	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
GfD: Gates	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Gn: Gibbon	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
HeB, HeC: Hersh	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
HeD, HeE: Hersh	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: too sandy, slope.
Hf. Histosols					
Hk, HmB: 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.
Hr: Hord	Slight	Moderate: seepage.	Slight	Slight	Good.
HrB: Hord	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Hy, HyB: Hord	Moderate: flooding.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
IpB: Ipage	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Le: Leshara	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness, thin layer.
Lo: Loup	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Pg*. Pits and Dumps					
Sa*:					
Saltine	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, excess sodium.	Severe: flooding, wetness.	Poor: excess salt, excess sodium.
Leshara	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Fair: wetness, thin layer.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
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.
SmE----------------- Simeon	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
UbD----------------- Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UbE----------------- Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UcD2*:					
Uly----------------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Coly---------------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UcF*:					
Uly----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Coly---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
VaB, VaD------------ Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VaE----------------- Valentine	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VaF----------------- Valentine	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ba: Barney	Poor: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, wetness.
Be: Blendon	Good	Probable	Improbable: too sandy.	Fair: thin layer.
Bo, Bp: 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.
CrE2*:				
Coly	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CrG*:				
Coly	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CuE2*:				
Coly	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Cx, CxB, CxC, Cy, CyB: Cozad	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
De: Detroit	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Fm: Fillmore Variant	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
GfC2: Gates	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
GfD: Gates	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Gn: Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
HeB, HeC: Hersh	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
HeD, HeE: Hersh	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Hf. Histosols				

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Hk, HmB: Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ho, HoB, HoC, HoC2: Holdrege	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hr, HrB, Hy, HyB: Hord	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
IpB: Ipage	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Le: Leshara	Fair: wetness.	Probable	Improbable: too sandy.	Good.
Lo: Loup	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
Pg*. Pits and Dumps				
Sa*:				
Saltine	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Leshara	Fair: wetness.	Probable	Improbable: too sandy.	Good.
Sc: Scott	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
SmB: Simeon	Good	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
SmE: Simeon	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
UbD: Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UbE: Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UcD2*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Coly	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UcF*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Coly	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
VaB, VaD: Valentine	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
VaE: Valentine	Good	Probable	Improbable: too sandy.	Poor: area reclaim, too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VaF-------------------- Valentine	Poor: slope.	Probable-------------	Improbable: too sandy.	Poor: area reclaim, too sandy, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ba----------------- Barney	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Be----------------- Blendon	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
Bo----------------- Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy.	Droughty.
Bp----------------- Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, too sandy.	Droughty.
Bu----------------- Butler	Moderate: seepage.	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
CrE2*, CrG*:							
Coly---------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Hobbs--------------	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, flooding.	Favorable------	Favorable.
CuE2*:							
Coly---------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Uly----------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope, erodes easily.	Slope, erodes easily.
Cx, CxB------------ Cozad	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily	Erodes easily.
CxC---------------- Cozad	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Erodes easily	Erodes easily.
Cy, CyB------------ Cozad	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
De----------------- Detroit	Slight----------	Moderate: hard to pack.	Severe: no water.	Deep to water	Percs slowly---	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Fm----------------- Fillmore Variant	Moderate: seepage.	Severe: piping, ponding.	Severe: no water.	Ponding, frost action.	Ponding, percs slowly.	Erodes easily, ponding.	Wetness, erodes easily.
GfC2--------------- Gates	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope, erodes easily.	Erodes easily, soil blowing.	Erodes easily.
GfD---------------- Gates	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope, erodes easily.	Slope, erodes easily, soil blowing.	Slope, erodes easily.
Gn----------------- Gibbon	Severe: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness---------	Wetness---------	Favorable.
HeB---------------- Hersh	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
HeC---------------- Hersh	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Soil blowing---	Favorable.
HeD, HeE----------- Hersh	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
Hf. Histosols							
Hk, HmB------------ Hobbs	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Flooding--------	Favorable-------	Favorable.
Ho, HoB------------ Holdrege	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable-------	Erodes easily	Erodes easily.
HoC, HoC2---------- Holdrege	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Erodes easily	Erodes easily.
Hr, HrB, Hy, HyB--- Hord	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Favorable-------	Favorable-------	Favorable.
IpB---------------- Ipage	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Le----------------- Leshara	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Lo----------------- Loup	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Pg*. Pits and Dumps							
Sa*:							
Saltine-----------	Moderate: seepage.	Severe: excess sodium, excess salt.	Severe: slow refill, salty water.	Percs slowly, flooding, frost action.	Wetness, percs slowly, flooding.	Wetness---------	Excess salt, excess sodium, percs slowly.
Leshara-----------	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Erodes easily.
Sc----------------- Scott	Moderate: seepage.	Severe: hard to pack, ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Ponding, percs slowly.	Not needed------	Not needed.
SmB---------------- Simeon	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
SmE---------------- Simeon	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
UbD---------------- Uly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope, erodes easily.	Slope, erodes easily.
UbE---------------- Uly	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope, erodes easily.	Slope, erodes easily.
UcD2*:							
Uly---------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope, erodes easily.	Slope, erodes easily.
Coly--------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
UcF*:							
Uly---------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope, erodes easily.	Slope, erodes easily.
Coly--------------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
VaB, VaD----------- Valentine	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
VaE, VaF---------- Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ba---------------- Barney	0-9	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	85-95	60-95	20-35	3-15
	9-60	Stratified loam to sand.	SM, ML	A-2, A-4	0	90-100	90-100	55-80	20-60	---	NP
Be---------------- Blendon	0-16	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	16-31	Fine sandy loam, sandy loam, loam.	SM, SC, ML, CL	A-4, A-2	0	100	85-100	60-100	20-60	20-33	NP-10
	31-60	Fine sandy loam, loamy fine sand, fine sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
Bo---------------- Boel	0-11	Loamy fine sand	SM, SP	A-2, A-3	0	100	95-100	85-95	0-35	---	NP
	11-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	85-95	0-25	---	NP
Bp---------------- Boel	0-11	Fine sandy loam	SM	A-4, A-2	0	100	100	85-95	20-40	<20	NP
	11-60	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
	12-40	Clay, silty clay	CH	A-7	0	100	100	100	95-100	50-70	30-45
	40-48	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	35-60	15-35
	48-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	30-60	10-35
CrE2*, CrG*:											
Coly------------	0-3	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	3-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10
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
CuE2*:											
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
Uly-------------	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	7-13	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	13-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
Cx, CxB, CxC, Cy, CyB-------------- Cozad	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	75-100	20-35	2-12
	8-25	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-95	20-35	2-12
	25-60	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-95	20-35	2-12
De---------------- Detroit	0-10	Silt loam--------	CL	A-6, A-4	0	100	100	95-100	85-95	25-40	8-20
	10-48	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	90-100	50-60	25-35
	48-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	25-45	10-25

See footnote at end of table.

TABLE 16.--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	
Fm---------------- Fillmore Variant	0-6	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	100	95-100	20-30	2-8
	6-22	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-40	2-15
	22-40	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	100	95-100	20-30	2-8
	40-60	Silty clay-------	CH	A-7	0	100	100	100	95-100	60-75	30-45
GfC2, GfD-------- Gates	0-4	Very fine sandy loam.	ML	A-4	0	100	100	95-100	65-100	20-40	NP-10
	4-7	Very fine sandy loam.	ML	A-4	0	100	100	95-100	65-100	20-40	NP-10
	7-60	Very fine sandy loam, silt loam, loamy very fine sand.	ML, SM	A-4	0	100	100	95-100	35-100	20-40	NP-10
Gn---------------- Gibbon	0-14	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	20-30	2-10
	14-20	Silt loam, clay loam.	CL	A-6	0	100	100	90-100	55-90	25-38	12-20
	20-60	Stratified fine sandy loam to silt loam.	SM, SC, CL, ML	A-4	0	100	100	70-95	35-90	<25	NP-8
HeB, HeC, HeD, HeE-------------- Hersh	0-6	Fine sandy loam	SM, SC, SM-SC, ML	A-4	0	100	100	85-100	40-75	<20	NP-10
	6-14	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
	14-60	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. Histosols											
Hk, HmB----------- 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
Ho, HoB, HoC, HoC2------------- Holdrege	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-40	2-18
	12-26	Silty clay loam	CL	A-7, A-6	0	100	100	98-100	90-100	30-50	15-35
	26-31	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
Hr, HrB, Hy, HyB- Hord	0-20	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	3-18
	20-44	Silt loam, silty clay loam, loam.	CL	A-6, A-4	0	100	100	98-100	85-100	25-40	8-23
	44-60	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
IpB--------------- Ipage	0-7	Loamy fine sand	SM, SP-SM	A-2	0	100	100	50-90	10-35	---	NP
	7-60	Fine sand, loamy sand, sand.	SM, SP-SM, SP	A-2, A-3	0	100	95-100	50-95	2-30	---	NP
Le---------------- Leshara	0-14	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	60-90	20-35	3-15
	14-60	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	60-90	20-35	3-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Lo---------------- Loup	0-10	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	55-80	15-35	4-15
	10-60	Fine sand, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	100	100	65-100	5-20	---	NP
Pg*. Pits and Dumps											
Sa*:											
Saltine----------	0-6	Silt loam---------	ML	A-4	0	100	100	85-100	60-90	25-35	3-8
	6-60	Silt loam, silty clay loam, loam.	CL	A-4, A-6, A-7	0	100	100	85-100	60-95	25-50	7-25
Leshara----------	0-9	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	60-90	20-35	3-15
	9-60	Silt loam, loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	60-90	20-35	3-15
Sc---------------- Scott	0-11	Silt loam---------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	2-20
	11-38	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	41-75	20-45
	38-56	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	56-60	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, SmE--------- Simeon	0-3	Loamy sand--------	SM, SP-SM	A-2, A-3	0	95-100	90-100	51-80	5-35	<20	NP
	3-60	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
UbD--------------- Uly	0-10	Silt loam---------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	10-29	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	29-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
UbE--------------- Uly	0-10	Silt loam---------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	10-29	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	29-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
UcD2*:											
Uly--------------	0-6	Silt loam---------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	6-18	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	18-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
Coly-------------	0-3	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	3-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10
UcF*:											
Uly--------------	0-10	Silt loam---------	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	2-15
	10-20	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	20-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
Coly-------------	0-3	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
	3-60	Silt loam, very fine sandy loam, loam.	ML, CL, CL-ML	A-4	0	100	100	85-100	85-100	20-35	2-10

See footnote at end of table.

TABLE 16.--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	
VaB, VaD---------- 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
VaE, VaF---------- Valentine	0-5	Fine sand--------	SM, SP-SM, SP	A-2, A-3	0	100	100	70-100	2-25	---	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

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cm3	In/hr	In/in	pH	mmhos/cm					Pct
Ba----------------	0-9	10-20	1.40-1.50	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	2	3	1-2
Barney	9-60	3-10	1.60-1.80	2.0-20	0.09-0.14	7.4-8.4	<2	Low--------	0.17			
Be----------------	0-16	10-18	1.25-1.35	2.0-6.0	0.11-0.17	5.6-7.3	<2	Low--------	0.20	5	3	2-4
Blendon	16-31	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low--------	0.20			
	31-60	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low--------	0.20			
Bo----------------	0-11	2-10	1.60-1.80	6.0-20	0.10-0.12	6.1-8.4	<2	Low--------	0.17	5	2	1-2
Boel	11-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.1-8.4	<2	Low--------	0.20			
Bp----------------	0-11	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
Boel	11-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.20			
Bu----------------	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
Butler	12-40	45-55	1.10-1.20	0.06-0.2	0.11-0.13	5.6-8.4	<2	High-------	0.37			
	40-48	32-45	1.10-1.30	0.2-0.6	0.14-0.20	6.6-8.4	<2	High-------	0.37			
	48-60	20-35	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.37			
CrE2*, CrG*:												
Coly-------------	0-3	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-2
	3-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
Hobbs------------	0-6	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			
CuE2*:												
Coly-------------	0-6	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	6-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
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	.5-1
	7-13	20-30	1.20-1.30	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
	13-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Cx, CxB, CxC, Cy,												
CyB--------------	0-8	11-25	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low--------	0.32	5	6	2-4
Cozad	8-25	10-18	1.30-1.40	0.6-2.0	0.17-0.19	6.1-8.4	<2	Low--------	0.43			
	25-60	8-18	1.25-1.50	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low--------	0.24			
De----------------	0-10	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
Detroit	10-48	35-45	1.35-1.50	0.06-0.2	0.12-0.18	6.6-7.8	<2	High-------	0.37			
	48-60	18-35	1.30-1.50	0.2-0.6	0.18-0.22	6.6-8.4	<2	Moderate	0.37			
Fm----------------	0-6	18-25	1.30-1.40	0.6-2.0	0.22-0.24	6.1-7.8	<2	Low--------	0.37	5	6	2-4
Fillmore Variant	6-22	18-35	1.30-1.40	0.6-2.0	0.18-0.22	6.1-7.8	<2	Low--------	0.37			
	22-40	18-25	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.8	<2	Low--------	0.37			
	40-60	40-50	1.30-1.50	0.06-0.2	0.10-0.13	6.1-7.8	<2	High-------	0.37			
GfC2, GfD---------	0-4	14-17	1.20-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.37	5	3	<1
Gates	4-7	13-15	1.20-1.40	0.6-2.0	0.17-0.19	7.4-8.4	<2	Low--------	0.37			
	7-60	14-17	1.20-1.40	0.6-6.0	0.17-0.19	7.4-8.4	<2	Low--------	0.37			
Gn----------------	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
Gibbon	14-20	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
	20-60	15-25	1.50-1.70	0.6-6.0	0.16-0.20	7.9-9.0	<2	Low--------	0.32			
HeB, HeC, HeD,												
HeE--------------	0-6	10-18	1.30-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low--------	0.24	5	3	.5-1
Hersh	6-14	8-18	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.3	<2	Low--------	0.24			
	14-60	10-18	1.20-1.50	2.0-6.0	0.14-0.16	6.6-7.8	<2	Low--------	0.24			
Hf.												
Histosols												

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cm3	In/hr	In/in	pH	mmhos/cm					Pct
Hk, HmB----------- 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			
Ho, HoB, HoC, HoC2------------ Holdrege	0-12	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	1-4
	12-26	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	26-31	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			
Hr, HrB, Hy, HyB- Hord	0-20	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
	20-44	20-35	1.35-1.45	0.6-2.0	0.17-0.22	6.1-7.8	<2	Low--------	0.32			
	44-60	18-30	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
IpB--------------- Ipage	0-7	3-10	1.40-1.50	6.0-20	0.10-0.12	5.1-7.8	<2	Low--------	0.17	5	2	.5-2
	7-60	1-8	1.50-1.60	6.0-20	0.04-0.10	5.1-7.8	<2	Low--------	0.17			
Le---------------- Leshara	0-14	15-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-8.4	<2	Low--------	0.32	5	6	2-4
	14-60	12-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.43			
Lo---------------- Loup	0-10	8-18	1.10-1.30	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	5	8	2-4
	10-60	2-7	1.50-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.17			
Pg*. Pits and Dumps												
Sa*: Saltine----------	0-6	15-27	1.30-1.40	0.6-2.0	0.20-0.24	7.4-9.0	>4	Low--------	0.32	5	6	1-2
	6-60	20-40	1.20-1.30	0.2-0.6	0.17-0.22	>8.4	>4	Moderate	0.32			
Leshara----------	0-9	15-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-8.4	<2	Low--------	0.32	5	6	2-4
	9-60	12-27	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.43			
Sc---------------- Scott	0-11	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
	11-38	40-55	1.20-1.40	<0.06	0.10-0.14	5.6-7.8	<2	High-------	0.37			
	38-56	27-40	1.15-1.40	0.2-0.6	0.18-0.20	6.6-7.8	<2	High-------	0.37			
	56-60	18-35	1.30-1.50	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.37			
SmB, SmE---------- Simeon	0-3	5-12	1.30-1.50	6.0-20	0.08-0.14	6.1-7.8	<2	Low--------	0.17	5	2	.5-1
	3-60	2-10	1.50-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low--------	0.15			
UbD--------------- Uly	0-10	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	10-29	20-30	1.20-1.30	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
	29-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
UbE--------------- Uly	0-10	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	10-29	20-30	1.20-1.30	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
	29-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
UcD2*: Uly--------------	0-6	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	1-2
	6-18	20-30	1.20-1.30	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
	18-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Coly-------------	0-3	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	3-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
UcF*: Uly--------------	0-10	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	10-20	20-30	1.20-1.30	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
	20-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Coly-------------	0-3	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	3-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
VaB, VaD---------- 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			
VaE, VaF---------- Valentine	0-5	0-6	1.70-1.90	6.0-20	0.07-0.09	5.6-7.3	<2	Low--------	0.15	5	1	.5-1
	5-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
Ba------------------ Barney	D	Frequent----	Long------	Mar-Jun	0-2.0	Apparent	Nov-Jun	Moderate	High-----	Low.
Be------------------ Blendon	B	None---------	---	---	>6.0	---	---	Moderate	Moderate	Low.
Bo, Bp------------ Boel	A	Occasional	Brief-----	Mar-Jun	1.5-3.5	Apparent	Nov-May	Moderate	High-----	Low.
Bu------------------ Butler	D	None---------	---	---	0.5-2.0	Perched	Mar-Jul	High-----	High-----	Low.
CrE2*, CrG*: Coly--------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
Hobbs-------------	B	Occasional	Brief-----	Apr-Sep	>6.0	---	---	Moderate	Low------	Low.
CuE2*: Coly--------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
Uly----------------	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
Cx, CxB, CxC------ Cozad	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Low.
Cy, CyB----------- Cozad	B	Rare---------	---	---	>6.0	---	---	Moderate	Low------	Low.
De------------------ Detroit	C	None---------	---	---	>6.0	---	---	Low------	High-----	Low.
Fm------------------ Fillmore Variant	D	None---------	---	---	+.5-3.0	Perched	Mar-Jul	High-----	High-----	Low.
GfC2, GfD---------- Gates	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Low.
Gn------------------ Gibbon	B	Rare---------	---	---	1.5-3.0	Apparent	Nov-Jun	High-----	High-----	Low.
HeB, HeC, HeD, HeE-------------- Hersh	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Low.
Hf. Histosols										
Hk------------------ Hobbs	B	Occasional	Brief-----	Apr-Sep	>6.0	---	---	Moderate	Low------	Low.
HmB---------------- Hobbs	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	Moderate	Low------	Low.
Ho, HoB, HoC, HoC2-------------- Holdrege	B	None---------	---	---	>6.0	---	---	Moderate	Low------	Low.
Hr, HrB----------- Hord	B	None---------	---	---	>6.0	---	---	Moderate	High-----	Low.
Hy, HyB----------- Hord	B	Rare---------	---	---	>6.0	---	---	Moderate	High-----	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
IpB: Ipage	A	None	---	---	3.0-6.0	Apparent	Dec-Jun	Moderate	Low	Low.
Le: Leshara	B	Occasional	Very brief	Mar-Jul	1.5-3.0	Apparent	Mar-May	High	High	Low.
Lo: Loup	D	Occasional	Brief	Jan-Jul	0-1.5	Apparent	Nov-May	Moderate	High	Low.
Pg*. Pits and Dumps										
Sa*:										
Saltine	C	Occasional	Brief	Mar-Jul	2.0-3.0	Apparent	Nov-Jul	High	High	High.
Leshara	B	Occasional	Very brief	Mar-Jul	2.0-3.0	Apparent	Mar-May	High	High	Low.
Sc: Scott	D	None	---	---	+.5-1.0	Perched	Mar-Aug	High	High	Low.
SmB, SmE: Simeon	A	None	---	---	>6.0	---	---	Low	Low	Low.
UbD: Uly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
UbE: Uly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
UcD2*:										
Uly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Coly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
UcF*:										
Uly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
Coly	B	None	---	---	>6.0	---	---	Moderate	High	Low.
VaB, VaD, VaE, VaF: Valentine	A	None	---	---	>6.0	---	---	Low	Low	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic; LL, liquid limit; and PI, plasticity index]

Soil name*, report number, horizon, and depth in inches	Classification		Grain-size distribution									LL	PI	Specific gravity
			Percentage passing sieve number--						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
Boel loamy fine sand: (S79NE-175-74)														
Ap---- 0 to 6	A-2-4 (0)	SM	--	--	100	100	95	20	18	7	4	NP	NP	2.58
C-----11 to 60	A-3(2)	SP-SM	--	--	100	100	95	1	1	1	1	NP	NP	2.60
Coly silt loam: (S80NE-175-62)														
A----- 0 to 5	A-4-5 (10)	ML	--	--	100	100	100	98	90	--	15	43	13	2.55
AC---- 5 to 11	A-6(9)	ML	--	--	100	100	100	99	91	--	12	39	12	2.61
C-----11 to 60	A-4(8)	ML	--	--	100	100	100	99	92	--	9	34	3	2.64
Cozad silt loam, terrace: (S79NE-175-30)														
Ap---- 0 to 6	A-4(8)	ML	--	--	100	100	100	95	84	--	17	34	7	2.57
Bw1---10 to 14	A-6(10)	CL	--	--	100	100	100	97	87	--	19	39	14	2.63
Bw2---14 to 22	A-6(10)	CL	--	--	100	100	100	97	88	--	19	38	14	2.65
C-----22 to 60	A-4(8)	ML	--	--	100	100	100	98	87	--	9	29	4	2.66
Hobbs silt loam: (S80NE-175-61)														
Ap1--- 0 to 3	A-6(9)	ML	--	--	100	100	100	97	90	--	14	39	12	2.57
Ap2--- 3 to 8	A-6(10)	CL	--	--	100	100	100	97	90	--	17	40	14	2.58
C----- 8 to 60	A-6(9)	CL	--	--	100	100	100	99	95	--	14	37	12	2.63
Holdrege silt loam: (S81NE-175-25)														
Ap---- 0 to 8	A-6(9)	CL	--	--	100	100	100	97	89	25	17	35	12	2.57
Bt2---19 to 26	A-7-6 (19)	CH	--	--	100	100	100	97	89	36	32	53	30	2.65
C2----36 to 60	A-6(9)	CL	--	--	100	100	100	99	91	20	14	36	12	2.68

See footnote at end of table.

TABLE 19.--ENGINEERING INDEX TEST DATA--Continued

Soil name*, report number, horizon, and depth in inches	Classification		Grain-size distribution									LL	PI	Specific gravity
			Percentage passing sieve number--						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
Uly silt loam: (S79NE-175-36)														
A1---- 0 to 11	A-6(9)	ML	--	--	100	100	100	97	88	--	15	38	12	2.64
Bw----14 to 22	A-6(10)	CL	--	--	100	100	100	99	91	--	20	40	15	2.64
C-----28 to 60	A-4(8)	ML	--	--	100	100	100	99	91	--	10	34	9	2.66

* Locations of the sampled pedons are as follows--

Boel loamy fine sand, 0 to 2 percent slopes, 500 feet east and 1,100 feet south of the northwest corner of sec. 6, T. 17 N., R. 16 W.

Coly silt loam, in an area of Uly-Coly silt loams, 15 to 30 percent slopes, 1,800 feet west and 550 feet north of the southeast corner of sec. 34, T. 19 N., R. 16 W.

Cozad silt loam, terrace, 0 to 1 percent slopes, 150 feet east and 2,600 feet north of the southwest corner of sec. 6, T. 19 N., R. 14 W.

Hobbs silt loam, 0 to 2 percent slopes, 1,100 feet east and 100 feet south of the northwest corner of sec. 32, T. 18 N., R. 14 W.

Holdrege silt loam, 1 to 3 percent slopes, 1,320 feet east and 400 feet north of the southwest corner of sec. 32, T. 18 N., R. 14 W.

Uly silt loam, 11 to 17 percent slopes, 2,300 feet east and 1,700 feet south of the northwest corner of sec. 7, T. 18 N., R. 15 W.

TABLE 20.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Barney	Sandy, mixed, mesic Mollic Fluvaquents
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
Butler	Fine, montmorillonitic, mesic Abruptic Argiaquolls
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Cozad	Coarse-silty, mixed, mesic Fluventic Haplustolls
Detroit	Fine, montmorillonitic, mesic Pachic Argiustolls
Fillmore Variant	Fine-silty, mixed, mesic Aquic Ustifluvents
Gates	Coarse-silty, mixed, nonacid, mesic Typic Ustorthents
*Gibbon	Fine-silty, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Hersh	Coarse-loamy, mixed, nonacid, mesic Typic Ustorthents
Histosols	Fine, mesic Medisaprists
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Holdrege	Fine-silty, mixed, mesic Typic Argiustolls
Hord	Fine-silty, mixed, mesic Cumulic Haplustolls
Ipage	Mixed, mesic Aquic Ustipsamments
Leshara	Fine-silty, mixed, mesic Typic Haplaquolls
Loup	Sandy, mixed, mesic Typic Haplaquolls
Saltine	Fine-silty, mixed (calcareous), mesic Typic Halaquepts
Scott	Fine, montmorillonitic, mesic Typic Argialbolls
Simeon	Mixed, mesic Typic Ustipsamments
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Valentine	Mixed, mesic Typic Ustipsamments

Interpretive Groups

INTERPRETIVE GROUPS

[Dashes indicate that the soil was not assigned to the interpretive group]

Map symbol and soil name	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
Ba: Barney	VIw	---	---	Wetland	10
Be: Blendon	IIe	IIe	Yes	Sandy	5
Bo: Boel	IVw	IVw	---	Subirrigated	2S
Bp: Boel	IIIw	IIIw	---	Subirrigated	2S
Bu: Butler	IIw	IIw	Yes**	Clayey	2W
CrE2:	VIe	---	---		
Coly				Limy Upland	8
Hobbs				Silty Overflow	1
CrG:	VIIe	---	---		
Coly				Thin Loess	10
Hobbs				Silty Overflow	1
CuE2:	VIe	---	---		
Coly				Limy Upland	8
Uly				Silty	3
Cx: Cozad	IIc	I	Yes	Silty	3
CxB: Cozad	IIe	IIe	Yes	Silty	3
CxC: Cozad	IIIe	IIIe	Yes	Silty	3
Cy: Cozad	IIc	I	Yes	Silty Lowland	1
CyB: Cozad	IIe	IIe	Yes	Silty Lowland	1
De: Detroit	IIc	I	Yes	Silty Lowland	3
Fm: Fillmore Variant	IIIw	IIIw	---	Silty Overflow	2W
GfC2: Gates	IIIe	IIIe	Yes	Silty	3
GfD: Gates	IVe	IVe	---	Silty	3
Gn: Gibbon	IIw	IIw	Yes**	Subirrigated	2S
HeB: Hersh	IIIe	IIe	Yes	Sandy	5
HeC: Hersh	IIIe	IIIe	Yes	Sandy	5
HeD: Hersh	IVe	IVe	---	Sandy	5

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
HeE: Hersh	VIe	---	---	Sandy	5
Hf: Histosols	VIIIw	---	---	---	10
Hk: Hobbs	IIw	IIw	Yes	Silty Overflow	1
HmB: Hobbs	VIw	---	---	Silty Overflow	10
Ho: Holdrege	IIc	I	Yes	Silty	3
HoB: Holdrege	IIe	IIe	Yes	Silty	3
HoC, HoC2: Holdrege	IIIe	IIIe	Yes	Silty	3
Hr: Hord	IIc	I	Yes	Silty	3
HrB: Hord	IIe	IIe	Yes	Silty	3
Hy: Hord	IIc	I	Yes	Silty Lowland	1
HyB: Hord	IIe	IIe	Yes	Silty Lowland	1
IpB: Ipage	IVe	IVe	---	Sandy Lowland	5
Le: Leshara	IIw	IIw	Yes**	Subirrigated	2S
Lo: Loup	Vw	---	---	Wet Subirrigated	2D
Pg: Pits and Dumps	VIIIs	---	---	---	10
Sa:	IVs	IVs	---		
Saltine				Saline Subirrigated	9S
Leshara				Subirrigated	2S
Sc: Scott	IVw	---	---	---	10
SmB: Simeon	VIs	IVs	---	Shallow to Gravel	10
SmE: Simeon	VIs	---	---	Shallow to Gravel	10
UbD: Uly	IVe	IVe	---	Silty	3
UbE: Uly	VIe	---	---	Silty	3
UcD2:	IVe	IVe	---		
Uly				Silty	3
Coly				Limy Upland	8

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Map symbol and soil name	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
UcF	VIe	---	---		
Uly				Silty	10
Coly				Limy Upland	10
VaB Valentine	IVe	IVe	---	Sandy	5
VaD Valentine	VIe	IVe	---	Sands	7
VaE Valentine	VIe	---	---	Sands	7
VaF	VIIe	---	---		
Valentine, rolling				Sands	10
Valentine, hilly				Choppy Sands	10

* A soil complex is treated as a single management unit in the land capability classification and prime farmland columns. The N column is for nonirrigated soils; the I column is for irrigated soils.
** Where drained.

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