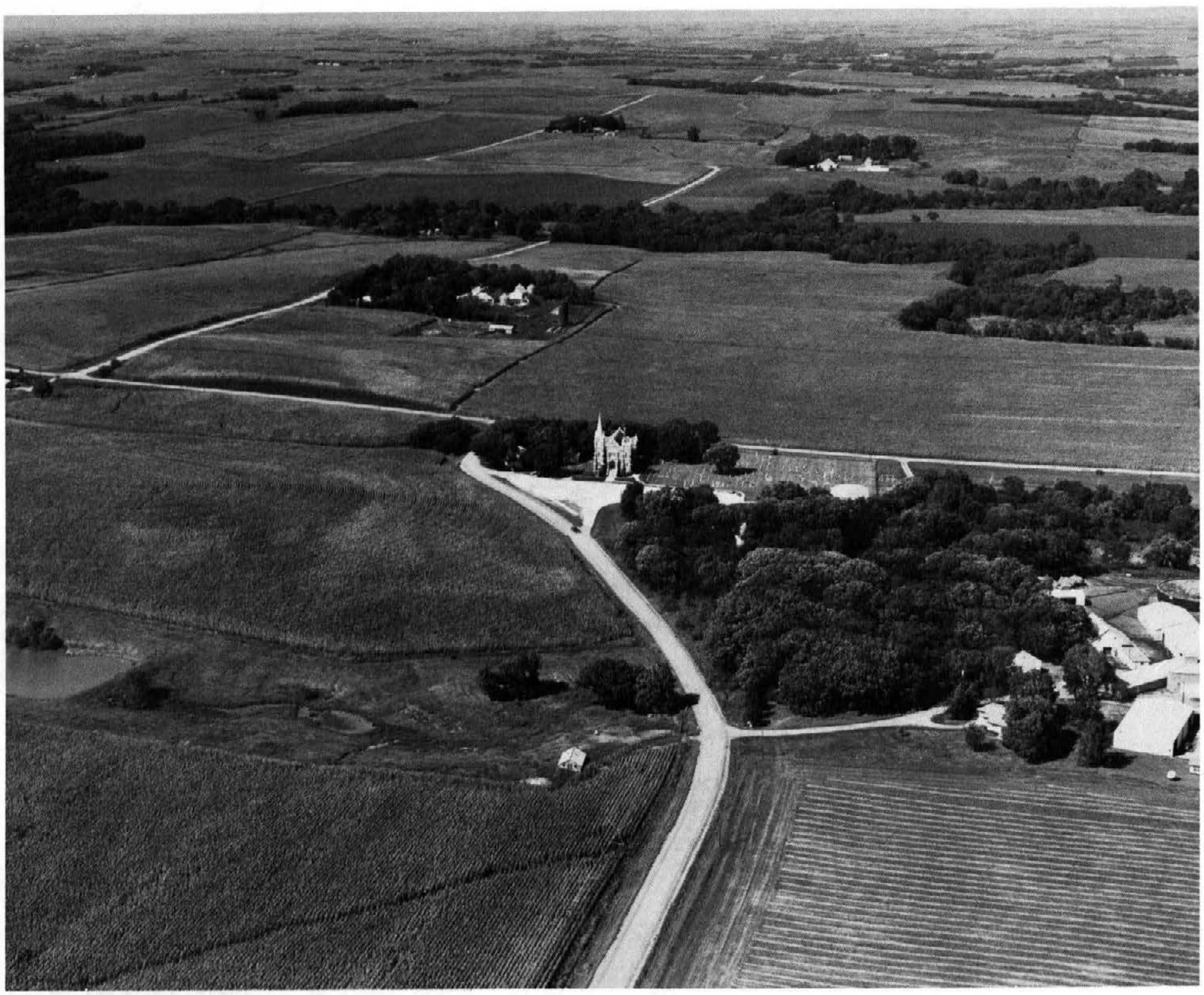
United States
Department of
Agriculture

Soil
Conservation
Service

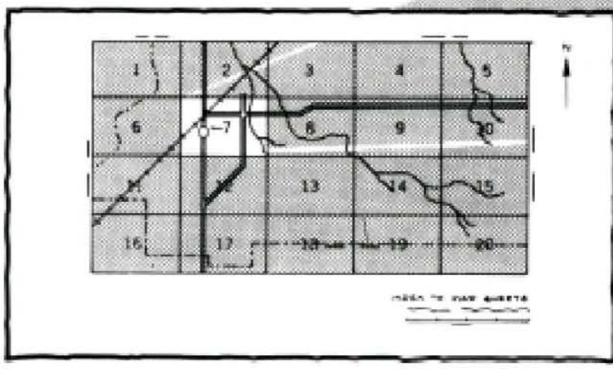
In cooperation with
University of Nebraska,
Conservation and
Survey Division

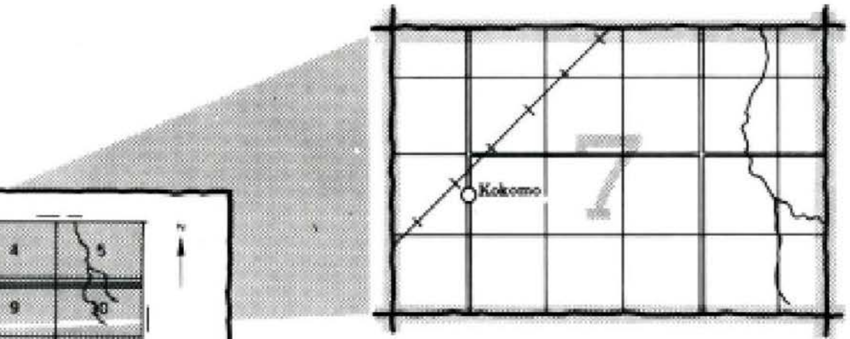
Soil Survey of Platte County, Nebraska



HOW TO USE

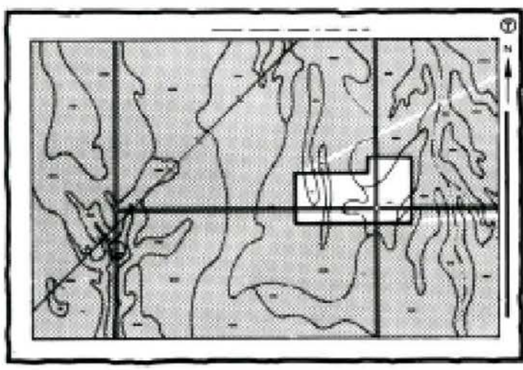
1. Locate your area of interest on the "Index to Map Sheets"

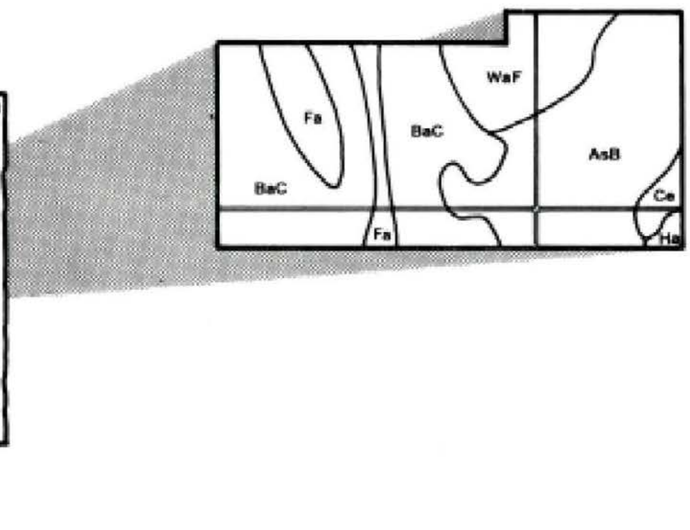




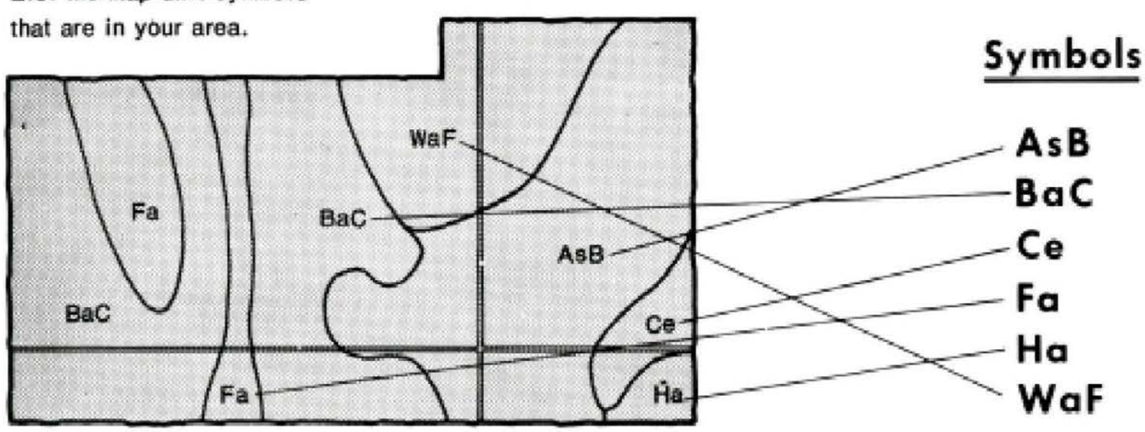
2. Note the number of the map sheet and turn to that sheet.

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



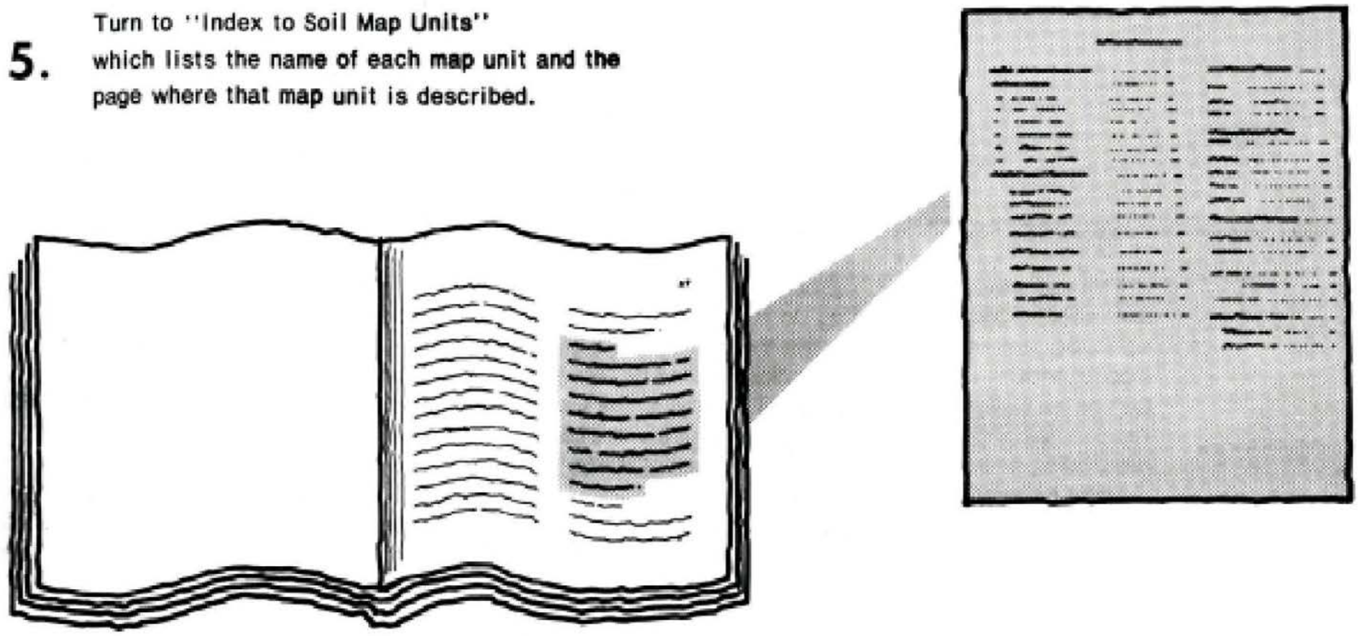


4. List the map unit symbols that are in your area.

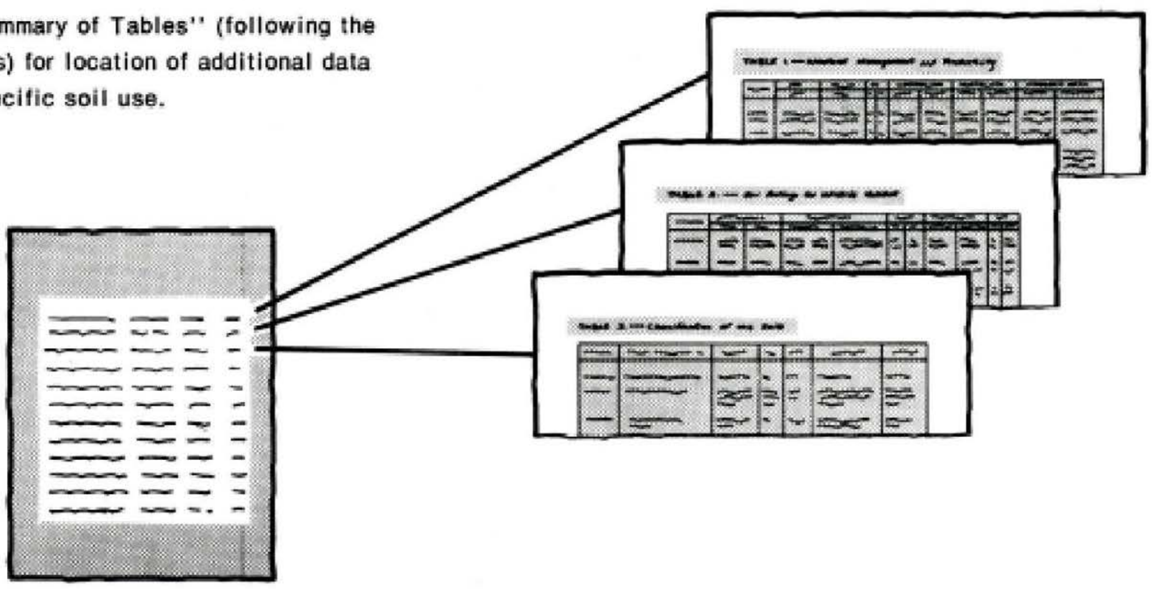


THIS SOIL SURVEY

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 Conservation and Survey Division, University of Nebraska, 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 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. 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 Elkhorn, Lower Platte North, and Lower Loup Natural Resources Districts. These natural resources districts provided financial assistance needed to purchase the aerial photography used in making the soil maps and to employ an additional soil scientist in accelerating the completion of the survey.

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

Cover: Typical landscape of the Nora-Crofton-Moody association on uplands and the Shell-Hobbs-Muir association on bottom lands and stream terraces.

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Soil Series

Issued September 1988

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Summary of Tables

Foreword

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

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

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

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

Sherman L. Lewis
State Conservationist
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Soil Survey of
Platte County, Nebraska

By Cameron Loerch, Charles L. Hammond, and Paul Bartlett,
Soil Conservation Service; and Philip Young, Kenneth Newton, and
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United States Department of Agriculture, Soil Conservation Service,
in cooperation with
the University of Nebraska, Conservation and Survey Division

Platte County is in the east-central part of Nebraska (fig. 1). It comprises an area of 689.4 square miles, or 441,049 acres. It is bordered on the east by Colfax County, on the south by Butler, Polk, and Merrick Counties, on the west by Boone and Nance Counties, and on the north by Madison and Stanton Counties. Columbus, the county seat, is the largest town in the county. Other towns in the county are Cornlea, Creston, Duncan, Humphrey, Lindsay, Monroe, Platte Center, and Tarnov. Each of these communities has most of the services required in a farming area.

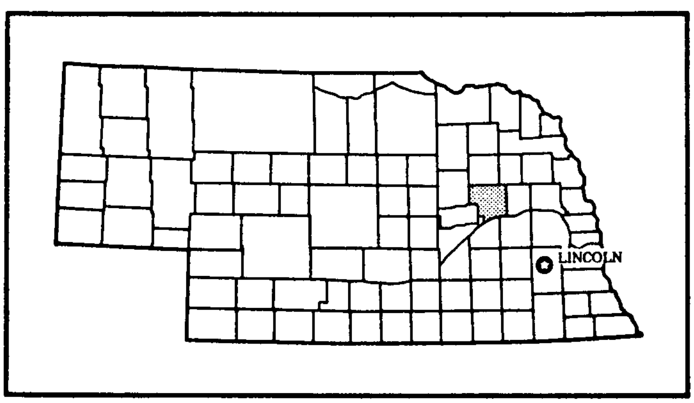

Figure 1.—Location of Platte County in Nebraska.

Agriculture is the main economic enterprise in the county. The main crops are corn, soybeans, alfalfa, and grain sorghum. Crops grown in lesser amounts are oats, wheat, and other small grain. The crops are used as feed for cattle, hogs, and sheep and provide cash income. Most employment is in agriculture or related businesses. In Columbus industrial plants manufacture products for nonagricultural uses.

In 1978, about 79 percent of the acreage of the county was cropland, about 10 percent was pasture and range, and about 5 percent was woodland. The rest was nonfarmland.

The first soil survey of Platte County was made in 1929 (*4*). This new survey updates the earlier survey, provides additional information, and contains larger maps that show the soils in greater detail.

General Nature of the County

This section provides general information about history and population; climate; geology and ground water; physiography, relief, and drainage; transportation facilities; and trends in farming and soil use in Platte County.

History and Population

Platte County was formed in 1855 from part of Dodge County. In 1858 it was enlarged by that part of Monroe County not included in the Pawnee Indian Reservation. Subsequent legislation has resulted in its present boundary. The first permanent settlement in the county was in 1856. Settlers from Columbus, Ohio, established themselves on the north side of the Loup River at the present site of Columbus. Later, settlers came from Iowa, Ohio, Illinois, and New York and other Eastern States.

In 1980, the population of Platte County was 28,852. The population of Columbus was 17,317, that of Cornlea was 40, that of Creston was 210, that of Duncan was 411, and that of Humphrey was 799. The population of Lindsay was 383, that of Monroe was 290, that of Platte Center was 368, and that of Tarnov was 63.

Climate

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

Winters are cold in Platte County. Summers are quite hot and have occasional cool spells. In winter precipitation frequently occurs as snowstorms, and during the warm months it occurs chiefly as showers, often heavy, when warm, moist air moves in from the south. Total annual rainfall is normally adequate for corn, soybeans, and small grain.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Columbus, 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 24 degrees F, and the average daily minimum temperature is 14 degrees. The lowest temperature on record, which occurred at Columbus on January 27, 1963, is -26 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on July 11, 1954, is 109 degrees.

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

The total annual precipitation is about 26 inches. Of this, 20 inches, or nearly 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 15 inches. The heaviest 1-day rainfall during the period of record was 4.19 inches at Columbus on September 11, 1972. Thunderstorms occur on about 48 days each year, and most occur in summer.

The average seasonal snowfall is about 25 inches. The greatest snow depth at any one time during the period of record was 21 inches. On the average, 30 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 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in spring.

Tornadoes and severe thunderstorms strike occasionally. These storms are local and of short duration and result in sparse damage in narrow belts. Hailstorms occur at times during the warmer part of the year in irregular patterns and in relatively small areas.

Geology and Ground Water

The Niobrara Formation underlies the entire county. It is the uppermost bedrock formation beneath most of the county. It consists of chalky shale and lime-cemented, marine sediment. The Ogallala Formation forms the bedrock along the western edge of the county. It has a maximum thickness of about 165 feet in the northwest corner of the county. It is partly consolidated fine sand, silt, and clay and has some limy zones. Unconsolidated deposits of Quaternary Age are throughout the county (*3*).

Glacial till, an unsorted, heterogeneous mixture of clay, silt, sand, and gravel, is in an area north of Platte Center and east of U.S. Highway 81. Sand and gravel are above and beneath the till body in this area. Deposits of Illionian age overlie the glacial till and the older Quaternary deposits. They range from sandy to clayey sediments and are capped by brown loess that crops out on the valley sides of the more deeply incised, upland drainageways.

Peoria loess mantles the Illionian-age deposits on the uplands and the Todd Valley sands on the Shell Creek terrace. Sandy to clayey, recent alluvium mantles the valleys of the Platte River, Prairie Creek, and other streams.

The effective saturated thickness of water-bearing material is greatest south of a line forming the boundary of the southern one-third of township 18 north, largely because of a buried valley containing coarser grained, water-bearing material.

The ground water throughout the county is of good quality and in adequate supply for all purposes. The water is generally hard, and some wells contain high concentrations of dissolved iron and manganese. Drainage from feedlots, septic tanks, and other waste disposal can contaminate the ground water. During installation of a domestic well, a water sample should be tested for contamination before the well is connected to the water system. Existing domestic wells should be tested occasionally for contamination. Contamination is more common in shallow wells than in deep wells.

Physiography, Relief, and Drainage

Platte County is part of the Great Plains. The greatest relief is in the breaks adjacent to the Shell Creek Valley and the Loup River Valley. Relief between the nearly level ridgetops and the bottoms of intermittent drains is about 90 to 150 feet.

About three-fifths of the county is in the loess hills, which are in the northern part of the county mainly north of the Loup River. The rest of the county is generally bottom lands and stream terraces.

An area of sandhills is in the southwest part of the county between the Loup and Platte Rivers. The topography of this area is mostly undulating to rolling. Relief ranges from 3 to 15 feet in the undulating areas to 10 to 30 feet in the rolling areas. The surface drainage is not well defined and flows directly or indirectly into the Loup or Platte River.

The rest of the county consists of bottom lands and stream terraces of the Loup and Platte Rivers. Most of these areas are nearly level and very gently sloping. The elevation between the stream terraces and the bottom lands in some areas changes so gradually as to be almost imperceptible. Generally, the relief ranges from 1 foot to 10 feet. It is modified in places by shallow stream channels. The water table is normally below a depth of 10 feet on stream terraces and generally ranges from a depth of 2 to 6 feet. Surface drainage is slow because the natural drainageways are not well defined or have been modified by land leveling.

Most of Platte County is drained by the Loup and Platte Rivers and their tributaries. A small area in the north-central and northeast parts of the county drains into the Elkhorn River. The Platte River flows east and northeast. The Loup River flows east and southeast and joins the Platte River in the southeast part of the county, just southeast of Columbus. Lost Creek parallels the Loup River northwest of Columbus, flows through Columbus, and joins the Platte River southeast of Columbus. Looking Glass Creek flows southeast and joins the Loup River in the western part of the county. Beaver Creek flows across the corner of the county in the west-central part. Shell Creek enters the county in the northwest corner, flows south-southeast, and leaves the county in the east-central part. Many smaller streams drain into Shell Creek.

The lowest elevation in the county, on the county line southeast of Columbus, is about 1,400 feet above sea level. The highest elevation, near Cornlea and Humphrey, is about 1,750 feet. Columbus is at an elevation of 1,440 feet. The slope of the county generally is south-southeast, except in the north-central part, where slope is northeast.

Flooding and ponding from surface water occurred in some areas in Loup Township during the spring of 1983 and that of 1984. Field studies suggest that higher than normal rainfall during these periods saturated the sandy soils on terraces between the Platte and Loup Rivers. The excess water flowed from seep areas in these higher-lying soils, flowed northward, and caused flooding and ponding of brief duration on farmland. One study made at the request of the Lower Loup Natural Resource District suggests that this area is subject to flooding and ponding about once every 30 years and probably more frequently (fig. 2).

Transportation Facilities

The transportation facilities in Platte County include railroads, highways, and airports. The main line of one railroad passes through Columbus and Duncan, in the southern part of the county. The county also is served by three branch lines.

Platte County has a number of good roads. The roads that provide most of the transportation in Platte County are state highways and county roads. U.S. Highway 30 is an east-southwest route in the southern part of the county. U.S. Highway 81 is a north-south route through the central part of the county. Nebraska Highway 22 is an east-west route to U.S. Highway 81 in the south-central part of the county. Nebraska Highway 45 is a north-south route in the northwest part of the county. Nebraska Highway 91 is an east-west route through the northern part of the county. Rural roads generally follow section lines, except along the Loup and Platte Rivers, which are crossed by few bridges. Most roads are graveled, and a few roads are paved. Some roads in the sandhills of Platte County are not maintained and are essentially trails.

The Columbus airport provides both commercial and charter air service.

Trends in Farming and Soil Use

Farming has been the most important enterprise in Platte County since the county was settled. In the early years crops were produced only for local use. When railroads and elevators made markets available, crop and livestock production increased. A rapid increase in use of irrigation, more efficient machinery, use of herbicides and pesticides, and increased crop yields have resulted in a significant increase in farm income. In 1971, about 1,430 farms were in Platte County, and 1,350 farms in 1982, according to Nebraska Agricultural Statistics. During this period the size of farms increased and urban areas expanded, mainly in the southeast part of the county. Most farms are combination cash-grain and livestock operations.

The acreage of irrigated crops is steadily increasing. Irrigation was used on 65,200 acres in 1971 and on 141,000 acres in 1981. The irrigation water is mostly from wells, but some water is pumped from the Platte and Loup Rivers and other major streams. The largest increase in irrigated acreage in the last 5 years has been from the use of center-pivot systems. There were 692 irrigation wells in the county in 1972 and 1,363 wells in 1982. More wells are being drilled every year.

The main cultivated crop in the county is corn. Other crops grown are soybeans, alfalfa, sorghum, oats, wheat,

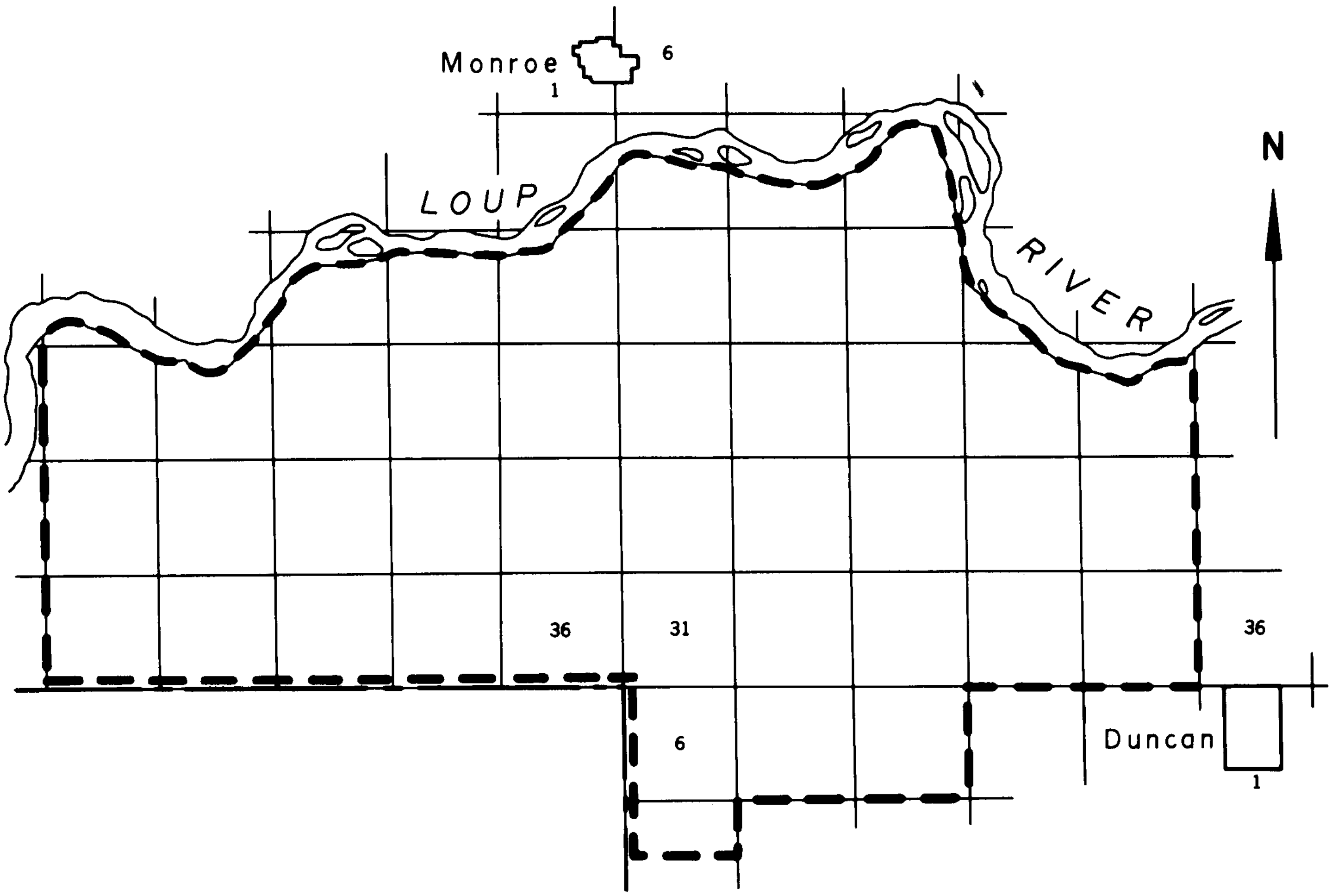

Figure 2.—Area in Loup Township where flooding and ponding occurred during the spring of 1983 and the spring of 1984.

and rye. The acreage of corn and soybeans has generally increased during the last 10 years. In 1970, corn was planted on 136,900 acres, of which 37,500 acres was irrigated, according to Nebraska Agricultural Statistics. Soybeans were planted on 26,500 acres in 1970 and on 82,000 acres in 1981. The acreage in alfalfa, oats, and sorghum has remained about the same in the last 10 years. In 1981, alfalfa was planted on 17,400 acres and oats on 10,500 acres.

Livestock is important on most farms in the county. The number of cattle has decreased in recent years. Cattle in 1971 numbered 85,000 and 80,000 in 1982. Dairy cattle decreased in number from 5,400 in 1970 to 3,900 in 1982. Hogs increased in number from 98,000 in 1970 to 128,000 by 1982. Many farms fatten a few hogs for market, and in a few places hogs are fed in confinement areas. Sheep and chickens have decreased in number since 1971.

The amount of fertilizer used in Platte County has increased from 12,206 tons in 1970 to 33,006 tons in 1979.

Machinery is used for much of the work formerly done by hand.

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 in this survey area may not fully match those in surveys of adjoining counties that were published at an earlier date. Any such differences are mainly the result of changes and refinements in series concept, different slope groupings, and application of the latest soil classification system.

Soil Descriptions

Silty Soils on Uplands and Foot Slopes

Two associations are in this group. The soils in the group are deep, very gently sloping to steep, and well drained and somewhat excessively drained. Most of the acreage in the group is used for cultivated crops, both dryland and irrigated. On the steep slopes the soils are mainly used for range or pasture. On the irrigated acreage, center-pivot systems are most common. In the sloping areas water erosion is a hazard. Maintaining a high level of fertility, conserving water for plant use, and controlling water erosion are the main management concerns.

1. Nora-Crofton-Moody Association

Deep, very gently sloping to steep, well drained and somewhat excessively drained, silty soils; formed in loess; on uplands

This association consists of soils on broad and narrow ridgetops, side slopes, and foot slopes of dissected uplands. Slopes range from 1 to 30 percent.

This association takes in 227,413 acres, or about 51 percent of the county. It is about 37 percent Nora soils, 25 percent Crofton soils, 17 percent Moody soils, and 21 percent minor soils (fig. 3).

The Nora soils are gently sloping to moderately steep and well drained. They are on convex ridgetops and side slopes. Typically, the surface layer is very dark grayish brown, friable silty clay loam about 7 inches thick. The subsurface layer is dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is friable silty clay loam about 17 inches thick. It is pale brown in the upper part and light yellowish brown in the lower part. The underlying material is very pale brown silt loam in the upper part and light gray silt loam in the lower part to a depth of more than 60 inches.

The Crofton soils are on narrow, convex ridgetops and on the steeper parts of side slopes. They are gently sloping on ridgetops and strongly sloping to steep on side slopes. They are well drained and somewhat excessively drained, and calcareous. Typically, the surface layer is grayish brown, very friable silt loam about 4 inches thick. The transition layer is pale brown, friable silt loam about 5 inches thick. The underlying material is silt loam. It is light yellowish brown in the upper part and light gray in the lower part to a depth of more than 60 inches.

The Moody soils are on broad and narrow, convex ridgetops, shoulders, and side slopes. They are very gently sloping and gently sloping on ridgetops and shoulders and strongly sloping on side slopes. They are well drained. Typically, the surface layer is dark grayish brown, friable silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 29 inches thick. It is dark grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material is light yellowish brown silty clay loam in the upper part and light yellowish brown silt loam in the lower part to a depth of 60 inches or more.

The minor soils in this association are the Alcester, Belfore, Fillmore, and Hobbs soils. Alcester soils are on concave foot slopes. They have dark upper layers more than 20 inches thick. Belfore soils are on broad, nearly level ridgetops and contain more clay than the major soils. Fillmore soils are poorly drained and in upland depressions. Hobbs soils are stratified and are in narrow, upland drainageways that are subject to occasional flooding.

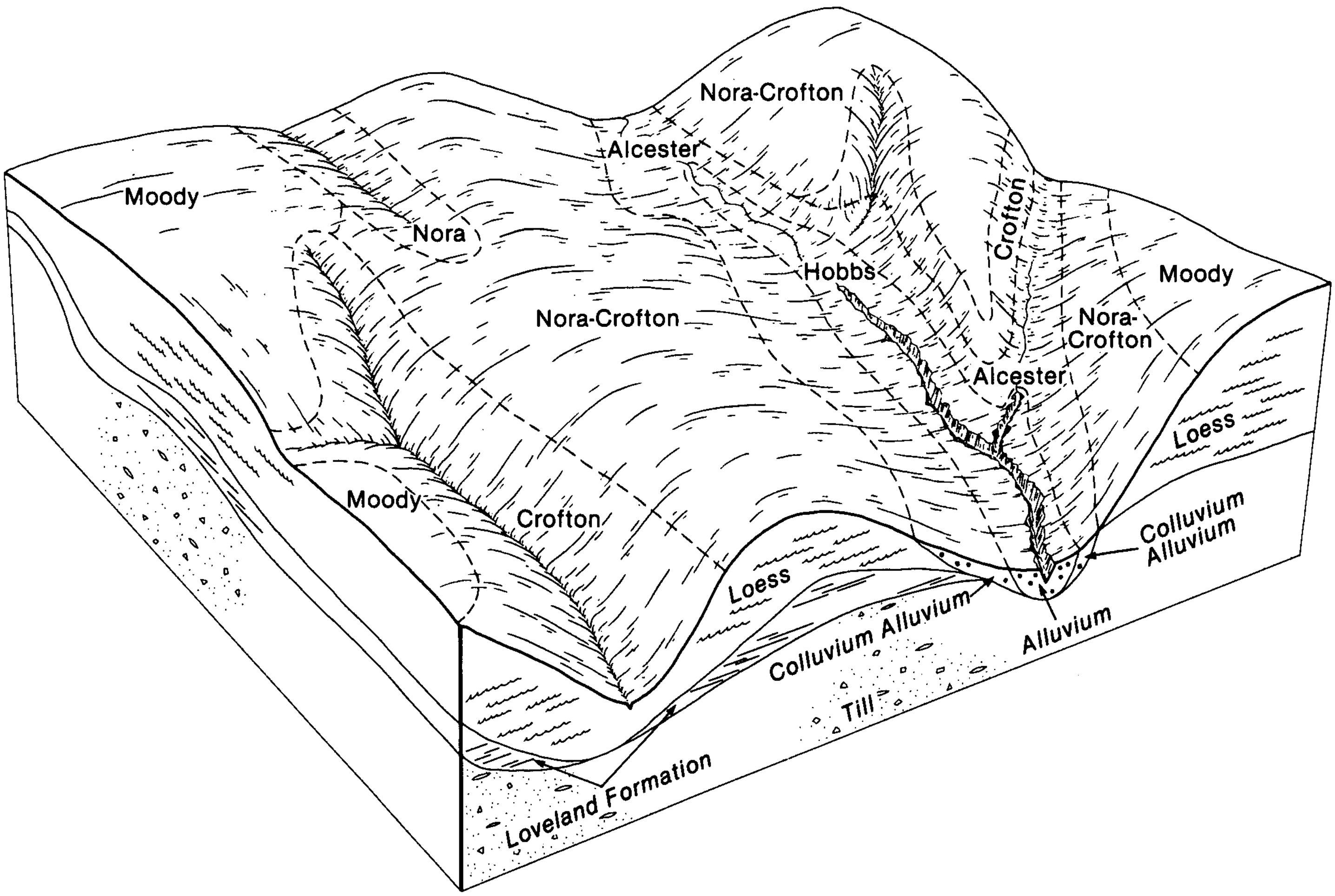

Figure 3.—Typical landscape pattern of the soils and the underlying material in the Nora-Crofton-Moody association.

Farms in this association are diversified. They are mainly a combination of cash-grain and livestock enterprises. The very gently sloping to moderately steep areas of soils on ridgetops and side slopes are generally used for cultivated crops. A few areas of steep soils on side slopes and areas around farmsteads support native or introduced grasses and are used for grazing. Most of the acreage in the association is used for dryland cultivated crops. The main crops are corn, soybeans, grain sorghum, oats, and alfalfa. A few areas where high yielding wells are available are irrigated by sprinkler systems.

Soil erosion is the main hazard. Maintaining soil fertility, controlling runoff, and conserving moisture are the main management concerns. In the narrow drainageways flooding is a hazard.

2. Geary-Alcester-Nora Association

Deep, gently sloping to steep, well drained, silty soils; formed in silty, colluvial-alluvial material and in loess; on uplands and foot slopes

This association consists of soils on strongly sloping to steep hillsides and gently sloping foot slopes adjacent to Shell Creek Valley. Slopes range from 2 to 30 percent.

This association takes in about 2,900 acres, or about 1 percent of the county. It is about 47 percent Geary soils, 21 percent Alcester soils, 17 percent Nora soils, and 15 percent minor soils.

The Geary soils are strongly sloping to steep and well drained. They are on hillsides. They formed in loess of the Loveland Formation. Typically, the surface layer is dark grayish brown, friable silty clay loam about 11 inches thick. The subsurface layer is dark brown silty clay loam about 5 inches thick. The subsoil is brown silty clay loam about 18 inches thick. The underlying material is light brown silty clay loam to a depth of more than 60 inches.

The Alcester soils are on gently sloping foot slopes below the Geary soils. They are well drained. They formed in silty, colluvial-alluvial material. Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 34 inches thick. It is dark grayish brown, friable silt loam in the upper part; brown, friable silty clay loam in the middle part; and brown, friable silty clay loam in the lower part. The underlying material is pale brown silty clay loam to a depth of more than 60 inches.

The Nora soils are on strongly sloping and moderately steep side hills. They are well drained. They formed in Peoria loess. Typically, the surface layer is very dark grayish brown, friable silty clay loam about 7 inches thick. The subsurface layer is dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is silty clay loam about 17 inches thick. It is pale brown in the upper part and light yellowish brown in the lower part. The underlying material is very pale brown silt loam in the upper part and light gray silt loam in the lower part to a depth of more than 60 inches.

The minor soils in this association are the Crofton and Thurman soils. Crofton soils have lime within a depth of 8 inches, do not have a dark surface layer, and are on side slopes on the same landscape position as Geary and Nora soils. Thurman soils are sandy throughout and on side slopes on the same landscape position as Geary and Nora soils.

Farms in this association are diversified. They are mainly a combination of cash-grain and livestock enterprises. The strongly sloping to steep areas are used for cultivated crops or are in native grasses and are used for hay or grazing. The gently sloping foot slopes are used mainly for cultivated crops. The main crops are corn, soybeans, grain sorghum, oats, and alfalfa. A few areas are irrigated, mainly by sprinkler systems.

Soil erosion is the main hazard. Maintaining fertility, reducing runoff, and conserving moisture are the main management concerns.

Silty Soils on Uplands and in Upland Depressions

Two associations are in this group. The soils in the group are deep, nearly level to gently sloping, and well drained, poorly drained, and very poorly drained. Most of the acreage in the group is used for cultivated crops, both dryland and irrigated. On the irrigated acreage, some center-pivot systems are used, but gravity furrow systems are most common. Water erosion is the principal hazard. Maintaining a high level of fertility, conserving water, and controlling erosion are the main management concerns.

3. Belfore-Moody Association

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

This association consists of soils on nearly level, broad divides on loess uplands. Slopes range from 0 to 6 percent.

This association takes in about 51,000 acres, or about 12 percent of the county. It is about 68 percent Belfore soils, 24 percent Moody soils, and 8 percent minor soils (fig. 4).

The Belfore soils are nearly level and on broad divides. Typically, the surface layer is dark grayish brown, firm silty clay loam about 14 inches thick. The subsoil is very firm and firm silty clay loam about 31 inches thick. It is grayish brown in the upper part, brown and pale brown in the middle part, and light yellowish brown in the lower part. The underlying material is light yellowish brown silty clay loam in the upper part and very pale brown silt loam in the lower part to a depth of more than 60 inches.

The Moody soils are on broad and narrow, convex ridgetops, shoulders, and side slopes. They are very gently sloping and gently sloping on ridgetops and shoulders and strongly sloping on side slopes. They are well drained. Typically, the surface layer is dark grayish brown, friable silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 29 inches thick. It is dark grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material is light yellowish brown silty clay loam in the upper part and light yellowish brown silt loam in the lower part to a depth of more than 60 inches.

The minor soils in this association are the Alcester, Butler, and Fillmore soils. Alcester soils are on concave foot slopes along the intermittent drainageways. They have dark upper layers more than 20 inches thick. Butler soils are somewhat poorly drained and in slightly concave basins. Fillmore soils are poorly drained and in depressions.

Farms in this association are diversified. They are mainly a combination of cash-grain and livestock enterprises. Most of the acreage is used for dryland cultivated crops. The crops are small areas of oats, winter wheat, and grain sorghum, but mainly corn, soybeans, and alfalfa. A few depressional areas are in introduced or native grasses and are used for grazing. In areas where high yielding wells are available, gravity and sprinkler systems are common. The principal irrigated crops are corn, soybeans, and alfalfa. The potential for irrigation in the association is high.

Erosion on the gently sloping Moody soils and ponding in the depressional areas of Fillmore soils are the main hazards. Maintaining fertility is the main management concern. Another management concern is drainage in depressional areas, but suitable outlets are commonly not available. In places, large pits are dug to hold the excess water.

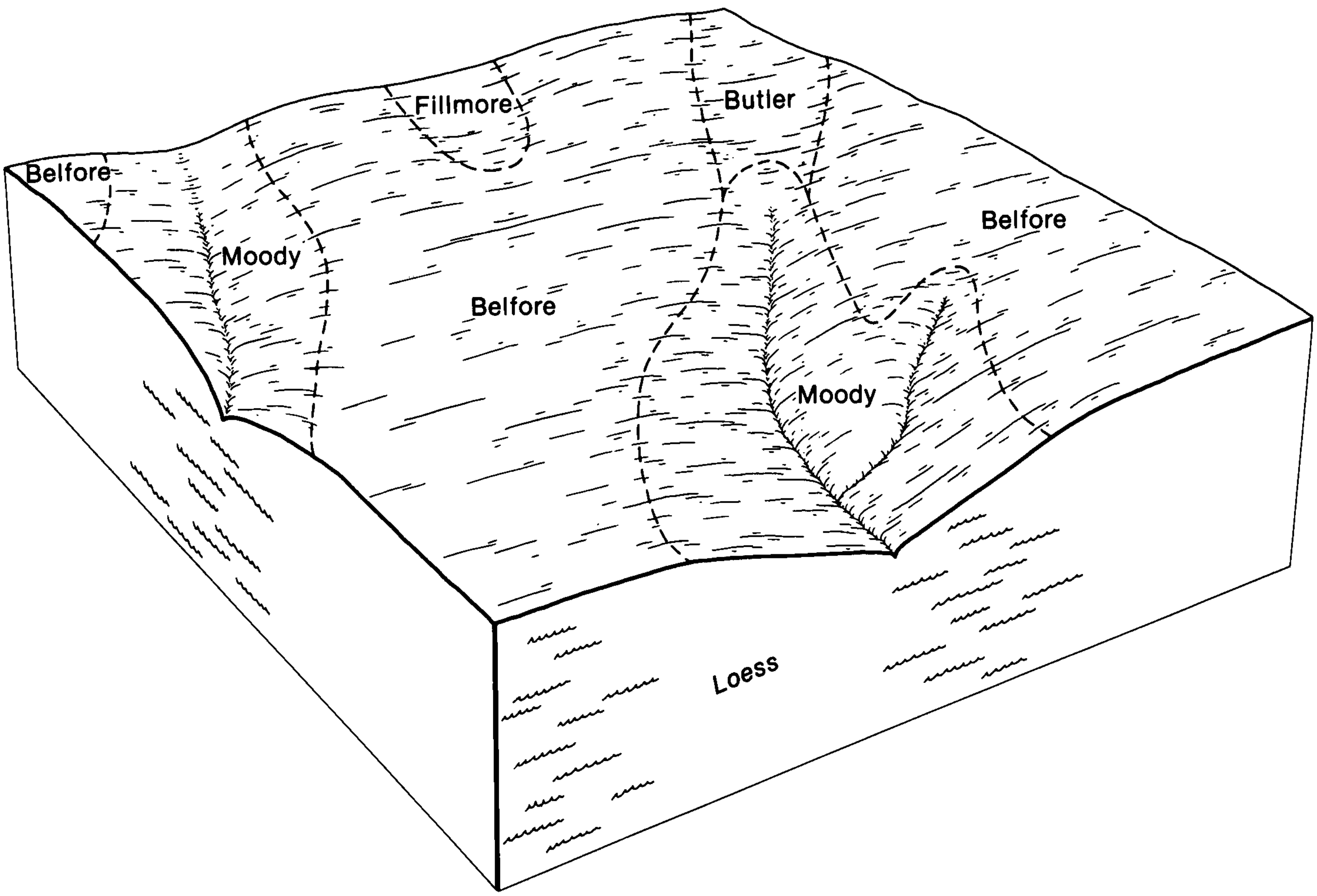

Figure 4.—Typical landscape pattern of the soils and the underlying material in the Belfore-Moody association.

4. Moody-Fillmore Association

Deep, nearly level to gently sloping, well drained, poorly drained, and very poorly drained, silty soils; formed in loess; on uplands and in upland depressions

This association consists of nearly level to gently sloping soils on smooth ridgetops and side slopes and nearly level soils in concave depressions. It is on an old, upland terrace between Shell Creek and the Platte River. Slopes range from 0 to 6 percent.

This association takes in about 22,500 acres, or about 5 percent of the county. It is about 75 percent Moody soils, 11 percent Fillmore soils, and 14 percent minor soils.

The Moody soils are on very gently sloping, broad, smooth ridgetops and gently sloping, convex ridges and side slopes. They are well drained. Typically, the surface layer is dark grayish brown, friable silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 29 inches thick. It is dark grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material is light yellowish brown silty clay loam in the upper part and light yellowish brown silt loam in the lower part to a depth of more than 60 inches.

The Fillmore soils are nearly level and poorly drained and very poorly drained. They are in concave, upland depressions. They are occasionally ponded. Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is leached, gray, friable silt loam about 4 inches thick. The subsoil is about 40 inches thick. It is dark gray, very firm silty clay in the upper part; gray, very firm silty clay in the middle part; and dark grayish brown, friable silty clay loam in the lower part. The underlying material is dark grayish brown silt loam to a depth of more than 60 inches.

The minor soils in this association are the Butler, Crofton, Nora, and Thurman soils. Butler soils are somewhat poorly drained and are on concave, nearly level slopes above Fillmore soils. Crofton soils are calcareous at the surface and are on strongly sloping and moderately steep side slopes. Nora soils are on gently sloping and strongly sloping ridgetops and side slopes. Thurman soils are sandy throughout and on gently sloping to strongly sloping side slopes.

The farms in this association are diversified. They are mainly a combination of cash-grain and livestock enterprises. Most of the acreage is used for cultivated crops, either dryland or irrigated. The crops are a few areas of grain sorghum and wheat, but mainly corn, soybeans, and alfalfa. Alfalfa and introduced or native grasses are common in depressions that are wet for most of the growing season. Water is available from high yielding, deep wells. The potential for irrigation in this association is high.

Soil erosion in the gently sloping areas and ponding in the depressional areas are the main hazards. Reducing runoff and maintaining fertility are the main management concerns.

Sandy Soils on Uplands and Stream Terraces

Two associations are in this group. The soils in the group are deep, nearly level to steep, and somewhat excessively drained, excessively drained, somewhat poorly drained, and moderately well drained. The acreage of the group is used for cultivated crops and grazing or haying. Most cultivated areas are irrigated by sprinkler systems. In areas where the soils are overgrazed and in cultivated areas, soil blowing is a hazard. Keeping the range in good condition and, in irrigated areas, controlling soil blowing and proper distribution of irrigation water are the main management concerns.

5. Valentine-Thurman Association

Deep, nearly level to steep, excessively drained and somewhat excessively drained, sandy soils; formed in eolian sands; on uplands

This association consists mainly of nearly level to steep soils on smooth, round-topped sandhills. The areas have few established drainage channels. Slopes range from 0 to 24 percent.

This association takes in about 18,000 acres, or about 4 percent of the county. It is about 47 percent Valentine soils, 45 percent Thurman soils, and 8 percent minor soils (fig. 5).

The Valentine soils are on sandhill hummocks and, in some areas, on ridgetops. These soils are gently sloping to steep and excessively drained. Typically, the surface layer is light brownish gray, loose fine sand about 5 inches thick. The transition layer is pale brown, loose fine sand about 6 inches thick. The underlying material is very pale brown fine sand to a depth of more than 60 inches.

The Thurman soils are on the lower slopes of hummocks and in concave areas. These soils are nearly level to strongly sloping and somewhat excessively drained. Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is grayish brown, very friable loamy fine sand about 6 inches thick. The transition layer is brown fine sand about 6 inches thick. The underlying material is pale brown fine sand in the upper part and very pale brown fine sand in the lower part to a depth of more than 60 inches.

The minor soils in this association are the Blendon, Boelus, Els, and Simeon soils. Blendon soils are in concave areas. Boelus soils are well drained and in smooth areas at positions lower than those of Thurman soils. Els soils are somewhat poorly drained and in basins and depressional areas. Simeon soils are shallow to coarse sand and gravel and in low areas in the association.

The acreage of this association is used for cultivation or is in native grasses and is used for grazing or haying. Nearly all cultivated areas are irrigated by sprinkler systems. The main crops are corn and alfalfa.

Controlling soil blowing, improving fertility, and efficient use of irrigation water are the main management concerns for cultivated crops. Establishing a planned grazing system and proper grazing use are the main management concerns in the range. If the vegetation is overgrazed, soil blowing is a hazard.

6. Els-Valentine-Ipage Association

Deep, nearly level to steep, somewhat poorly drained, excessively drained, and moderately well drained, sandy soils; formed in eolian sands; in upland sandhill valleys, on uplands, and on stream terraces

This association consists of low, undulating ridges on uplands and of intervening swales and depressions in sandhill valleys. Slopes range from 0 to 24 percent.

This association takes in about 2,700 acres, or about 1 percent of the county. It is about 48 percent Els soils, 28 percent Valentine soils, 20 percent Ipage soils, and 4 percent minor soils.

The Els soils are in smooth areas in upland, sandhill valleys and on low stream terraces. They are nearly level and somewhat poorly drained. Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 8 inches thick. The transition layer is grayish brown, very friable loamy fine sand about 4 inches thick. The underlying material is mottled fine sand. It is very pale brown and light gray in the upper part and white in the lower part to a depth of more than 60 inches.

The Valentine soils are on sandhill hummocks. These soils are gently sloping to steep and excessively drained. Typically, the surface layer is grayish brown, loose fine sand about 5 inches thick. The transition layer is pale brown, loose fine sand about 6 inches thick. The underlying material is very pale brown fine sand to a depth of more than 60 inches.

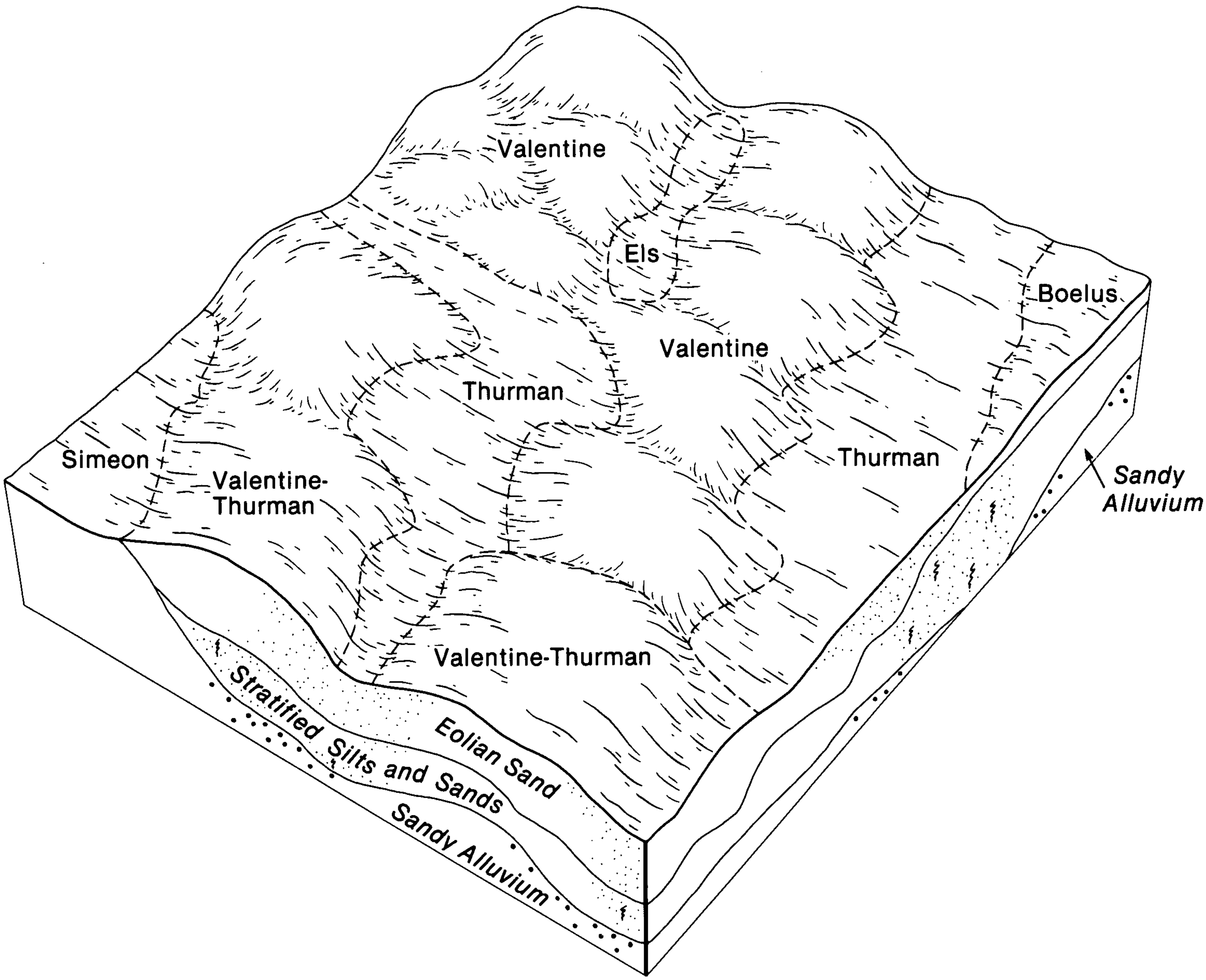

Figure 5.—Typical landscape pattern of the soils and the underlying material in the Valentine-Thurman association.

The Ipage soils are in sandhill valleys and on stream terraces. They are moderately well drained, and nearly level and very gently sloping. Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 7 inches thick. The transition layer is brown, very friable fine sand about 5 inches thick. The underlying material is pale brown and very pale brown fine sand to a depth of more than 60 inches.

The minor soils in this association are the Thurman soils. They are somewhat excessively drained and on the lower slopes of hummocks and in concave areas.

The acreage of this association is used for cultivation and grazing or haying. Nearly all of the cultivated areas are irrigated by sprinkler systems. The main crop is corn.

Wetness in spring and droughtiness in the coarse textured soils are the main limitations. During dry periods soil blowing is a severe hazard. Maintaining fertility and controlling soil blowing are the main management concerns. In the range establishing a planned grazing system and proper grazing use are the main management concerns.

Loamy and Silty Soils on Stream Terraces and Bottom Lands

Three associations are in this group. The soils in the group are deep and moderately deep over coarse sand, nearly level, and well drained, moderately well drained, and somewhat poorly drained. Nearly all areas of the group are cropland, most areas of which are irrigated. Pivot systems are in common use, but gravity systems are most common. The soils on bottom lands are subject to flooding. In early spring the seasonal high water table is a problem in some areas. Soil blowing is a hazard. Conserving water and maintaining a high level of fertility are management concerns.

7. Blendon-O'Neill Association

Deep and moderately deep over coarse sand, nearly level, well drained, loamy soils; formed in sandy alluvium and loamy material over coarse sand; on stream terraces

This association consists of nearly level soils on stream terraces of the Loup River and Platte River Valleys. Slopes range from 0 to 2 percent.

This association takes in about 5,800 acres, or about 1 percent of the county. It is about 53 percent Blendon soils, 20 percent O'Neill soils, and about 27 percent minor soils.

The Blendon soils are deep and on nearly level stream terraces. Typically, the surface layer is dark grayish brown, friable fine sandy loam about 9 inches thick. The subsoil is friable fine sandy loam about 20 inches thick. It is very dark grayish brown in the upper part and dark grayish brown in the lower part. The underlying material is grayish brown loamy fine sand in the upper part and light gray fine sand and sand in the lower part to a depth of more than 60 inches.

The O'Neill soils are moderately deep and on nearly level stream terraces. Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 12 inches thick. The upper part of the subsoil is grayish brown, very friable sandy loam about 10 inches thick, and the lower part is grayish brown, loose loamy sand about 4 inches thick. The underlying material is very pale brown coarse sand to a depth of more than 60 inches.

The minor soils in this association are the Janude, Merrick, Thurman, and Wann soils. Janude and Merrick soils are moderately well drained and slightly lower in the landscape than the major soils. Thurman soils are somewhat excessively drained and higher in the landscape than the major soils. Wann soils are somewhat poorly drained and lower in the landscape than the major soils.

The farms in this association are diversified. They are mainly combination cash-grain and livestock enterprises. Most of the acreage is irrigated cropland. The main crops are corn, soybeans, grain sorghum, and alfalfa. Most areas are irrigated with well water. Both gravity and sprinkler irrigation systems are used. A few areas are in native or introduced grasses and are used for grazing or haying.

Conserving water and maintaining good tilth and fertility are the main management concerns. If the soils are used for dryland farming, droughtiness is a hazard. Soil blowing is the main hazard. Maintaining a cover of crop residue on the surface helps reduce the soil blowing.

8. Muir Association

Deep, nearly level, well drained, silty soils; formed in silty alluvium; on stream terraces

This association consists of nearly level soils on stream terraces of the Loup River Valley. Slopes range from 0 to 2 percent.

This association takes in about 6,100 acres, or about 1 percent of the county. It is about 75 percent Muir soils and 25 percent minor soils.

Muir soils are on stream terraces. They are subject to rare flooding. Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 19 inches thick. It is dark grayish brown, friable silt loam in the upper part and brown, friable silt loam in the lower part. The underlying material is pale brown silt loam to a depth of more than 60 inches.

The minor soils in this association are the Hobbs and Zook soils. Hobbs soils are on bottom lands and are lower in the landscape than the Muir soils. Zook soils are poorly drained and in the lowest part of the association.

The farms in this association are diversified. They are mainly combination cash-grain and livestock enterprises. Most of the acreage is used for cultivated crops. The main crops are corn, soybeans, grain sorghum, and alfalfa. Most of the acreage is irrigated from high producing, deep wells. Gravity systems are well suited to these soils, but a few areas have sprinkler systems. Small pastures of introduced grass or native grass are near farmsteads and in very wet areas.

Maintaining tilth and fertility and efficient use of irrigation water are the main management concerns.

9. Janude-Gibbon-Novina Association

Deep, nearly level, moderately well drained and somewhat poorly drained, silty and loamy soils; formed in silty, loamy, and sandy alluvium; on bottom lands

This association consists of soils on bottom lands of the Platte and Loup River Valleys. Slopes range from 0 to 2 percent.

This association takes in about 9,450 acres, or about 2 percent of the county. It is about 37 percent Janude soils, 28 percent Gibbon soils, 23 percent Novina soils, and 12 percent minor soils.

The Janude soils are moderately well drained and subject to rare flooding. They are on nearly level bottom lands slightly above Gibbon soils in the landscape. Typically, the surface layer is very dark grayish brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown, very friable fine sandy loam about 10 inches thick. The transition layer is dark grayish brown, very friable fine sandy loam about 15 inches thick. The underlying material is light brownish gray sandy loam in the upper part, light brownish gray loamy fine sand in the middle part, and light gray fine sand in the lower part to a depth of more than 60 inches.

The Gibbon soils are somewhat poorly drained, subject to occasional flooding, and on nearly level bottom lands. Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is dark gray, friable silt loam about 10 inches thick. The underlying material is gray, light gray, and light brownish gray silt loam in the upper part and light brownish gray, mottled fine sandy loam in the lower part to a depth of more than 60 inches.

The Novina soils are moderately well drained, nearly level, and subject to rare flooding. They are on bottom lands slightly higher in the landscape than Gibbon soils. Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 9 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 8 inches thick. The transition layer is grayish brown, very friable fine sandy loam about 8 inches thick. The underlying material is grayish brown and light gray loam in the upper part, light gray fine sandy loam in the middle part, and light gray loamy fine sand in the lower part to a depth of more than 60 inches.

The minor soils in this association are the Els, Ipage, and Merrick soils. These soils are higher in the landscape than the major soils. Also, Els soils are sandier throughout. They are subject to rare flooding. Ipage and Merrick soils are moderately well drained.

The farms in this association are diversified, mainly combination cash-grain and livestock enterprises. Most of the acreage is cultivated and is used for dryland and irrigated crops. The main crops are corn, soybeans, grain sorghum, alfalfa, and small grain. Most irrigated areas have gravity systems, but some areas have sprinkler systems. A few small areas are in native or introduced grasses and are used for grazing or are mowed for hay.

On the Janude and Novina soils soil blowing is a management concern. On the Gibbon soils flooding and drainage are major concerns. Measures that maintain fertility and result in the efficient use of irrigation water are needed on all of the soils.

Silty Soils on Bottom Lands and Stream Terraces

One association is in this group. The soils in the group are deep, nearly level, and well drained. Nearly all areas of the group are cropland, most areas of which are irrigated. Pivot systems are common, but most areas have gravity systems. The soils on bottom lands are subject to flooding. Conserving water and maintaining a high level of fertility are management concerns.

10. Shell-Hobbs-Muir Association

Deep, nearly level, well drained, silty soils; formed in silty alluvium; on bottom lands and stream terraces

This association consists of nearly level soils on bottom lands and stream terraces of Beaver Creek, Shell Creek, Looking Glass Creek, Loseke Creek, Tracy Creek, South Fork Union Creek, and other creeks. Slopes range from 0 to 2 percent.

This association takes in 33,500 acres, or about 8 percent of the county. It is about 33 percent Shell soils, 29 percent Hobbs soils, 18 percent Muir soils, and 20 percent minor soils (fig. 6).

The Shell soils are well drained and on nearly level bottom lands that are subject to occasional flooding. Typically, the surface layer is dark grayish brown, very friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 17 inches thick. The underlying material is silt loam. It is grayish brown in the upper part and brown in the lower part to a depth of more than 60 inches.

The Hobbs soils are on nearly level flood plains adjacent to the creeks and their tributary drainageways below the Shell soils in the landscape. They are subject to occasional flooding, and some areas are channeled. They are well drained. Typically, the surface layer is grayish brown, thinly stratified, friable silt loam about 8 inches thick. The underlying material is silt loam. It is dark grayish brown and pale brown and thinly stratified in the upper part and dark grayish brown in the lower part to a depth of more than 60 inches.

The Muir soils are on high, stream terraces above the Shell soils and are subject to rare flooding. They are well drained and nearly level. Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 12 inches thick. The subsoil is friable and about 19 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material is pale brown silt loam to a depth of more than 60 inches.

The minor soils in this association are the Colo, Kezan, Lamo, and Zook soils, which have a seasonal high water table and are on bottom lands.

The farms in this association are diversified, mainly combination cash-grain and livestock enterprises. Most of the acreage is used for cultivated crops. The main crops are corn, soybeans, grain sorghum, and alfalfa. Most of the acreage is irrigated from high producing, deep wells. Gravity systems are well suited to these soils, but a few areas have sprinkler systems. Small

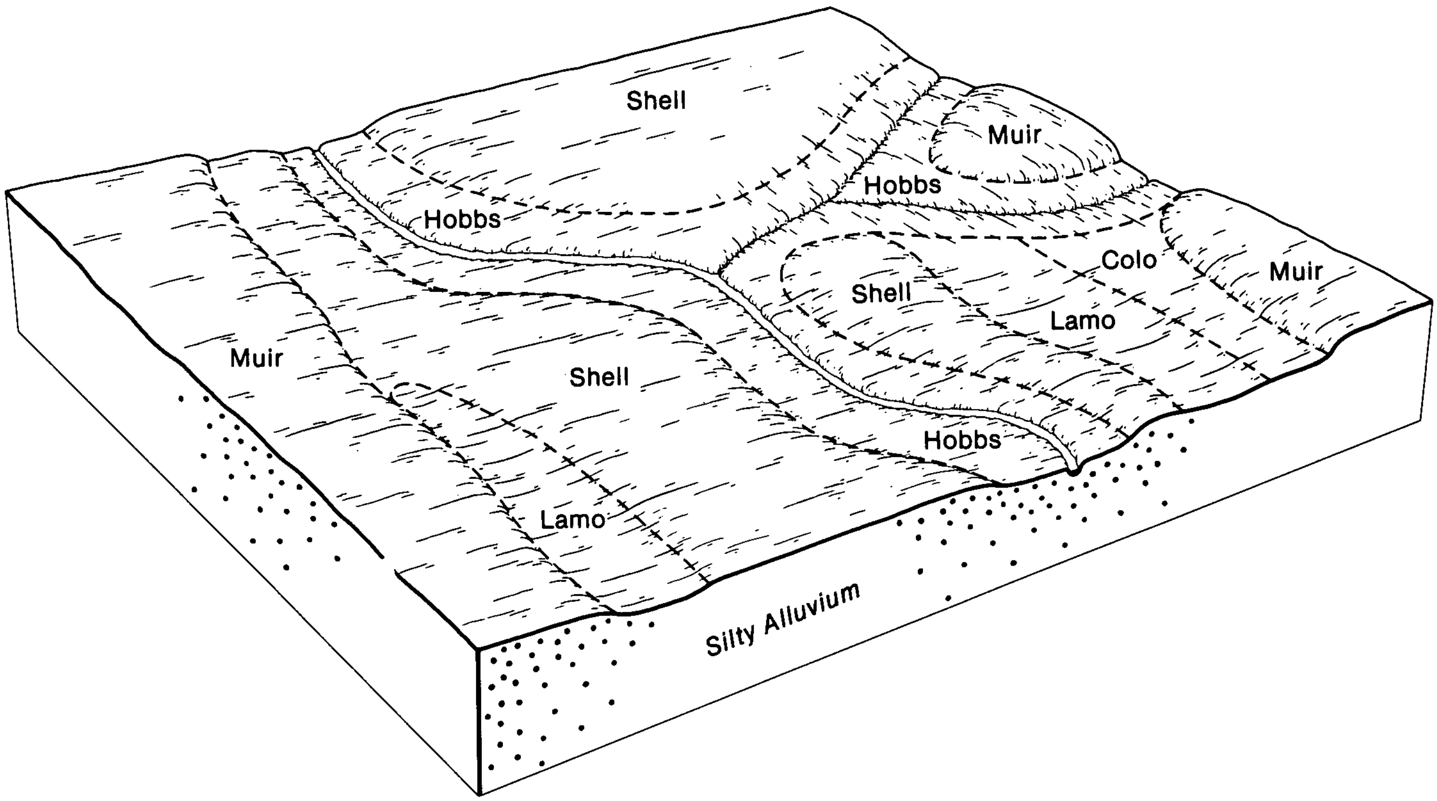

Figure 6.—Typical landscape pattern of the soils and the underlying material in the Shell-Hobbs-Muir association.

pastures of introduced grass or native grass are near the stream channels.

The hazard of flooding in spring on bottom lands, maintaining fertility, and efficient use of irrigation water are the main management concerns.

Silty, Calcareous Soils on Bottom Lands and Stream Terraces

Two associations are in this group. The soils in the group are deep, nearly level, and well drained, somewhat poorly drained, and poorly drained. Most areas of this group are used for cultivated crops, both dryland and irrigated. Gravity irrigation systems are the most common type. The principal limitation is wetness in spring. The soils are subject to flooding. Maintaining a high level of fertility and improving soil drainage are the main management concerns.

11. Grigston-Gibbon-Gayville Association

Deep, nearly level, well drained and somewhat poorly drained, silty soils; formed in calcareous, silty and clayey alluvium; on bottom lands and stream terraces

This association consists of nearly level soils on low stream terraces and flood plains of the Loup River Valley. Slopes range from 0 to 2 percent.

This association takes in 17,350 acres, or about 4 percent of the county. It is about 38 percent Grigston soils, 26 percent Gibbon soils, 15 percent Gayville soils, and 21 percent minor soils.

The Grigston soils are well drained, subject to rare flooding, and on stream terraces. Typically, the surface layer is grayish brown, friable silt loam about 8 inches thick. The subsoil is grayish brown, firm silty clay loam about 11 inches thick. The underlying material is light gray silt loam in the upper part, grayish brown silty clay loam in the middle part, and light gray silt loam in the lower part to a depth of more than 60 inches.

The Gibbon soils are somewhat poorly drained, subject to occasional flooding, and on low terraces below the Grigston soils in the landscape. They have an apparent seasonal high water table that ranges from a depth of about 1.5 feet in most wet seasons to about 3.0 feet in most dry seasons. Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is dark gray, friable silt loam about 10 inches thick. The underlying material is light gray silt loam in the upper part, light brownish gray silt loam in the middle part, and light brownish gray fine sandy loam in the lower part to a depth of more than 60 inches.

The Gayville soils are somewhat poorly drained, subject to occasional flooding, and slightly lower than the Grigston soils in the landscape. These soils are strongly saline-alkali. Typically, the surface layer is grayish brown, friable, calcareous silt loam about 6 inches thick. The subsoil is firm, calcareous silty clay loam about 11 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material is calcareous silt loam. It is very pale brown in the upper part and light gray in the lower part to a depth of more than 60 inches.

The minor soils in this association are the Janude, Lamo, and Zook soils. Janude soils are moderately well drained and slightly higher on the landscape than the major soils. Lamo soils are somewhat poorly drained and poorly drained and are in the same landscape position as the Gibbon soils. Zook soils are poorly drained and lower in the landscape than the major soils.

The farms in this association are diversified. They are mainly a combination of cash-grain and livestock enterprises. Most of the acreage is cultivated and is used for irrigated and dryland crops. Many irrigated areas have gravity systems, but some areas have sprinkler systems. The main crops are corn, soybeans, alfalfa, wheat, and grain sorghum. The city of Columbus is in this association. A few areas are in introduced or native grasses and are used for grazing.

The saline-alkali reaction of the Gayville soils is the main limitation. Wetness caused by flooding and the seasonal high water table is another limitation. Efficient use of irrigation water and maintaining fertility are the main management concerns.

12. Lamo-Gibbon-Lawet Association

Deep, nearly level, somewhat poorly drained and poorly drained, silty soils; formed in calcareous, silty alluvium; on bottom lands

This association consists of soils on bottom lands of the Loup River Valley and on the flood plain of Lost Creek. Slopes range from 0 to 2 percent.

This association takes in about 8,500 acres, or about 2 percent of the county. It is about 45 percent Lamo soils, 26 percent Gibbon soils, 13 percent Lawet soils, and 16 percent minor soils.

The Lamo soils are on nearly level bottom lands and subject to occasional flooding. They are somewhat poorly drained. The apparent seasonal high water table ranges from a depth of about 1.5 feet in most wet seasons to about 3.0 feet in most dry seasons. Typically, the surface layer is dark gray, calcareous, firm silty clay loam about 7 inches thick. The subsurface layer is dark gray, firm silty clay loam about 15 inches thick. The transition layer is gray, calcareous silty clay loam about 7 inches thick. The underlying material is gray and light gray, calcareous silty clay loam to a depth of more than 60 inches.

The Gibbon soils are somewhat poorly drained, on nearly level bottom lands, and subject to occasional flooding. The apparent seasonal high water table ranges from a depth of about 1.5 feet in most wet seasons to about 3.0 feet in most dry seasons. Typically, the surface layer is very dark gray, friable silt loam about 8 inches thick. The subsurface layer is dark gray, friable silt loam about 10 inches thick. The underlying material is light gray and light brownish gray silt loam in the upper part and light brownish gray fine sandy loam in the lower part to a depth of more than 60 inches.

The Lawet soils are poorly drained, on nearly level bottom lands, and subject to occasional flooding. The apparent seasonal high water table ranges from a depth of about 1 foot in most wet years to about 2 feet in most dry years. Typically, the surface layer is dark gray, very friable silt loam about 7 inches thick. The subsurface layer is gray, very friable loam about 8 inches thick. The subsoil is about 19 inches thick. It is light brownish gray, friable loam in the upper part and light gray, friable sandy clay loam in the lower part. The underlying material is light brownish gray sandy clay loam in the upper part and light brownish gray silt loam in the lower part to a depth of more than 60 inches.

The minor soils in this association are the Gayville, Grigston, Wann, and Zook soils. Gayville soils are strongly saline-alkali and in the same landscape position as the major soils. Grigston soils are well drained and slightly higher in the landscape than the major soils. Wann soils contain less clay in the profile and are in the same landscape as the major soils. Zook soils are poorly drained, contain more clay in the profile, and are slightly lower in the landscape than the major soils.

The farms in this association are diversified. They are mainly a combination of cash-grain and livestock enterprises. Much of the acreage is cultivated, but a fairly large acreage is in native or introduced grasses. The crops are soybeans and alfalfa, but principally corn. Most cultivated areas are irrigated by gravity systems, but a few areas have sprinkler systems. Areas of native or introduced grasses are used for haying or grazing.

Wetness caused by the seasonal high water table and the hazard of flooding are the main management concerns. Maintaining fertility and efficient use of irrigation water are also concerns.

Sandy and Loamy Soils on Bottom Lands

Two associations are in this group. The soils in the group are deep and very shallow over sand, nearly level to strongly sloping, and somewhat excessively drained, somewhat poorly drained, and poorly drained. About half of the acreage is used as cropland, most areas of which are irrigated. The other half of the acreage is in native grass and trees and is used for grazing or as wildlife habitat or recreation areas. The soils in this association are subject to flooding, and in some areas frequent flooding. Soil blowing is a hazard if the soils are cultivated. Wetness in early spring is a limitation. In areas in grass good range management is the main concern.

13. Boel-Inavale-Wann Association

Deep, nearly level and very gently sloping, somewhat poorly drained and somewhat excessively drained, sandy and loamy soils; formed in sandy alluvium; on bottom lands

This association consists of soils on bottom lands of the Loup River and Platte River Valleys. The Boel and Wann soils have a seasonal high water table that ranges from about 1.5 feet in most wet seasons to about 3.5 feet in most dry seasons. Slopes range from 0 to 3 percent.

This association takes in about 19,500 acres, or about 4 percent of the county. It is about 57 percent Boel soils, 22 percent Inavale soils, 11 percent Wann soils, and 10 percent minor soils.

The Boel soils are somewhat poorly drained and subject to occasional flooding. They are on nearly level bottom lands. Typically, the surface layer is dark gray, very friable fine sandy loam about 12 inches thick. The transition layer is grayish brown, very friable loamy fine sand about 6 inches thick. The underlying material is light gray and white fine sand to a depth of more than 60 inches.

The Inavale soils are somewhat excessively drained and subject to rare flooding. They are on nearly level to very gently sloping bottom lands. Typically, the surface layer is grayish brown, very friable loamy fine sand about 6 inches thick. The transition layer is grayish brown, very friable loamy fine sand about 12 inches thick. The underlying material is light gray fine sand to a depth of more than 60 inches.

The Wann soils are somewhat poorly drained and are subject to occasional flooding. They are on nearly level

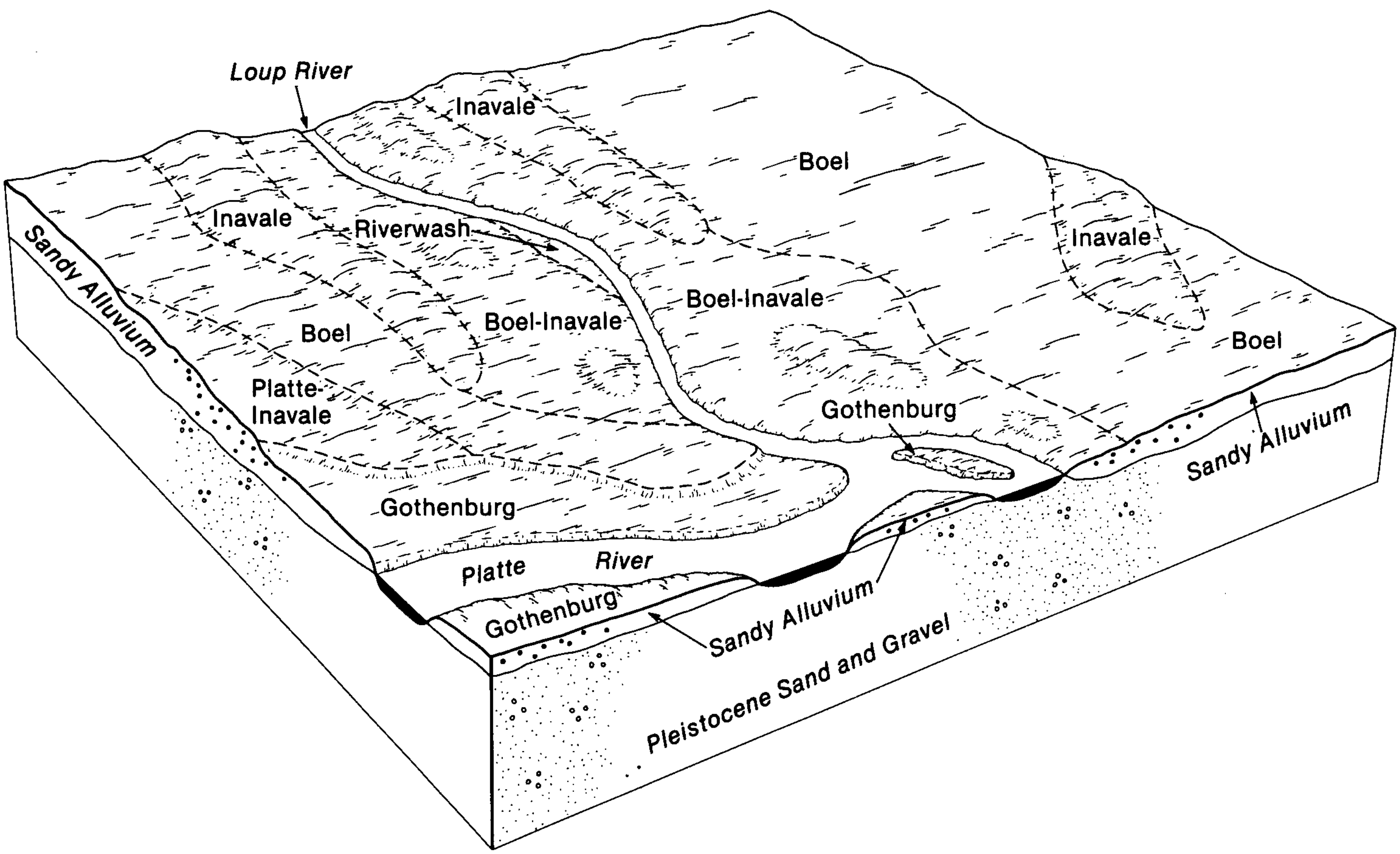

Figure 7.—Typical landscape pattern of the soils and the underlying material in the Boel-Inavale-Gothenburg association.

bottom lands. Typically, the surface layer is dark gray, very friable loam about 9 inches thick. The subsurface layer is dark grayish brown, friable fine sandy loam about 7 inches thick. The transition layer is light brownish gray, friable fine sandy loam to a depth of about 23 inches. The underlying material is stratified, very pale brown sandy loam, light brownish gray fine sandy loam, and light gray fine sand to a depth of more than 60 inches.

The minor soils in this association are the Alda, Janude, and Loup soils. Alda soils have coarse sand at a depth of 20 to 40 inches. Janude soils are moderately well drained. Loup soils are very poorly drained and in the lowest part of the landscape.

The farms in this association are diversified. They are mainly a combination of cash-grain and livestock enterprises. Most of the acreage is cultivated. Most irrigated areas have sprinkler systems. The main crops under both dryland and irrigated farming are corn, soybeans, and alfalfa. Some small areas are in native grasses and are used for grazing or are mowed for hay.

On the Boel and Wann soils, wetness caused by the seasonal high water table is a limitation. On the Inavale soils soil blowing is a management concern. On the Boel and Inavale soils, the low available water capacity is also a concern. In some areas, maintaining fertility and controlling flooding are concerns. In areas in grass, proper grazing and timely haying are the major concerns.

14. Boel-Inavale-Gothenburg Association

Deep and very shallow over sand, nearly level to strongly sloping, somewhat poorly drained, somewhat excessively drained, and poorly drained, loamy and sandy soils; formed in sandy alluvium; on bottom lands

This association consists of soils on bottom lands of the Loup River and Platte River Valleys. Slopes range from 0 to 9 percent.

This association takes in about 16,336 acres, or about 4 percent of the county. It is about 38 percent Boel soils, 30 percent Inavale soils, 20 percent Gothenburg soils, and 12 percent minor soils (fig. 7).

The Boel soils are deep, somewhat poorly drained, and subject to frequent flooding. They are on nearly level bottom lands. Typically, the surface layer is dark grayish brown, friable loam about 11 inches thick. The transition layer is grayish brown, very friable fine sandy loam about 5 inches thick. The underlying material is light brownish gray, light gray, very pale brown, and white, mottled fine sand and loamy fine sand to a depth of more than 60 inches.

The Inavale soils are deep, somewhat excessively drained, and subject to frequent flooding. They are on nearly level to strongly sloping bottom lands. The strongly sloping areas are generally the higher, long, sandy ridges within the bottom lands. Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 8 inches thick. The transition layer is grayish brown, loose fine sand about 4 inches thick. The underlying material is white sand in the upper part and light gray fine sand in the lower part to a depth of more than 60 inches.

The Gothenburg soils are very shallow over coarse sand, poorly drained, and subject to frequent flooding. They are on nearly level and very gently sloping bottom lands. Typically, the surface layer is dark gray, very friable sandy loam about 4 inches thick. The underlying material is light gray coarse sand to a depth of more than 60 inches.

The minor soils in this association are the Platte soils. Also included are Pits and Dumps and small areas of Riverwash. Platte soils are shallow over coarse sand. They are in landscape positions similar to those of the Boel soils and are higher in the landscape than the Gothenburg soils. Pits and Dumps are on bottom lands where sand and gravel have been mined and where the waste material has been deposited.

These areas are used mainly for grazing. They are also used as habitat for wildlife and for recreation, mainly hunting and fishing. The dominant vegetation is mixed woodland and native grass.

Frequent flooding is the main hazard. Wetness caused by the seasonal high water table is the main limitation. Good range management practices, such as proper grazing and a planned grazing system, are the main management concerns.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Moody silty clay loam, 0 to 1 percent slopes, is a phase of the Moody 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. Boel-Inavale complex, channeled, 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. Riverwash 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 in this survey area may not fully match those in surveys of adjoining counties that were published at an earlier date. Any such differences are mainly the result of changes and refinements in series concept, 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

AcC—Alcester silt loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on foot slopes adjacent to loess uplands. It formed in silty, colluvial-alluvial material. Areas range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, very friable silt loam about 10 inches thick. The subsoil is about 34 inches thick. It is dark grayish brown, friable silt loam in the upper part and brown, friable silty clay loam in the lower part. The underlying material is pale brown silty clay loam to a depth of more than 60 inches. In some places the dark colored subsurface layer is less than 10 inches thick.

Included with this soil are small areas of Hobbs soils. Hobbs soils are nearly level, occasionally flooded, and in upland drainageways and the lower areas. They make up 5 to 15 percent of the unit.

Permeability is moderate in this Alcester soil. Available water capacity is high. Runoff is medium. Organic matter content is high. Natural fertility is high. The rate of water intake is moderately low. Tilth is good. This soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most areas are used for dryland farming, but a few are irrigated. A few small areas are in introduced grasses and are used for grazing or haying.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. The principal hazard is water erosion. The main management concern is conserving surface water. Terraces and grassed waterways help to control erosion and to conserve water. Conservation tillage systems, such as disking, chiseling, and no-till, that keep all or part of the crop residue on the surface help to control water erosion and to conserve soil moisture.

If irrigated, this soil is suited to both sprinkler and gravity irrigation systems. Bench leveling reduces the gradient on contour furrows. In some areas bench leveling and terraces are needed for a gravity system to work properly. The common crops are corn, soybeans, and alfalfa. Water erosion is the main hazard. This soil needs to be protected from runoff from soils on higher lying slopes. Conservation tillage systems, such as disking, chiseling, or no-till, that keep all or part of the crop residue on the surface help to control runoff and conserve soil moisture.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Pasture grasses can be alternated with row crops as part of the crop rotation. Overgrazing or grazing when the soil is wet causes surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer increase the growth and vigor of the grasses.

This soil is suited to range. A cover of range plants is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, the less desirable plants, especially Kentucky bluegrass, buckbrush, snowberry, and sumac, invade the plant community.

This soil is suited to trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. Weeds can be controlled by cultivating between the tree rows, and by applying appropriate herbicides in the rows. Contour planting or a cover crop helps to control erosion. Watering of newly planted trees is needed when rainfall is insufficient.

This soil is well suited to use as sites for septic tank absorption fields. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Strengthening foundations for dwellings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. Runoff from higher lying areas should be considered in the construction of sanitary facilities, buildings, and roads and streets. The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Ad—Alda loam, 0 to 2 percent slopes. This soil is moderately deep over coarse sand or gravelly sand, nearly level, and somewhat poorly drained. It is on bottom lands of the Platte River. It formed in stratified alluvium. It is subject to occasional flooding. Areas range from 10 to 300 acres in size.

Typically, the surface layer is dark gray, friable loam about 10 inches thick. The transition layer is light brownish gray, friable loam about 6 inches thick. The underlying material is light gray fine sandy loam to a depth of about 28 inches and light gray sand and coarse sand in the lower part to a depth of more than 60 inches. In some places the depth to coarse sand is more than 40 inches. In places the surface layer contains more clay.

Included with this soil in mapping are small areas of Platte and Wann soils and saline-alkali areas. Platte soils have gravelly coarse sand at a depth of 10 to 20 inches and are generally lower in the landscape than the Alda soil. Wann soils are deep and are slightly higher in the landscape than the Alda soil. The saline-alkali areas are in the lower, poorly drained positions. The included soils make up 10 to 15 percent of the unit.

Permeability in the Alda soil is moderately rapid in the upper part and very rapid in the coarse sand. Available water capacity is low. Runoff is slow. The seasonal high water table ranges from a depth of about 2 feet in most wet seasons to about 3 feet in most dry seasons. Organic matter content is moderate. Natural fertility is medium. The rate of water intake is moderate. The root zone of commonly grown crops is limited by the coarse sand. Tilth is good. This soil releases moisture readily to plants.

The acreage of this soil is used for cropland or is in native or introduced grasses and is used for grazing or haying. The cultivated areas are used for dryland and irrigated crops.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Wetness caused by the seasonal high water table is the principal limitation. Wetness commonly delays tillage in the spring. Late in summer, however, the water table recedes and the soil becomes droughty. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve moisture.

Ridges warm up earlier and are drier in spring. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content and the rate of water intake, and improves natural fertility. Perforated tile or V-ditches help to lower the water table if a suitable outlet is available.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Wetness in spring caused by the seasonal high water table is the principal limitation. It generally delays tillage. Late in summer the soil becomes droughty. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application help to sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. Deep cuts that expose the coarse underlying material should be avoided. In areas that have been cut by land leveling, returning crop residue to the soil increases the organic matter content. Limiting the length of irrigation runs and application time is needed because of the very rapid permeability of the underlying material.

This soil is suited to introduced or domesticated grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Reed canarygrass and creeping foxtail are suited to this soil. Floodwater deposits sediment, which in some areas partly covers the grasses and reduces their vigor and growth. Grazing when the water table is highest results in damage to the grass stand and a rough soil surface and impedes mowing for hay. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Nitrogen fertilizer increases the growth and vigor of the grasses.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, timothy, redtop, foxtail barley, clovers, sedges, and rushes invade the plant community.

This soil is suited to trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are tolerant of a moderately high water table. The survival rate of seedlings is higher if competing vegetation is controlled or removed by good site preparation, tilling the soil, and planting the seedlings after the soil has begun to dry. Weeds can be controlled by cultivating with conventional equipment between the tree rows and rototilling or hoeing by hand in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil is not suited to use as sites for septic tank absorption fields because of flooding and wetness. The soil does not adequately filter the effluent from an absorption field because of the very rapid permeability in the underlying material. An alternative site should be selected. Sewage lagoons need to be lined or sealed to prevent seepage, diked as protection from flooding, and constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving if shoring is done during the dry season. This soil is not suitable for use as building sites because of flooding. An alternative site should be selected.

Constructing roads and streets 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 the seasonal high water table. Providing a gravel moisture barrier in the subgrade helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability unit is IIIw-4, dryland, and IIIw-7, irrigated; Subirrigated range site; windbreak suitability group 2S.

Be—Belfore silty clay loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on broad ridgetops and tablelands in the uplands. It formed in loess. It is on the higher parts of the landscape. Areas range from 20 to 660 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 9 inches thick. The subsurface layer is dark grayish brown, firm silty clay loam about 5 inches thick. The subsoil is firm silty clay loam about 23 inches thick. It is grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material is light yellowish brown silty clay loam in the upper part and very pale brown silt loam in the lower part to a depth of more than 60 inches. In some places, the dark colored surface layer is more than 20 inches thick. In some places, the soil has less clay in the surface layer and the subsoil and is on narrow ridgetops and side slopes.

Included with this soil in mapping are small areas of Butler and Fillmore soils. Butler soils are somewhat poorly drained and are in slightly concave areas. Fillmore soils are poorly drained and in shallow depressions. The included soils make up 5 to 10 percent of the unit.

Permeability is moderately slow in the Belfore soil. Available water capacity is high. This soil releases moisture slowly to plants. Runoff is slow. Organic matter content is moderate. Natural fertility is high. Shrink-swell potential in the subsoil is high. The rate of water intake is low. Tilth is good.

Nearly all of the acreage of this soil is in cultivated row crops. Most of the acreage is irrigated. Some small areas adjacent to farmsteads are in pasture.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Row crops can be grown in consecutive years if the proper kinds and amounts of fertilizer are applied and if weeds and insects are controlled. Conserving water is an important management concern. Conservation tillage systems that keep all or part of the crop residue on the surface help to conserve moisture, increase the organic matter content, and maintain fertility. Lime is generally needed to reduce soil acidity if alfalfa is to be grown.

If irrigated, this soil is suited to such row crops as corn, soybeans, and grain sorghum and to such close-growing crops as alfalfa and grasses. Conservation tillage systems, such as disking, chiseling, and no-till, that keep all or part of the crop residue on the surface help to conserve soil moisture. Both gravity and sprinkler irrigation systems are suited. If a furrow irrigation system is used, land leveling and constructing a tailwater recovery system help to conserve water. Center-pivot sprinkler systems are well suited.

This soil is suited to introduced grasses for pasture. Cool-season species, such as smooth bromegrass or orchardgrass, can be mixed with alfalfa. Pasture grasses can also be alternated with row crops as part of the crop rotation. Proper stocking rates and rotation grazing help to keep the pasture grasses in good condition. Nitrogen fertilizer and irrigation water help to maintain fertility and to increase the growth and vigor of the grasses.

This soil is suited to most species of trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Adapted species have a good chance of survival and growth. Competition from weeds is a management concern. Grasses and weeds can be controlled by cultivating between the tree rows, by applying appropriate herbicides, or by rototilling in the rows.

The moderately slow permeability is a limitation of this soil to use as sites for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. This soil is generally suited to use as sites for sewage lagoons. Strengthening foundations for buildings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. Mixing the base material for roads and streets with additives, such as hydrated lime, helps to prevent excessive shrinking and swelling.

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

Bn—Blendon fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces and alluvial fans. It formed in sandy alluvium reworked by wind. Areas range from 5 to 350 acres in size.

Typically, the surface layer is dark grayish brown, friable fine sandy loam about 9 inches thick. The subsoil is friable fine sandy loam about 20 inches thick. It is very dark grayish brown in the upper part and dark grayish brown in the lower part. The underlying material is grayish brown loamy fine sand in the upper part and light gray fine sand and sand in the lower part to a depth of more than 60 inches. In some small areas, the subsoil is brown. In some small areas, the subsoil has more clay.

Included with this soil in mapping are small areas of O'Neill and Thurman soils. O'Neill soils have more sand in the underlying material than the Blendon soil and are slightly lower in the landscape. Thurman soils are somewhat excessively drained, have a dark surface layer less than 20 inches thick, and are higher in the landscape than the Blendon soil. The included soils make up 5 to 15 percent of the unit.

Permeability in the Blendon soil is moderately rapid in the subsoil and rapid in the underlying material. Available water capacity is moderate. Runoff is slow. Organic matter content is moderate. Natural fertility is high. The rate of water intake is moderately high. Tilth is good. The soil absorbs moisture readily and releases it readily to plants.

Nearly all of the acreage of this soil is farmed. Most areas are used for irrigated crops. A few small areas are used for dryland crops. A few areas are in native or introduced grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Soil blowing is a moderate hazard if the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue and applying manure to the soil help to maintain tilth and increase the organic matter content.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Soil blowing is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application help to sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil increases the organic matter content. Deep cuts should be avoided because of the fine sand underlying material. Adjusting the rate at which water is applied to the rate of water intake reduces runoff at the end of the field and minimizes deep percolation.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Overgrazing reduces the protective cover and causes deterioration of the stands, resulting in soil blowing. Rotation grazing and proper stocking rates help to keep the grasses in good condition. Sprinkler or gravity irrigation systems can be used. Nitrogen fertilizer and irrigation water help to increase the growth and vigor of the grasses.

This soil is suited to range. A permanent cover of grass is effective in controlling soil blowing. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for many years, the less desirable plants increase, sand moves very actively, and blowouts develop in some areas.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in slightly sandy soils. The survival rate of seedlings is higher if competing vegetation is controlled or removed by good site preparation and by timely cultivation with conventional equipment between the tree rows. Appropriate herbicides can be used in the rows. Cover crops between the rows are needed in some areas to prevent soil blowing and sand blasting of the seedlings. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. This soil is generally suited to use as a site for dwellings and small commercial buildings.

A surface drainage system helps to prevent the damage to roads and streets caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IIs-6, dryland, and IIs-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 lands of the Loup River and Platte River Valleys. It is subject to occasional flooding. It formed in recent, sandy alluvium. Areas range from 10 to more than 300 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 10 inches thick. The transition layer is light brownish gray, very friable loamy fine sand about 5 inches thick. The underlying material is light gray, mottled fine sand to a depth of more than 60 inches. In some places, the surface layer is less than 7 inches thick. Also, in places, fine sand or coarse sand is at a depth of more than 20 inches. In places, gravelly coarse sand is at a depth of 20 to 40 inches. In some places, the soil is poorly drained.

Included with this soil in mapping are small areas of Wann soils. These soils contain more silt and less sand between depths of 20 and 40 inches than the Boel soil. They are in the same landscape position as the Boel soil. They make up 5 to 15 percent of the unit.

Permeability is rapid in the Boel soil. Available water capacity is low. Runoff is very slow. The apparent seasonal high water table ranges from a depth of about 1.5 feet in most wet seasons to about 3.5 feet in most dry seasons. The organic matter content is moderately low. Natural fertility is low. The rate of water intake is very high. Tilth is good. This soil releases moisture readily to plants.

Most of the acreage of this soil is in native or introduced grasses and is used for range. Areas nearest to the river channels support scattered native trees, shrubs, and forbs. Some areas are used for cultivated crops. Many cultivated areas are irrigated, and the rest are used for dryland crops.

If used for dryland farming, this soil is poorly suited to crops, including corn, soybeans, small grain, and alfalfa. The principal limitation is wetness caused by the seasonal high water table. Tillage is generally delayed in spring. In late summer, however, the water table recedes and the soil becomes droughty. Soil blowing is a severe hazard if the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

If irrigated, this soil is poorly suited to corn, soybeans, and alfalfa. Soil blowing is the principal hazard. Wetness caused by the seasonal high water table is the principal limitation. Tillage is generally delayed in the spring.

Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and to conserve soil moisture. Small, frequent applications of irrigation water are needed because of the low available water capacity and the very high rate of water intake.

Sprinkler irrigation systems are best suited to this soil. Gravity irrigation systems are not suited because of the very high rate of water intake and the rapid permeability. Deep cuts that expose the sandy underlying material should be avoided. In areas that have been cut by land leveling, returning crop residue to the soil increases the organic matter content.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Reed canarygrass and creeping foxtail are suited to this soil. Floodwater deposits sediment, which in some areas partly covers the grasses and reduces their vigor and growth. Grazing when the water table is highest results in damage to the grass stand, a rough soil surface, and difficulty in mowing for hay. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Nitrogen fertilizer increases the growth and vigor of the grasses.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, timothy redtop, foxtail barley, clovers, sedges, and rushes invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are tolerant of a moderately high water table. The survival rate of seedlings is higher if competing vegetation is controlled or removed by good site preparation, tilling the soil, and planting the seedlings after the soil has begun to dry. Cultivating after planting helps to control competition from weeds. Conventional equipment can be used to cultivate between the tree rows, and rototilling can be used in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil is not suited to septic tank absorption fields because of flooding, wetness, and the hazard of ground water pollution. An alternative site should be selected. Sewage lagoons need to be lined or sealed to prevent seepage, diked as protection from flooding, and constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving if shoring is done during the dry season. This soil is not suitable for use as building sites because of flooding and the seasonal high water table. An alternative site should be selected.

Constructing roads and streets 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 the seasonal high water table.

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 lands of the Loup River and Platte River Valleys. It is subject to occasional flooding. The soil formed in recent, sandy alluvium. Areas range from 5 to more than 400 acres in size.

Typically, the surface layer is dark gray, very friable fine sandy loam about 12 inches thick. The transition layer is grayish brown, very friable loamy fine sand about 6 inches thick. The underlying material is light gray, mottled fine sand in the upper part and white, mottled fine sand in the lower part to a depth of more than 60 inches. In some places, the surface layer is less than 7 inches thick. In some areas, fine sand is at a depth of more than 20 inches. In places, gravelly coarse sand is at a depth of 20 to 40 inches. In some small areas the surface layer is loamy fine sand.

Included with this soil are small areas of Inavale and Wann soils. Inavale soils are higher in the landscape than the Boel soil and have a lighter colored surface layer. Wann soils contain more silt and less sand than the Boel soil. They are in the same position in the landscape as the Boel soil. The included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Boel soil. Available water capacity is low. Runoff is very slow. The apparent seasonal high water table ranges from a depth of about 1.5 feet in most wet seasons to about 3.5 feet in most dry seasons. The organic matter content is moderately low. Natural fertility is medium. The rate of water intake is very high. Tilth is good. This soil releases moisture readily to plants.

The acreage of this soil is used for cultivation or is in native or introduced grass and is used for grazing or haying. Many cultivated areas are irrigated, and the rest are used for dryland crops.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. The principal limitation is wetness caused by the seasonal high water table. Tillage is generally delayed in spring. Soil blowing is a moderate hazard if the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Soil blowing is the principal hazard. Wetness caused by the seasonal high water table is the principal limitation. Tillage is generally delayed in spring. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application help to sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. Deep cuts that expose the sandy underlying material should be avoided. In areas that have been cut by land leveling, returning crop residue to the soil increases the organic matter content. Limiting the length of irrigation runs and application times is needed because of the very high rate of water intake and the rapid permeability.

This soil is suited to introduced grasses for pasture and hay. Pastures and hayland can be alternated with other crops as part of the crop rotation. Reed canarygrass and creeping foxtail are suited to this soil. Floodwater deposits sediment, which in some areas partly covers the grasses and reduces their vigor and growth. Grazing when the water table is highest results in damage to the grass stand, a rough soil surface, and difficulty in mowing for hay. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Nitrogen fertilizer increases the growth and the vigor of the grasses.

This soil is suited to range and native hay (fig. 8). The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, timothy, redtop, foxtail barley, clovers, sedges, and rushes invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are

Figure 8.—Cattle grazing in an area of Boel fine sandy loam, 0 to 2 percent slopes.

those that are tolerant of a moderately high water table. The survival rate of seedlings is higher if competing vegetation is controlled or removed by good site preparation, tilling the soil, and planting the seedlings after the soil has begun to dry. Weeds can be controlled by cultivating with conventional equipment between the tree rows and rototilling in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil is not suited to septic tank absorption fields because of flooding, the seasonal high water table, and the hazard of ground water pollution. An alternative site should be selected. Sewage lagoons need to be lined or sealed to prevent seepage, diked as protection from flooding, and constructed on fill material to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving if shoring is done during the dry season. This soil is not suitable for use as building sites because of flooding and the seasonal high water table. An alternative site should be selected.

Constructing 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 the seasonal high water table.

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

Br—Boel-Inavale complex, channeled. These deep, nearly level to gently sloping soils formed in recent, sandy alluvium on bottom lands along the Loup River. The Boel soil is somewhat poorly drained and typically has slopes of 0 to 2 percent. The Inavale soil is somewhat excessively drained and typically has slopes of 2 to 6 percent. Areas of these soils consist mainly of old, abandoned, shallow channels that alternate with slightly higher, uneven areas. They are subject to frequent flooding. They are elongated and range from 60 to more than 1,000 acres in size. They are about 40 to 70 percent Boel soil in the slightly lower positions and 20 to 50 percent Inavale soil in the slightly higher positions. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Boel soil has a surface layer of dark grayish brown, very friable loam about 11 inches thick. The transition layer is grayish brown, very friable fine sandy loam about 5 inches thick. The underlying material is light brownish gray, light gray, very pale brown, and white, mottled fine sand and loamy fine sand to a depth of more than 60 inches. In some places, the depth to fine sand is more than 20 inches.

Typically, the Inavale soil has a surface layer of dark grayish brown, very friable loamy fine sand about 8 inches thick. The transition layer is grayish brown, loose fine sand about 4 inches thick. The underlying material is white sand in the upper part and light gray fine sand in the lower part to a depth of more than 60 inches. In places, mottles are above a depth of 40 inches and the soil is poorly drained.

Included with these soils in mapping are small areas of Wann soils. Wann soils contain more silt and less sand in the upper 40 inches than the Boel and Inavale soils. They are in positions in the landscape similar to those of these Boel and Inavale soils. The included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the Boel and Inavale soils. Available water capacity is low in both soils. Runoff is slow on both soils. The apparent seasonal high water table in the Boel soil ranges from a depth of about 1.5 feet in most wet seasons to a depth of about 3.5 feet in most dry seasons. The apparent seasonal high water table of the Inavale soil is below a depth of 6 feet. Organic matter content is moderately low in the Boel soil and low in the Inavale soil. Natural fertility is low in both soils.

Nearly all the acreage of these soils supports native grasses and many scattered native trees, shrubs, and forbs and is used for grazing or haying. These soils also provide good cover and food for wildlife.

These soils are not suited to cultivated crops because of flooding and the seasonal high water table in the spring and the low available water capacity in late summer. It is generally not practical to avoid or overcome these hazards and the wetness limitation under a system of cultivation.

The Boel soil is suited to range. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed, timothy, redtop, foxtail barley, clovers, sedges, and rushes invade the plant community. The Inavale soil is suited to range. A permanent cover of native grasses is effective in controlling soil blowing. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, and switchgrass. If the plants are continuously overgrazed, blue grama, hairy grama, sand dropseed, Scribner panicum, and numerous annual and perennial weeds invade the plant community. Brush control helps to reduce or eliminate scattered native trees and shrubs.

These soils are generally not suited to the trees and shrubs grown as windbreaks. Planting of and survival of trees and shrubs are limited because of the hazard of flooding, droughtiness on the Inavale soil, and wetness on the Boel soil. Onsite investigation is needed to determine if small areas are suitable for hand planting.

These soils are generally not suited to use as sites for septic tank absorption fields, sewage lagoons, or buildings because of flooding and the seasonal high water table of the Boel soil. An alternative site should be selected. Constructing 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 the seasonal high water table.

The capability unit is VIw-5, dryland. The Boel soil is in the Subirrigated range site, and the Inavale soil is in the Sandy Lowland range site. Both soils are in windbreak suitability group 10.

BsC—Boelus loamy fine sand, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on convex and concave slopes in the uplands. It formed in sandy eolian material deposited over loess. Areas range from 5 to 100 acres in size.

Typically, the surface layer is brown, very friable loamy fine sand about 6 inches thick. The subsurface layer is grayish brown, very friable loamy fine sand about 8 inches thick. The subsoil is pale brown, loose loamy fine sand to a depth of about 23 inches and pale brown, friable silty clay loam to a depth of about 33 inches. The underlying material is very pale brown silt loam to a depth of more than 60 inches. In some places, the surface layer is fine sandy loam. In some areas, the depth to silty material is less than 20 inches. In places, the soil has mottles above a depth of 40 inches.

Included with this soil in mapping are small areas of Thurman and Valentine soils and areas where the loess is at the surface. Thurman soils are somewhat excessively drained, contain more sand in the subsoil than the Boelus soil, and are higher in the landscape. Valentine soils are excessively drained, contain more sand in the subsoil than the Boelus soil, have a thinner surface layer, and are higher in the landscape. The areas of exposed loess are on knobs. The included soils make up 5 to 15 percent of the unit.

Permeability in the Boelus soil is rapid in the sandy upper part and moderate in the silty lower part. Available water capacity is high. Runoff is medium. Organic matter content is moderately low. Natural fertility is medium. The rate of water intake is high. Tilth is good. The surface layer is easily tilled throughout a wide range of moisture conditions.

Nearly all of the acreage of this soil is cultivated. Most cultivated areas are used for irrigated crops. A few small areas are used for dryland crops. A few small areas are in native grasses and are used for range.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Soil blowing is a severe hazard if the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Terraces, grassed waterways, and contour farming help to control water erosion. Returning crop residue to the surface helps to maintain tilth, increases the organic matter content, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Soil blowing and water erosion are the principal hazards. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and conserve soil moisture. Efficient water management is needed because of slope.

Sprinkler irrigation systems are best suited to this soil. Adjusting the rate at which water is applied to the water intake rate of the soil helps to prevent excessive runoff and to control erosion. Returning crop residue to the soil increases the organic matter content. Contour furrows are suited if used with terraces and waterways and if an adequate amount of residue is left on the surface.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with a legume, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Overgrazing reduces the protective cover, causes deterioration of the stands, and results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Nitrogen fertilizer and irrigation help to increase the growth and vigor of the grasses.

This soil is suited to range. A cover of native grasses is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for many years, the less desirable plants increase, sand moves very actively, and blowouts develop in some areas.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in slightly sandy soils. The survival rate of seedlings is higher if competing vegetation is controlled or removed by good site preparation, timely cultivation, or application of appropriate herbicides. Maintaining strips of sod or an annual cover crop between the tree rows helps to control soil blowing. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil is generally suited to use as septic tank absorption fields. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. Strengthening the foundations for buildings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing a coarser grained base material helps to ensure better performance.

The capability units are IIIe-6, dryland, and IIIe-10, irrigated; Sandy range site; windbreak suitability group 5.

Bu—Butler silt loam, 0 to 1 percent slopes. This deep, somewhat poorly drained soil is in slightly concave basins on loess uplands. Areas range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is gray, friable silt loam about 3 inches thick. The subsoil is very firm silty clay about 26 inches thick. It is very dark gray in the upper part, dark gray in the middle part, and grayish brown in the lower part. The underlying material is mottled silty clay loam. It is light brownish gray in the upper part, light olive gray in the middle part, and light gray in the lower part to a depth of more than 60 inches. In some places, the dark surface colors extend to a depth of less than 20 inches and the subsoil contains less clay. In some small areas, the soil is poorly drained.

Included with this soil in mapping are small areas of Moody soils. Moody soils have less clay in the B horizon than the Butler soil and are slightly higher in the landscape. The included soils make up 5 to 8 percent of the unit.

Permeability is slow in the Butler soil. Available water capacity is high. Runoff is slow. The perched water table is above the claypan subsoil. It ranges from about 1 foot to about 3 feet below the surface. It is ponded briefly following periods of heavy precipitation. The content of organic matter is moderate. Natural fertility is medium. The rate of water intake is low. The soil releases moisture slowly to plants. Shrink-swell potential is high. Tilth is good.

Most of the acreage of this soil is cultivated. Most areas are used for dryland crops, and a few areas are irrigated.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Wetness caused by slow permeability and runoff from higher lying soils are the main limitations. In some years droughtiness is a slight hazard in midsummer. Terraces, diversions, and contour farming on higher lying soils help to prevent excessive runoff and ponding on this soil. Conservation tillage systems, such as disking, chiseling, and no-till, that keep crop residue on the surface help to maintain tilth. Crops generally are planted early in spring, but replanting is needed in ponded areas.

If irrigated, this soil is suited to corn and soybeans. Ponding of surface water commonly delays tillage and in some areas damages small crops. Using diversions or terraces to prevent excessive runoff from higher lying soils helps to reduce ponding. Gravity and sprinkler irrigation systems are suited to this soil. Land leveling establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. Conservation tillage systems, such as disking, chiseling, and no-till, that keep all or part of the crop residue on the surface increase the organic matter content and help to control soil blowing.

This soil is suited to introduced grasses for pasture. Wetness caused by flooding is the principal hazard. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes surface compaction. Artificial drainage and diversion of runoff help to prevent flooding. Proper stocking rates and deferred grazing help to keep the pasture in good condition.

This soil is suited to range. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, and switchgrass. If overgrazing continues for many years, tall dropseed, Kentucky bluegrass, western wheatgrass, numerous annual and perennial weeds, and woody plants, including snowberry and buckbrush, invade the plant community. Brush management and prescribed burning help to control woody plants.

This soil generally is suited to the trees and shrubs grown as windbreaks. The best suited species are those that are tolerant of wetness. Adapted species have a good chance of survival. Weeds can be controlled by cultivating between the tree rows and by applying selected herbicides in the row. The soil should be tilled and seedlings should be planted after the soil has begun to dry.

This soil is not suited to septic tank absorption fields because of ponding of surface water and the slow permeability. On sites for sewage lagoons, dikes protect the lagoon from flooding. This soil is poorly suited to dwellings and small commercial buildings because of ponding of surface water and the seasonal high water table.

Constructing roads and streets on suitable, well compacted fill material above the level of ponding, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. The surface pavement and base material should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Cp—Colo silt loam, 0 to 1 percent slopes. This deep, somewhat poorly drained, nearly level soil is on bottom lands of the Platte River Valley and Shell Creek and in narrow, upland drainageways. Some areas are adjacent to stream channels, and other areas are between the natural levee and foot slopes adjacent to uplands. The soil is occasionally flooded. Areas range from 5 to 50 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 6 inches thick. The subsurface layer is friable and about 20 inches thick. It is dark gray silt loam in the upper part and very dark gray silty clay loam in the lower part. The subsoil is very dark gray, friable silty clay loam about 6 inches thick. The underlying material is silty clay loam. It is dark gray in the upper part and gray in the lower part to a depth of more than 60 inches. In some places, carbonates are within a depth of 10 inches.

Included with this soil in mapping are small areas of Kezan and Shell soils. Kezan soils are poorly drained and slightly lower in the landscape than the Colo soil. Shell soils are well drained and higher in the landscape than the Colo soil. Also included in some areas are narrow, deeply entrenched stream channels. The included areas make up 5 to 10 percent of the unit.

Permeability is moderately slow in the Colo soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 2 feet in most wet seasons to a depth of about 3 feet in most dry seasons. Organic matter content and natural fertility are high. The rate of water intake is low. Shrink-swell potential is high. Tilth is good. This soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most areas are used for dryland crops. Some areas are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, grain sorghum, and alfalfa. Row crops can be grown in consecutive years under a high level of management. Conservation tillage systems, such as ridge till-plant, that keep all or part of the crop residue on the surface help to conserve soil moisture. Wetness caused by the seasonal high water table and occasional flooding in the spring commonly delay tillage. Tile drainage or surface V-ditches improve surface drainage.

If irrigated, this soil is suited to corn, soybeans, grain sorghum, and such close-growing crops as alfalfa. The main limitation is wetness caused by the seasonal high water table. Although flooding occurs on an average of about once in a 3- to 5-year period, crop losses are generally slight. This soil is somewhat difficult to work because it tends to form hard clods if tilled when wet. Perforated tile improves drainage, and V-ditches remove surface water. Gravity and sprinkler irrigation systems are suited to the soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Proper stocking rates, rotation grazing, and restricted use during wet periods help keep the pasture in good condition. Fertilizer helps to maintain fertility.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

This soil is suited to the trees and shrubs grown as windbreaks. The only suited species are those that are tolerant of a moderately high water table. Adapted species have a good chance of survival and growth. Cultivation after planting helps to control weeds. Weeds can be controlled by cultivating with conventional equipment between the tree rows and use of selected herbicides in the rows.

This soil is not suited to use as sites for septic tank absorption fields or buildings because of occasional flooding and the seasonal high water table. An alternative site should be selected. On sites for sewage lagoons, dikes protect the lagoon from flooding. Constructing the lagoons on fill material helps to raise the bottom of the lagoon to a sufficient height above the seasonal high water table.

Constructing roads and streets 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 the seasonal high water table. The surface pavement and base material should be thick enough to compensate for the low strength of this soil. Providing coarse grained subgrade or base material helps to ensure better performance. Mixing the base material with additives, such as hydrated lime, helps to prevent excessive shrinking and swelling.

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

CrE2—Crofton silt loam, 11 to 15 percent slopes, eroded. This moderately steep, well drained soil is on side slopes in the uplands. It formed in loess. After heavy rains rills and small gullies are common but are plowed in by successive cultivations. Consequently, tillage is mainly in the transition layer and the underlying material. Areas range from 5 to 30 acres in size.

Typically, the surface layer is grayish brown, friable, calcareous silt loam about 6 inches thick. Most of the original, dark colored surface layer has been removed by erosion. The transition layer is light brownish gray, friable, calcareous silt loam about 8 inches thick. The underlying material is light yellowish brown, friable, calcareous silt loam to a depth of more than 60 inches.

Included with this soil in mapping are small areas of the better developed Nora soils. These soils are in landscape positions similar to those of the Crofton soil. They make up 5 to 10 percent of the unit.

Permeability is moderate in the Crofton soil. Available water capacity is high. Runoff is medium. Organic matter content and natural fertility are low. The soil releases moisture readily to plants. Availability of phosphate is low. Tilth is good.

Most of the acreage of this soil is cultivated and mainly in dryland crops. A few small areas are in introduced or native grasses and are used for range or pasture.

If used for dryland farming, this soil is poorly suited to cultivated crops because of the moderately steep slope and the severe hazard of erosion. It is better suited to close-growing crops, such as alfalfa, small grain, and introduced grasses, than to row crops, such as corn and grain sorghum. Contour farming in combination with terraces and grassed waterways help to control erosion. Water conservation and low fertility are the principal management concerns. Free carbonates in excessive amounts in this soil bind phosphorus, making it unavailable for plant use. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to control erosion. Using a properly planned fertilizer program and applying manure help to improve fertility.

This soil is not suited to irrigation because of the moderately steep slope and the severe hazard of erosion.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Nitrogen fertilizer, rotation grazing, and proper stocking rates help to keep the pasture in good condition.

This soil is suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are overgrazed, the plant community is mostly sideoats grama, blue grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, bur oak, eastern redcedar, buckbrush, snowberry, and sumac invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings that are tolerant of calcareous soils and that are planted in a well prepared site survive and grow well. Planting trees on the contour, in combination with terraces, and using a cover crop between the tree rows help to control erosion. Weeds can be controlled by cultivating between the tree rows and by applying appropriate herbicides in the rows. Watering of newly planted trees is needed in some areas when rainfall is insufficient.

Land shaping and installing the septic tank absorption field on the contour generally help to ensure that the system operates properly. On sites for sewage lagoons, extensive grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. The design of dwellings and small commercial buildings should accommodate the slope, or the site should be graded.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. Providing surface drainage helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability unit is IVe-8, dryland; Limy Upland range site; windbreak suitability group 8.

CrF—Crofton silt loam, 15 to 30 percent slopes. This steep, somewhat excessively drained soil is on uneven side slopes in the uplands. It formed in loess. After rains rills and gullies are common where the vegetation does not sufficiently hold the soil. Areas range from 5 to 25 acres in size.

Typically, the surface layer is grayish brown, very friable, calcareous silt loam about 4 inches thick. The transition layer is pale brown, friable, calcareous silt loam about 5 inches thick. The underlying material is light yellowish brown and light gray, calcareous silt loam to a depth of about 60 inches. In a few small areas where the soil is cultivated, the surface layer has been removed by erosion and the transition layer or the underlying material is exposed at the surface.

Included with this soil in mapping, in similar landscape positions, are small areas of Nora and Thurman soils. The included soils make up 5 to 20 percent of the unit.

Permeability is moderate in the Crofton soil. Available water capacity is high. Runoff is rapid. Organic matter content is low or moderately low. Natural fertility is low.

Most of the acreage of this soil is in introduced grasses, native grasses, and trees. A few small areas on the lower slopes are in dryland crops.

This soil is not suited to common cultivated crops because of the steep slope and the hazard of erosion.

This soil is suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are overgrazed, the plant community is mostly sideoats grama, blue grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, bur oak, eastern redcedar, buckbrush, snowberry, and sumac invade the plant community. Brush management helps to control woody plants.

This soil is generally not suited to the trees and shrubs grown as windbreaks because of the steep slope. In some areas, trees can be planted by hand to enhance recreation areas or wildlife habitat.

This soil is generally not suited to use as sites for septic tank absorption fields or sewage lagoons because of the steep slope. An alternative site should be selected. The design of dwellings and small commercial buildings should accommodate the slope, or the site should be graded.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. Cutting and filling generally are needed to provide a suitable grade for roads and streets. A surface drainage system helps to reduce the damage to roads caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability unit is VIe-8, dryland; Limy Upland range site; windbreak suitability group 10.

CsC2—Crofton-Nora complex, 2 to 6 percent slopes, eroded. These deep, well drained, gently sloping soils formed in loess on narrow ridgetops in the uplands. Areas range from 5 to 40 acres in size. They are 45 to 55 percent Crofton soil generally on ridgetops and 35 to 45 percent Nora soil on side slopes below the Crofton soil in the landscape. The two soils occur as areas so intricately mixed that mapping them separately was not practical. Rills are common after heavy rains. Erosion has removed most of the original surface soil and, in places, part of the subsoil. On the Nora soil, the remaining surface soil has been mixed with part of the subsoil by tillage.

Typically, the Crofton soil has a surface layer of pale brown, very friable, calcareous silt loam about 5 inches thick. The transition layer is light brownish gray, friable, calcareous silt loam about 8 inches thick. The underlying material is calcareous silt loam. It is light yellowish brown in the upper part and light gray in the lower part to a depth of more than 60 inches. Limy concretions are common at the surface.

Typically, the Nora soil has a surface layer of grayish brown, friable silty clay loam about 5 inches thick. The subsoil is friable silty clay loam about 18 inches thick. It is brown in the upper part and pale brown and calcareous in the lower part. The underlying material is light yellowish brown, calcareous silt loam to a depth of more than 60 inches. In some areas, lime is at a depth of more than 30 inches.

Included with these soils in mapping are small areas of reddish brown soils and Moody soils on the lower part of the landscape. Included soils make up 5 to 10 percent of the unit.

Permeability in the Crofton and Nora soils is moderate. Available water capacity is high. Organic matter content is low in the Crofton soil and moderately low in the Nora soil. Runoff is medium. The rate of water intake is moderate in both soils. The soils are generally deficient in phosphorus and zinc. Natural fertility is low in the Crofton soil and medium in the Nora soil. The surface layer of the Crofton soil is very friable and easily tilled throughout a fairly wide range of moisture content. The surface layer of the Nora soil is friable and can be tilled within a limited range in moisture content. These soils release moisture readily to plants.

Most of the areas of these soils are cultivated. Some areas are in introduced grasses and are used for grazing or mowed for hay.

If used for dryland farming, these soils are suited to corn, soybeans, grain sorghum, small grain, and alfalfa. They are best suited to close-growing crops, but row crops can be grown under a high level of management that adequately controls erosion and improves fertility. Water erosion is the major hazard. Terraces, contour farming, and grassed waterways help to control erosion and to conserve soil moisture. Low fertility and water conservation are the principal management concerns. Free carbonates in excessive amounts bind phosphorus and make it unavailable for plant use. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to control water erosion, increase the organic matter content, and improve fertility. Additions of manure and commercial fertilizers supply phosphorus and nitrogen and thus improve fertility.

If irrigated, these soils are suited to corn and soybeans. They are better suited to such close-growing crops as alfalfa. Water erosion is the principal hazard. Low fertility is the major management concern. Terraces, grassed waterways, and maintaining a large amount of crop residue on the surface help to control erosion. Returning crop residue to the soil and adding feedlot manure and commercial fertilizers, especially phosphorus and nitrogen, improve fertility. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to control water erosion and to conserve soil moisture. Center-pivot systems are well suited to the soils. The soils can be bench-leveled to reduce the grade for row crops, or the crops can be grown in contour furrows supplemented with terraces and grassed waterways.

These soils are suited to introduced grasses for pasture. A cover of pasture grasses is effective in controlling erosion. Cool-season grasses, such as smooth brome, orchardgrass, or tall fescue, can be mixed with alfalfa. Warm-season grasses are also suited. Separate pastures of cool- and warm-season grasses can be used to provide a long season of grazing. Pasture grasses can also be used as part of a crop sequence that includes row crops. Overgrazing causes low plant vigor. Proper stocking rates, rotation grazing, and weed control help to keep the pasture in good condition. Nitrogen fertilizer and irrigation increases the growth and vigor of the grasses.

These soils are suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are overgrazed, the plant community is mostly sideoats grama, blue grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, bur oak, eastern redcedar, buckbrush, snowberry, and sumac invade the plant community. Brush management helps to control woody plants.

These soils are suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. Planting the trees on the contour, in combination with terraces, or planting a cover crop between the tree rows helps to control erosion. Weeds can be controlled by cultivating and applying selected herbicides in the rows. Watering of newly planted trees is needed when rainfall is insufficient.

The Crofton soil is generally suited to use as sites for septic tank absorption fields and dwellings. On the Nora soil, the moderate permeability is a limitation for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. On sites for sewage lagoons on both soils, lining or sealing the lagoon helps to prevent seepage. On the Nora soil, strengthening foundations for buildings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of these soils. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Em—Els loamy fine sand, 0 to 3 percent slopes. This deep, somewhat poorly drained, nearly level or very gently sloping soil is in upland sandhill valleys and on low stream terraces in sandhill areas. It formed in eolian and alluvial sands. It is subject to rare flooding. Areas range from 5 to 100 acres in size.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 8 inches thick. The underlying material is pale brown fine sand in the upper part and light brownish gray fine sand in the lower part to a depth of more than 60 inches. In a few small areas, the dark surface soil is more than 10 inches thick. Some small areas are moderately well drained.

Included with this soil in mapping are small areas of Loup and Thurman soils. Loup soils are poorly drained and lower in the landscape than the Els soil. Thurman soils are somewhat excessively drained and higher in the landscape than the Els soil. The included soils make up about 10 to 15 percent of the unit.

Permeability is rapid in the Els soil. Available water capacity is low. The seasonal high water table ranges from a depth of 1.5 feet in most wet years to a depth of 3.0 feet in most dry years. Runoff is slow. Organic matter content is moderately low. Natural fertility is low. The rate of water intake is very high. This soil releases moisture readily to plants. Tilth is good.

Some of the acreage of this soil is cultivated. Many areas are in native grasses and are used for grazing or haying.

If used for dryland farming, this soil is suited to corn and grain sorghum. It is poorly suited to alfalfa because of wetness. The main limitation is the seasonal high water table, which delays tillage and causes the soil to warm slowly in the spring. Soil blowing is a hazard if the vegetative cover is removed. Conservation tillage systems, such as ridge till-plant, that leave crop residue on the surface help to control soil blowing. Narrow field windbreaks also help to control soil blowing. Returning crop residue to the soil helps to conserve soil moisture. Applying feedlot manure helps to maintain the organic matter content and improves fertility.

If irrigated, this soil is suited to corn and sorghum. Sprinkler systems can be used. Alfalfa can be grown, but it is generally short lived. Frequent applications of water are needed because of the very high rate of water intake and the low water holding capacity. Excessive amounts of water should be avoided to prevent leaching of plant nutrients below the root zone. Gravity systems are not suited because of the very high rate of water intake. Conservation tillage systems, such as ridge till-plant, that leave crop residue on the surface help to control soil blowing. Cover crops also help to control soil blowing. Establishing drainage ditches helps to lower the seasonal high water table.

This soil is suited to introduced grasses for pasture. The best suited species are those that are tolerant of a high water table, such as reed canarygrass and creeping foxtail. A cover of pasture or hay plants is effective in controlling soil blowing. Separate pastures of cool- and warm-season grasses can be used for a long season of grazing. Continuous overgrazing reduces the protective vegetative cover, allows weeds to grow, and can cause soil blowing. Proper stocking rates, rotation grazing, and weed control help to keep the pasture in good condition. Nitrogen fertilizer and irrigation help to increase the growth and vigor of the grasses.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

This soil is suited to the trees and shrubs grown as windbreaks. Seedlings that tolerate wetness caused by the seasonal high water table survive and grow well. In some years, establishing seedlings is difficult because of wetness. Maintaining cover crops between the tree rows helps to control soil blowing. Competition from grasses and weeds is a management concern. Grasses and weeds can be controlled by cultivating between the tree rows, by applying appropriate herbicides, and by hand hoeing or rototilling in the rows.

This soil generally is not suited to use as sites for septic tank absorption fields because of the seasonal high water table. The soil does not adequately filter the effluent in a waste disposal system because of the rapid permeability in the underlying material. An alternative site should be selected. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing dwellings on elevated, well compacted fill material helps to prevent the structural damage caused by flooding.

Establishing adequate side ditches and culverts for roads and streets improves surface drainage. It helps to prevent the damage caused by flooding and the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Fm—Fillmore silt loam, 0 to 1 percent slopes. This deep, poorly drained soil is in broad, generally round or oblong, shallow depressions on loess uplands or on high terraces that formed in loess. It is occasionally ponded. Areas range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is leached, gray, very friable silt loam about 4 inches thick. The subsoil is about 40 inches thick. It is dark gray, very firm silty clay in the upper part and dark grayish brown, friable silty clay loam in the lower part. The underlying material is grayish brown silt loam to a depth of more than 60 inches. In places, the soil does not have a gray subsurface layer. Some small areas are very poorly drained and frequently ponded.

Permeability is very slow. Available water capacity is high. Runoff is very slow or ponded. The perched water table is above the claypan subsoil. It ranges from about 0.5 foot above the soil surface to about 1.0 foot below. Most of the surface water is removed by evaporation or transpiration. Organic matter content is moderate. Natural fertility is medium. The rate of water intake is low. Tilth is good. Shrink-swell potential is high.

Most of the acreage of this soil is farmed. Most areas are used for dryland crops. A few areas are irrigated. A few small areas are in native or introduced grasses and are used for range or pasture.

If used for dryland farming, this soil is suited to corn, soybeans, and grain sorghum. Wetness caused by the very slow permeability and by runoff from higher lying soils is the main limitation. In some years droughtiness is a slight hazard in midsummer. Artificial drainage is needed for consistent growth of crops. Terraces and contour farming on the higher lying soils help to prevent excessive runoff and flooding on this soil. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to keep the soil friable. Crops generally are planted in early spring, but replanting is needed in ponded areas. This soil is somewhat droughty during dry years because the subsoil absorbs moisture slowly and releases it slowly to plants.

If irrigated, this soil is suited to corn and soybeans. Flooding commonly delays tillage and in some areas damages small crops. The soil can be drained with V-ditches if adequate outlets are available. Using diversions or terraces to prevent excessive runoff from higher lying soils helps to control flooding. Gravity and sprinkler irrigation systems can be used. Constructing a tailwater recovery system helps to conserve water. A system of conservation tillage, such as disking, chiseling, and no-till, that leaves all or part of the crop residue on the surface helps to increase organic matter content and to control soil blowing.

This soil is suited to introduced grasses for pasture. Wetness caused by flooding is the principal hazard. Grass species that are adapted to wet conditions, such as reed canarygrass, can be grown on this soil. Artificial drainage and diversion of runoff help to prevent flooding. Grazing when the soil is wet causes surface compaction and the formation of bogs or small mounds. Proper stocking rates and deferred grazing help to keep the pasture in good condition.

This soil is suited to range. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, and switchgrass. If the plants are continuously overgrazed, the plant community is mostly tall dropseed, Kentucky bluegrass, western wheatgrass, and numerous annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks. The best suited species are those that are tolerant of occasional ponding. The soil should be tilled and the trees should be planted after the soil has begun to dry. Weeds can be controlled by cultivating between the tree rows, and by applying selected herbicides in the rows.

This soil is not suited to septic tank absorption fields because of ponding and slow permeability. On sites for sewage lagoons, dikes protect the lagoon from ponding. This soil is not suited to use as sites for dwellings and small commercial buildings because of ponding.

Constructing roads and streets on suitable, well compacted fill material above ponding levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by ponding. The surface pavement and base material of roads should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IIIw-2, dryland, and IIIw-2, irrigated; Clayey Overflow range site; windbreak suitability group 2W.

Fp—Fillmore silt loam, ponded. This deep, very poorly drained soil is in shallow basins or depressions on uplands. It formed in loess. It is subject to frequent ponding. Slopes range from 0 to 1 percent. Areas range from 3 to 50 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 7 inches thick. The subsurface layer is leached, light gray, friable silt loam about 12 inches thick. The subsoil is gray, very firm silty clay about 23 inches thick. The underlying material is gray silty clay to a depth of more than 60 inches. Some small areas are occasionally ponded and poorly drained.

Permeability is very slow. Available water capacity is high. Areas of this soil do not have natural drainage outlets. As a result, water does not run off the surface. Only a small amount of ponded water moves through the soil because of the very slow permeability in the subsoil. Most of the water is removed by evaporation and transpiration. The perched seasonal high water table ranges from about 1 foot above the surface to about 1 foot below. Organic matter content is moderate. Natural fertility is medium. Shrink-swell potential in the subsoil is high.

Most of the acreage of this soil is in introduced grasses and is used for pasture or as habitat for wildlife. A few areas are used for hay.

If used for dryland farming, this soil is poorly suited to small grain. Ponded water is the main hazard. Tile drains, dugouts, or large drainage ditches help to remove excess water. In areas that do not have a drainage system, the vegetation consists mainly of tall sedges, prairie cordgrass, reed canarygrass, and smartweed.

This soil is not suited to irrigated crops unless the surface has been drained. Installing tile drains or V-ditches or land leveling improves surface drainage.

This soil is poorly suited to introduced grasses for pasture. Reed canarygrass and creeping foxtail are suited. Grazing when the soil is wet causes surface compaction. Installing V-ditches or perforated tile improves surface drainage.

This soil is suited to wetland plants in shallow water areas that provide habitat for wetland wildlife.

This soil generally is not suited to the trees and shrubs grown as windbreaks because of frequent ponding. In small areas, plantings can be made to enhance wildlife habitat. The best suited species of trees and shrubs are those that are tolerant of ponding. Special planting methods are needed to prevent small trees from drowning.

This soil is not suited to use as sites for sanitary facilities or buildings because of frequent ponding. An alternative site should be selected. Some sites can be drained by V-ditches if a suitable outlet is available, or the site can be filled and leveled. Potential is good for development of pond reservoir areas.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. Constructing roads on suitable, well compacted fill material above ponding levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by ponding and the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action.

The capability unit is IVw-2, dryland; windbreak suitability group 10. This soil is not assigned to a range site.

Fu—Fluvaquents, silty. These deep, level, and very poorly drained soils are on a delta in the north and west part of Lake Babcock. They formed in silty material deposited as sediment from water from the Loup Public Power Canal flowing into slower moving lake water. The soils are generally covered with 0.5 to 1.0 foot of water. Areas range from 2 to 70 acres in size.

Typically, the surface layer is about 10 inches of black silty material high in content of organic matter. The underlying material is dark gray and very dark gray silt loam to a depth of more than 48 inches. The soils differ in color and thickness from one area to another.

Permeability is moderate. Available water capacity is high. Runoff is ponded. Organic matter content is very high. The apparent seasonal high water table is at or above the surface.

These soils are used as habitat for wetland wildlife. They are managed as a wildlife refuge. Native vegetation includes cattails, rushes, and other aquatic plants.

These soils are not suited to farming, range, windbreaks, and building site development. An alternative site should be selected.

The capability unit is VIIIw-7, dryland; windbreak suitability group 10. These soils are not assigned to a range site.

GeD2—Geary silty clay loam, 6 to 11 percent slopes, eroded. This deep, strongly sloping, well drained soil is on upland side slopes and ridgetops. It formed in brownish loess. Areas range from 5 to 30 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 28 inches thick. It is brown in the upper part and light brown in the lower part. The underlying material is light brown silty clay loam to a depth of more than 60 inches. In some places, the underlying material is pale brown. In some places, the surface layer is loam or silt loam.

Included with this soil in mapping are small areas of Crofton soils. Crofton soils are calcareous at the surface and slightly higher than the Geary soil on side slopes. Also included are some small areas of glacial till. The included soils make up 5 to 10 percent of the unit.

Permeability is moderately slow in the Geary soil. Available water capacity is high. Runoff is medium. Organic matter content is moderately low. Natural fertility is medium. Shrink-swell potential is moderate. The rate of water intake is low. Tilth is good.

About one-half of the acreage of this soil is used for dryland crops. The rest is in introduced grasses.

If used for dryland farming, this soil is poorly suited to corn and grain sorghum. It is better suited to small grain and legumes. Water erosion is the main hazard where the surface is not adequately protected by close-growing crops or crop residue. Conservation tillage practices, such as disking and chiseling, that leave all or part of the crop residue on the surface help to control water erosion, to conserve soil moisture, and to increase the organic matter content. Terraces, grassed waterways, and field borders also help to control erosion and to conserve soil water.

If irrigated, this soil is poorly suited to corn and grain sorghum. It is better suited to alfalfa. Water erosion is the principal hazard. In irrigation, efficient management of water is a concern. Conservation tillage systems, such as chiseling, disking, and no-till, that leave all or part of the crop residue on the surface help to control erosion. Sprinkler irrigation systems are well suited because the rate of water application can be adjusted to reduce runoff.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Continuous overgrazing or grazing when the soil is wet causes surface compaction and reduces the rate of water intake. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range. A cover of range plants is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation and timely cultivation or application of appropriate herbicides. Planting a cover crop between the tree rows or planting trees on the contour, in combination with terraces, helps to control erosion. Limited rainfall is the principal limitation when planting trees. Supplemental irrigation of the seedlings is needed in some areas.

The moderately slow permeability of this soil is a limitation to use as sites for septic tank absorption fields. It can generally be overcome by increasing the size of the absorption field. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Strengthening foundations of buildings and backfilling with coarse material help to prevent the damage caused by shrinking and swelling. The design of dwellings and small commercial buildings should accommodate the slope or the sites should be graded.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

GeE2—Geary silty clay loam, 11 to 15 percent slopes, eroded. This deep, moderately steep, well drained soil is on side slopes in the uplands. It formed in brownish loess. Areas range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 6 inches thick. The subsoil is firm silty clay loam about 33 inches thick. It is brown in the upper part and light brown in the lower part. The underlying material is light brown silty clay loam to a depth of more than 60 inches. In places, the soil is sandy clay loam or clay loam below a depth of 30 inches. In some places, the surface layer is silt loam or loam.

Included with this soil in mapping are small areas of Crofton soils. Crofton soils are calcareous at the surface and are higher than the Geary soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow in the Geary soil. Available water capacity is high. The soil readily releases moisture to plants. Organic matter content is moderately low. Natural fertility is medium. Runoff is rapid. Shrink-swell potential is high. Tilth is fair.

About one-third of the acreage of this soil is in introduced grasses and is used for pasture. The rest is in cultivated crops or native grasses.

If used for dryland farming, this soil is poorly suited to corn and grain sorghum. Water erosion is a hazard. Because of the moderately steep slope, the soil is better suited to close-growing crops, such as alfalfa and small grain. Conserving water and improving fertility are major management concerns. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to control water erosion and to conserve soil moisture. Contour farming in combination with terraces and grassed waterways also help to reduce the evaporation rate and to control erosion. Adding manure and commercial fertilizer and keeping crop residue on the surface help to improve fertility.

This soil is not suited to irrigation because erosion is a severe hazard and irrigation water is difficult to manage.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Continuous overgrazing or grazing when the soil is wet causes surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range. A cover of range plants is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled or removed by good site preparation and cultivation. Appropriate herbicides can be used in the tree rows. Planting a cover crop between the tree rows and planting trees on the contour help to control erosion. Irrigation can supply moisture when rainfall is insufficient.

This soil is generally not suited to use as sites for septic tank absorption fields and sewage lagoons because of the moderately steep slope. An alternative site can be selected. The design of dwellings and small commercial buildings should accommodate the slope, or the site should be graded.

Cutting and filling are generally needed to provide a suitable grade for roads and streets. The surface pavement and base material of roads should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

GeF—Geary silty clay loam, 15 to 30 percent slopes. This deep, steep, well drained soil is on uneven side slopes in the uplands. It formed in brownish loess. After rains rills and gullies are common where the vegetation is sparse. Areas range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 11 inches thick. The subsurface layer is brown, friable silty clay loam about 5 inches thick. The subsoil is brown, firm silty clay loam about 18 inches thick. The underlying material is light brown silty clay loam to a depth of more than 60 inches. In a few cultivated areas, much of the surface layer has been removed by erosion and the lighter colored subsoil is at or near the surface.

Included with this soil in mapping are small areas of Crofton soils. Crofton soils are calcareous at the surface and in positions in the landscape similar to those of the Geary soil. The included soils make up 5 to 8 percent of the unit.

Permeability is moderately slow in the Geary soil. Available water capacity is high. Runoff is rapid. Organic matter content is moderate. Natural fertility is medium.

Most of the acreage of this soil is in introduced grasses, native grasses, and trees. A few small areas are used for dryland crops.

This soil is not suited to common cultivated crops because of the steep slope and the severe hazard of erosion.

This soil is suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, the less desirable plants, such as Kentucky bluegrass, buckbrush, snowberry, and sumac, invade the plant community.

This soil is generally not suited to the trees grown as windbreaks because of the steep slope. In some areas it is suited to the plantings that enhance recreation areas or wildlife habitat. Trees can be hand planted. Adapted species have a fair chance of survival and growth if erosion is controlled.

This soil is generally not suited to use as sites for septic tank absorption fields and sewage lagoons because of the steep slope. An alternative site should be selected. The design of dwellings and small commercial buildings should accommodate the slope, or the site should be graded.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. Cutting and filling generally are needed for a suitable grade. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability unit is VIe-1, dryland; Silty range site; windbreak suitability group 10.

Gk—Gibbon silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands along the Loup River and the Platte River and in Lost Creek Valley. The soil formed in silty, calcareous alluvium. It is subject to occasional flooding. Areas range from 5 to 100 acres in size.

Typically, the surface layer is very dark gray, calcareous, friable silt loam about 8 inches thick. The subsurface layer is dark gray, friable silt loam about 10 inches thick. The underlying material is light gray, calcareous silt loam in the upper part; light gray and light brownish gray, calcareous silt loam in the middle part; and light gray fine sandy loam in the lower part to a depth of more than 60 inches. In some places, the dark color of the surface layer extends to a depth of more than 20 inches. In places, the surface layer is thinner and lighter colored. In some places, the surface layer is silty clay loam. In places, buried surface horizons are below a depth of 26 inches.

Included with this soil in mapping are small areas of Grigston, Wann, Zook, and Gayville soils. Grigston soils are well drained and higher than the Gibbon soil in the landscape. Compared to the Gibbon soil, Wann soils have more sand above a depth of 40 inches and are in similar positions on the landscape. Zook soils are poorly drained and lower than the Gibbon soil in the landscape. Gayville soils are affected by salinity and alkalinity and are in positions in the landscape similar to those of the Gibbon soil. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Gibbon soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of 1.5 feet in most wet seasons to about 3.0 feet in most dry seasons. Organic matter content is moderately low. Natural fertility is high. The rate of water intake is low. Tilth is good. The soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most cultivated areas are used for irrigated crops. Some areas are used for dryland crops. Some areas are in native or introduced grasses and are used for pasture or haying.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Wetness caused by the seasonal high water table in the spring commonly delays tillage and delays planting of small grain. Tile drains or drainage ditches help to lower the seasonal high water table if suitable outlets are available. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content and the rate of water intake, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Wetness caused by the seasonal high water table is the principal limitation. It commonly delays tillage in the spring. Tile drainage or drainage ditches help to lower the seasonal high water table where a suitable outlet is available. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue to the soil increases the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep percolation.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Reed canarygrass and creeping foxtail are suited to this soil. Excessive wetness limits the choice of pasture grasses and legumes. Grazing when the water table is highest results in damage to the grassland, a rough soil surface, and difficulty in mowing for hay. Because of wetness, seeding of the grasses can be difficult. Floodwater deposits sediment, which in some areas partly covers the grasses and reduces their vigor and growth. Proper stocking rates, rotation grazing, and restrictive grazing during wet periods help to keep the pasture in good condition. Nitrogen and phosphate fertilizers increase the growth and vigor of the grasses.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

This soil generally is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Selected species, if tolerant of a high water table, have a good chance of survival and growth. Herbaceous vegetation on this soil is abundant and persistent, but it can be controlled. Weeds and grasses can be controlled by cultivating and growing annual cover crops between the tree rows and by applying appropriate herbicides in the rows.

This soil is generally not suited to use as septic tank absorption fields or building sites because of flooding and the seasonal high water table. An alternative site should be selected. On sites for sewage lagoons, dikes protect the lagoon from flooding. Constructing the lagoon on fill material helps to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Constructing roads and streets on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent damage caused by floodwater. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Gm—Gibbon-Gayville silt loams, 0 to 2 percent slopes. These deep, nearly level, somewhat poorly drained soils are on low stream terraces and high bottom lands. They formed in clayey and silty alluvium. They are subject to occasional flooding. Areas range from 8 to more than 640 acres in size. They are about 40 to 70 percent Gibbon soil and 20 to 50 percent Gayville soil. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical. The Gayville soil is affected by salinity and alkalinity (fig. 9).

Typically, the Gibbon soil has a surface layer of dark gray, friable silt loam about 7 inches thick. The subsurface layer is gray, friable silt loam about 7 inches thick. The transition layer is gray, friable silt loam about 10 inches thick. The underlying material is gray silt loam in the upper part and white silt loam in the lower part to a depth of more than 60 inches.

Typically, the Gayville soil has a surface layer of grayish brown, friable, calcareous silt loam about 6 inches thick. The subsoil is firm, calcareous silty clay loam about 11 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material is calcareous silt loam. It is very pale brown in the upper part and light gray in the lower part to a depth of more than 60 inches. This soil is very strongly saline-alkali.

Included with these soils in mapping are small areas of Muir and Zook soils. Muir soils are well drained, leached of carbonates, and slightly higher than the Gibbon and Gayville soils in the landscape. Zook soils are poorly drained and lower than the Gibbon and Gayville soils in the landscape. The included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the Gibbon soil and very slow in the subsoil and moderate in the underlying material in the Gayville soil. The available water capacity is high in the Gibbon soil and moderate in the Gayville soil. Runoff on both soils is slow. The organic matter content is moderate in the Gibbon soil and moderately low in the Gayville soil. Natural fertility is high in the Gibbon soil but low in the Gayville soil because of the high alkalinity. The rate of water intake is moderate for the Gibbon soil and moderately low for the Gayville soil. The Gibbon soil releases moisture readily to plants, but the Gayville soil releases moisture slowly. Tilth is good in the Gibbon soil and poor in the Gayville soil. Shrink-swell potential is low for the Gibbon soil and high for the Gayville soil. The seasonal high water table in both soils is at a depth of 1.5 feet in most wet years to about 3.0 feet in most dry years. The Gayville soil is strongly alkaline or very strongly alkaline in the subsoil and ranges from moderately alkaline to very strongly alkaline in the underlying material.

Most of the acreage of these soils is cultivated. Many areas are used for irrigated crops. Some areas are used for dryland crops. A few small areas are in native or introduced grasses and are used for grazing or haying.

If used for dryland farming, these soils are poorly suited to corn, soybeans, small grain, and alfalfa. The high alkalinity and salinity of the Gayville soil are the main limitations. Conservation tillage systems, such as ridge till-plant, that leave maximum amounts of crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil helps to improve tilth, increases the organic matter content, improves fertility, and increases the rate of water intake.

If irrigated, these soils are poorly suited to corn, soybeans, and alfalfa. The high alkalinity and salinity of the Gayville soil are the principal management concerns. Efficient management of irrigation water, because of poor surface drainage, is also a concern. Conservation tillage systems, such as ridge till-plant, that leave

Figure 9.—An area of Gibbon-Gayville silt loams, 0 to 2 percent slopes. The salinity and alkalinity of the light-colored Gayville soil restrict plant growth.

maximum amounts of crop residue on the surface help to conserve soil moisture.

These soils are best suited to sprinkler irrigation systems. Adjusting the rate at which water is applied to the rate of water intake helps to reduce runoff and to control erosion. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In land leveling, cuts should be avoided that expose or spread the high alkaline subsoil. In areas that have been cut by land leveling, returning crop residue to the soil increases the organic matter content. On the Gayville soil, chemical amendments help to reduce the effects of alkalinity. Reducing the grade in the row by adjusting the direction of the row helps to distribute water evenly. Constructing a tailwater recovery system helps to conserve water.

These soils are suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Tall wheatgrass and switchgrass are suited to the saline-alkali condition of the Gayville soil. Continuous overgrazing or grazing when these soils are wet causes surface compaction. Nitrogen and phosphate fertilizers increase the growth and vigor of the grasses.

These soils are suited to range and native hay. On the Gibbon soil, the natural plant community is mostly mid and tall grasses, such as big bluestem, little bluestem, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly Kentucky bluegrass, tall dropseed, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management and prescribed burning help to control woody plants. On the Gayville soil, the natural plant community is mostly short and mid grasses and grasslike plants, such as inland saltgrass, plains bluegrass, slender wheatgrass, switchgrass, western wheatgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly inland saltgrass, foxtail barley, Kentucky bluegrass, western wheatgrass, sedges, and rushes. If the soils are wet, overgrazing can cause surface compaction and the formation of small mounds, and consequently grazing and haying are difficult. The hay yield on these soils generally is low.

The Gibbon soil is suited to the trees and shrubs grown as windbreaks. The Gayville soil is poorly suited to plantings that enhance recreation areas or wildlife habitat and to farmstead, feedlot, and field windbreaks. Onsite investigation is needed before planting. Good site preparation and timely cultivation between the tree rows help to control undesirable grasses and weeds.

These soils are not suited to use as sites for sanitary facilities or as home sites because of wetness and flooding. An alternative site should be selected. On sites for sewage lagoons, dikes protect the lagoon from flooding.

Constructing roads and streets on suitable, well compacted fill material above flood level, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. On the Gayville soil, low strength is a limitation for roads and streets. On this soil, providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system and a gravel moisture barrier in the subgrade help to minimize the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Go—Gothenburg soils, 0 to 3 percent slopes. These nearly level and very gently sloping, poorly drained soils are on bottom lands of the Platte River. They are very shallow over coarse sand or gravelly sand. The surface layer ranges from gravelly sand to loam. These soils are dissected by shallow stream channels and are subject to frequent flooding. Areas range from 20 to 300 acres in size.

Typically, the surface layer is dark gray, very friable sandy loam about 4 inches thick. The underlying material is light gray coarse sand. The content of gravel is about 8 percent at a depth of 14 inches to more than 60 inches.

Included with these soils in mapping are small areas of Alda soils. Alda soils have coarse sand or gravelly sand at a depth of 20 to 40 inches and are higher than the Gothenburg soils in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is very rapid in the Gothenburg soils. Available water capacity is very low. Runoff is very slow. Natural fertility is low. Organic matter content is very low. The root zone is restricted by the underlying material of coarse sand or gravelly sand. The apparent seasonal high water table ranges from at the surface in most wet seasons to a depth of 2 feet in most dry seasons.

Most areas of these soils are used as habitat for woodland and wetland wildlife. Some areas are used for grazing.

These soils are not suited to cultivated crops because of the very shallow root zone, very low available water capacity, and frequent flooding.

In some areas, these soils are poorly suited to range. Native vegetation along the Platte River is annual grasses, sedges, weeds, shrubs, and cedar. An adequate supply of water is available in the river channels during most seasons.

These soils are generally not suited to the trees and shrubs grown as windbreaks. The limitations are the shallow root zone, the very low available water capacity, and frequent flooding.

These soils are generally not suited to use as sites for buildings or septic tank absorption fields because of the flooding and the seasonal high water table. They do not adequately filter the effluent in waste disposal systems because of the rapid permeability in the underlying material. Seepage from septic tank absorption fields and sewage lagoons can result in ground water pollution. An alternative site should be selected. Constructing roads and streets on suitable, compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding and the seasonal high water table. Some areas of these soils are a source of sand and gravel. These soils provide suitable sites for excavated ponds for use as livestock watering facilities.

The capability unit is VIIs-3, dryland; windbreak suitability group 10. These soils are not assigned to a range site.

Gr—Grigston silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on stream terraces and high bottom lands. It is subject to rare flooding. The soil formed in alluvium. Areas range from 10 to 160 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, firm silty clay loam about 3 inches thick. The subsoil is grayish brown, firm silty clay loam about 8 inches thick. The underlying material is light gray silt loam in the upper part, grayish brown silty clay loam in the middle part, and light gray silt loam in the lower part to a depth of more than 60 inches. In some pedons loamy fine sand is below a depth of 48 inches.

Included with this soil in mapping are small areas of Lamo, Muir, Gayville, and Wann soils. Lamo soils are somewhat poorly drained and are slightly lower than the Grigston soil in the landscape. Muir soils have a dark surface layer more than 20 inches thick and are in positions in the landscape similar to those of the Grigston soil. Gayville soils have high alkalinity and are in positions in the landscape similar to those of the Grigston soil. Wann soils are somewhat poorly drained, have more sand in the profile, and are lower in the landscape than the Grigston soil. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Grigston soil. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. The rate of water intake is moderate. Tilth is good. The soil releases moisture readily to plants.

Nearly all of the acreage of this soil is cultivated. Most cultivated areas are used for irrigated crops, and a few areas are used for dryland crops. A few small areas are in introduced grasses and are used for pasture or hay.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content and the rate of water intake, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, small grain, and alfalfa. Conservation tillage practices, such as disk or chisel and plant, no-till, and till plant, that leave all or part of the crop residue on the surface help to reduce the evaporation rate. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue to the soil helps to increase the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep percolation. Constructing a tailwater recovery system helps to conserve water.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or warm-season grasses, such as switchgrass or big bluestem. Floodwater deposits sediment, which in some areas partly covers the grasses and reduces their growth and vigor. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler or gravity irrigation systems can be used.

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses, such as big bluestem, little bluestem, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly Kentucky bluegrass, tall dropseed, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Seedlings generally survive and grow well, if competing vegetation is controlled or removed by good site preparation and cultivation with conventional equipment between the tree rows. Annual cover crops also can be used to control weeds between the tree rows. Appropriate herbicides can be used in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

Rare flooding is a limitation to use of this soil as sites for sanitary facilities and buildings. On sites for sewage lagoons, dikes protect the lagoon from flooding. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by flooding.

Constructing roads and streets on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Gs—Grigston silt loam, wet substratum, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is on stream terraces. It formed in silty alluvium. It is subject to rare flooding. 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 6 inches thick. The subsoil is grayish brown, friable silt loam about 8 inches thick. The underlying material is pale brown silty clay loam in the upper part and light gray, calcareous silt loam in the lower part to a depth of more than 60 inches. In some places, the surface layer is less than 7 inches thick. Also, in places, carbonates are at the surface. Some small areas are well drained.

Included with this soil in mapping are small areas of Gibbon and Gayville soils. Gibbon and Gayville soils are somewhat poorly drained. Also, Gayville soils have high alkalinity and are lower than the Grigston soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Grigston soil. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. The rate of water intake is moderate. The seasonal high water table ranges from a depth of 4 feet in most wet years to a depth of 6 feet in most dry years. Tilth is good.

Nearly all of the acreage of this soil is cultivated. Many areas are used for irrigated crops. Some areas are used for dryland crops.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Conservation tillage practices, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue to the soil helps to increase the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep percolation. Constructing a tailwater recovery system helps to conserve water.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and increases the likelihood of soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler or gravity irrigation systems can be used.

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses, such as big bluestem, little bluestem, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly Kentucky bluegrass, tall dropseed, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and timely cultivation with conventional equipment between the tree rows. Appropriate herbicides can be used in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

Rare flooding is a limitation to use of this soil as sites for sanitary facilities and buildings. Constructing septic tank absorption fields and sewage lagoons on well compacted fill material helps to elevate the absorption field and the bottom of the lagoon to a sufficient distance above the seasonal high water table. Constructing dwellings and small commercial buildings on elevated, well compacted fill material helps to prevent the damage caused by flooding.

A surface drainage system helps to reduce the damage to roads and streets caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Hb—Hobbs silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on flood plains of narrow, upland drainageways. It formed in stratified alluvium. It is subject to occasional flooding. Areas range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, thinly stratified, friable silt loam about 8 inches thick. The underlying material is silt loam. It is pale brown and thinly stratified in the upper part and dark grayish brown in the lower part to a depth of more than 60 inches. In a few small areas, the surface layer has thin, calcareous strata of recent deposition.

Included with this soil in mapping are small areas of Alcester, Colo, Kezan, and Shell soils. Alcester soils are not subject to flooding, have a dark colored surface layer more than 24 inches thick, and are on foot slopes higher than the Hobbs soil in the landscape. Kezan soils are poorly drained. Colo soils are somewhat poorly drained. Kezan and Colo soils are slightly lower than the Hobbs soil in the landscape. Shell soils are stratified lower in the profile than the Hobbs soil and are in positions in the landscape similar to those of the Hobbs soil. The included soils make up 3 to 10 percent of the unit.

Permeability is moderate in the Hobbs soil. Available water capacity is high. Organic matter content is moderate. Natural fertility is high. Runoff is slow. The rate of water intake is moderate. Tilth is good. The soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Many areas are irrigated. Some areas are used for dryland crops. A few small areas are in introduced or native grasses. They are generally near channels and bends of creeks that are inaccessible to farm equipment.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. In some years, floodwater deposits silt, delays tillage, and limits production of small grain and alfalfa. Conserving water during dry years is a management concern. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture and to increase the content of organic matter.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Floodwater generally recedes within a few hours and seldom causes severe crop damage. Surface drainage with V-ditches helps to remove floodwater. Wetness in the spring commonly delays early planting. Sprinkler and gravity irrigation systems can be used. In areas irrigated by a gravity system, land preparation is needed to divert and intercept floodwater.

This soil is suited to introduced grasses for pasture. Pastures are generally brome grass or a mixture of grasses and legumes. Continuous overgrazing or grazing when the soil is too wet can cause surface compaction. Proper stocking rates, deferred grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses and grasslike plants, such as big bluestem, little bluestem, switchgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly Kentucky bluegrass, sedges, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks. Competition from weeds is a management concern. Weeds can be controlled by cultivating between the tree rows and by hand hoeing and applying appropriate herbicides in the rows.

This soil is generally not suited to use as sites for septic tank absorption fields, sewage lagoons, or buildings because of flooding. An alternative site should be selected.

Constructing roads and streets on suitable, well compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Hf—Hobbs silt loam, channeled. This deep, nearly level, well drained soil is on bottom lands of the larger creeks and their tributaries and in deep channels of meandering streams in the areas. The soil is subject to frequent flooding. Areas are long and narrow and range from 10 to 200 acres in size. Overall, slopes are 0 to 2 percent. The stream channels are very steep to vertical.

Typically, the surface layer has strata of dark gray and grayish brown, friable silt loam about 8 inches thick. The underlying material is stratified silt loam. It is dark grayish brown and grayish brown in the upper part, very dark grayish brown and dark grayish brown in the middle part, and brown in the lower part to a depth of more than 60 inches.

Included with this soil in mapping are small areas of Colo, Kezan, and Shell soils. Colo soils are somewhat poorly drained, and Kezan soils are poorly drained. Colo and Kezan soils are slightly lower than the Hobbs soil in the landscape. Shell soils are stratified lower in the profile than the Hobbs soil and are slightly higher than the Hobbs soil in the landscape. The included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the Hobbs soils. Available water capacity is high. Runoff is slow. The organic matter content is moderate. Natural fertility is low.

Nearly all of the acreage of this soil is in trees and native grasses and is used for grazing and as habitat for wildlife. A few small areas are in introduced grasses.

This soil is not suited to cultivation because frequent flooding is a hazard and many areas are not accessible to machinery. Streambank erosion can occur when streamflow is high.

In accessible areas, this soil is suited to introduced grasses for pasture. It is used for grazing mainly during dry periods. Flooding is a hazard. Proper stocking rates and, during the wettest periods, restricted grazing help to keep the pasture in good condition.

This soil is suited to range. The natural plant community is mostly mid and tall grasses and grasslike plants, such as big bluestem, little bluestem, switchgrass, and various sedges. If the plants are continuously overgrazed, the plant community is mostly Kentucky bluegrass, sedges, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is generally not suited to the trees and shrubs grown as windbreaks because of frequent flooding and general inaccessibility. In some areas, it is suited to the trees and shrubs grown as plantings that enhance wildlife habitat. The best suited species are those that can withstand flooding if hand planting or other special practices are used.

This soil is not suited to use as sites for sanitary facilities or buildings because of frequent flooding. An alternative site should be selected. Bridges or culverts are needed where roads cross areas of this soil. Constructing roads and streets on suitable, well compacted fill material above flood levels and establishing adequate side ditches help to prevent the damage caused by flooding. The surface pavement and base material should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage to roads caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

ImB—Inavale loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, somewhat excessively drained soil is on bottom lands. It is subject to rare flooding. It formed in sandy alluvium that, in places, has been reworked by wind. Areas typically range from 5 to 240 acres in size, but a few areas are more than 640 acres in size.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 6 inches thick. The transition layer is grayish brown, friable loamy fine sand about 12 inches thick. The underlying material is light gray fine sand to a depth of more than 60 inches. In some places, mottles are above a depth of 40 inches.

Included with this soil in mapping are small areas of Boel and Wann soils. Boel soils are somewhat poorly drained and are lower than the Inavale soil in the landscape. Wann soils are somewhat poorly drained and contain more silt and clay above a depth of 40 inches and are lower in the landscape than the Inavale soil. The included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Inavale soil. Available water capacity is low. Runoff is slow. Organic matter content is low. Natural fertility is low. The rate of water intake is very high. Tilth is good. The soil releases moisture readily to plants.

Most of the acreage of this soil is in either native or introduced grasses and is used for grazing. Some areas are used for cultivated crops. Most cultivated areas are irrigated.

If used for dryland farming, this soil is poorly suited to corn, soybeans, small grain, and alfalfa. Soil blowing is a severe hazard if the surface is not adequately protected by crops or crop residue. Conservation tillage practices, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases organic matter content, and improves fertility. Field windbreaks help to control soil blowing.

If irrigated, this soil is suited to corn and alfalfa. It is suited only to sprinkler irrigation. Soil blowing is a severe hazard. Conservation tillage systems that leave crop residue on the surface help to control soil blowing and to conserve soil moisture. Frequent, light applications of water are needed to avoid excessive leaching of plant nutrients and because the available water capacity is low. Returning crop residue to the soil helps to maintain tilth, increases organic matter content, and improves fertility.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in severe soil blowing. Sprinkler irrigation systems can be used.

This soil is suited to range and native hay. A cover of native plants is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly blue grama, hairy grama, sand dropseed, Scribner panicum, and annual and perennial weeds.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in slightly sandy soils. The survival rate of seedlings is higher if competing vegetation is controlled or removed by good site preparation and timely cultivation or application of appropriate herbicides. Maintaining strips of sod or an annual cover crop between the tree rows helps to control soil blowing. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing buildings on elevated, well compacted fill material prevents the damage caused by flooding. Constructing 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 IVe-5, dryland, and IIIe-11, irrigated; Sandy Lowland range site; windbreak suitability group 5.

ImD—Inavale loamy fine sand, 3 to 9 percent slopes. This deep, gently sloping or strongly sloping, somewhat excessively drained soil is on hummocks on bottom lands. It is subject to rare flooding. It formed in sandy alluvium that has been reworked by wind. Areas range from 5 to 100 acres in size.

Typically, the surface layer is grayish brown, loose loamy fine sand about 8 inches thick. The transition layer is pale brown, loose loamy fine sand about 8 inches thick. The underlying material is light gray fine sand to a depth of more than 60 inches. In some places, mottles are above a depth of 40 inches.

Included with this soil in mapping are small areas of Boel soils. Boel soils are somewhat poorly drained and are in low depressional areas. The included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Inavale soil. Available water capacity is low. Runoff is slow. Organic matter content is low. Natural fertility is low. The rate of water intake is very high.

Nearly all of the acreage of this soil is in either native or introduced grasses and is used for grazing. A few small areas are cultivated.

This soil is generally not suited to dryland crops because of soil blowing and droughtiness. These limitations are generally not practical to overcome if the soil is used for dryland farming.

If irrigated, this soil is poorly suited to corn and alfalfa. It is suited only to sprinkler irrigation. Soil blowing is a severe hazard. Frequent, light applications of water are needed to avoid excessive leaching of nutrients. Conservation tillage systems that keep crop residue on the soil most of the time help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

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 mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for many years, the less desirable plants invade the plant community, sand movement becomes very active, and blowouts develop in some areas.

This soil is suited to the coniferous trees grown as windbreaks for farmsteads and feedlots and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled by good site preparation. In addition, the trees should be planted in a shallow furrow where the soil has been disturbed as little as possible or in a strip where the vegetation has been killed by nonselective herbicides. Maintaining sod between the tree rows helps to control soil blowing. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by flooding. Constructing 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 VIe-5, dryland, and IVe-11, irrigated; Sands range site; windbreak suitability group 7.

InB—Inavale fine sandy loam, 0 to 3 percent slopes. This deep, nearly level or very gently sloping, somewhat excessively drained soil is on bottom lands. It is subject to rare flooding. It formed in sandy alluvium that, in places, has been reworked by wind. Areas range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 8 inches thick. The transition layer is grayish brown, loose loamy fine sand about 8 inches thick. The underlying material is very pale brown and light gray fine sand to a depth of more than 60 inches. In places, mottles are above a depth of 40 inches.

Included with this soil in mapping are small areas of Boel and Wann soils. Boel and Wann soils are somewhat poorly drained and are lower than the Inavale soil in the landscape. Also, Wann soils contain more silt and clay above a depth of 40 inches. The included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Inavale soil. Available water capacity is low. Runoff is slow. Organic matter content is low. Natural fertility is low. The rate of water intake is very high. Tilth is good. The soil releases moisture readily to plants.

Most of the acreage of this soil is in either native or introduced grasses and is used for grazing. Some areas are used for cultivated crops. Most cultivated areas are irrigated. A few small areas are used for dryland farming.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Soil blowing is a moderate hazard if the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility. Field windbreaks help to control soil blowing.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. It is suited only to sprinkler irrigation. Soil blowing is a moderate hazard. Frequent, light applications of water are needed to avoid excessive leaching of nutrients and because the available water capacity is low. Conservation tillage systems that keep crop residue on the soil most of the time help to control soil blowing and to reduce the evaporation rate. Returning crop residue to the soil helps to maintain tilth, increases organic matter content, and improves fertility.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and can result in severe soil blowing. Sprinkler irrigation systems can be used.

This soil is suited to range and native hay. A permanent cover of native grasses is effective in controlling soil blowing. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly blue grama, hairy grama, sand dropseed, Scribner panicum, and annual and perennial weeds.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in slightly sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and timely cultivation or application of appropriate herbicides. Maintaining strips of sod or an annual cover crop between the tree rows helps to control soil blowing. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by flooding. Constructing 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 IIIe-3, dryland, and IIIe-11, irrigated; Sandy Lowland range site; windbreak suitability group 5.

Iw—Ipage-Els loamy fine sands, 0 to 3 percent slopes. These deep, nearly level and very gently sloping soils formed in eolian and alluvial sand on stream terraces and in sandhill valleys. The Ipage soil is moderately well drained. The Els soil is somewhat poorly drained and is subject to rare flooding. Areas of these soils range from 5 to 100 acres in size. They are 50 to 60 percent Ipage soil on the higher, very gently sloping parts of the landscape and 35 to 45 percent Els soil on the low, nearly level parts. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Ipage soil has a surface layer of dark grayish brown, very friable loamy fine sand about 7 inches thick. The transition layer is brown, very friable fine sand about 5 inches thick. The underlying material is pale brown and very pale brown fine sand to a depth of more than 60 inches. Some small areas are excessively drained.

Typically, the Els soil has a surface layer of dark grayish brown, very friable loamy fine sand about 8 inches thick. The transition layer is grayish brown, very friable loamy fine sand about 4 inches thick. The underlying material is mottled fine sand. It is very pale brown and light gray in the upper part and white in the lower part to a depth of more than 60 inches.

Included with these soils in mapping are small areas of Thurman soils. Thurman soils are somewhat excessively drained, are dark to a depth of 10 to 20 inches, and are higher than the Ipage and Els soils in the landscape. The included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Ipage and Els soils. Available water capacity is low. Runoff is slow. In the Ipage soil, the apparent seasonal high water table ranges from a depth of about 3 feet in most wet seasons to about 6 feet in most dry seasons. In the Els soil, the apparent seasonal high water table ranges from about 1.5 feet in most wet seasons to about 3.0 feet in most dry seasons. Organic matter content and natural fertility are low. The rate of water intake is very high. Tilth is good.

Nearly all the acreage of these soils is in native grasses and is used for range. A few small areas are cultivated.

If used for dryland farming, these soils are poorly suited to corn, small grain, and alfalfa. Soil blowing is a severe hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as ridge till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and to conserve soil moisture. On the Els soil, tillage in most years is delayed in early spring because of the seasonal high water table. Returning crop residue to the surface helps to improve tilth, increases the organic matter content, and improves fertility.

If irrigated, these soils are poorly suited to corn and alfalfa. Soil blowing is a severe hazard. On the Els soil, tillage is delayed in the spring of most years because of the seasonal high water table. Conservation tillage systems that keep the surface covered with residue most of the time help to control soil blowing and to conserve soil moisture. Ridge till-plant is best suited because ridges warm up and dry out faster in spring. In irrigation, small, frequent applications of water are needed because of the low available water capacity. These applications help to avoid excessive leaching of plant nutrients. Returning crop residue to the soil helps to improve tilth, increases the organic matter content, and improves fertility.

These soils are suited to range and native hay. On the Els soil, the natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

On the Ipage soil, a permanent cover of native grasses is effective in controlling soil blowing. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly blue grama, hairy grama, sand dropseed, Scribner panicum, and annual and perennial weeds.

These soils are suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought on the Ipage soil and the moderately high water table on the Els soil and can be grown in slightly sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation. Weeds can be controlled by use of appropriate herbicides in the tree rows. Maintaining strips of sod or an annual cover crop between the rows helps to control soil blowing. Cultivation with conventional equipment generally should be restricted to the rows.

Because of wetness and rare flooding, the Els soil is not suited to use as sites for septic tank absorption fields or dwellings. The Ipage soil is suited to use as building sites, but the seasonal high water table somewhat limits its use as sites for buildings with basements. Because of the rapid permeability in the underlying material, these soils do not adequately filter the effluent in a waste disposal system. The poor filtering capacity can result in ground water pollution. Seepage is a hazard on sites for septic tank absorption fields and sewage lagoons. It can result in ground water pollution. Alternative sites for these uses should be selected. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving.

Constructing roads and streets on suitable, compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding and wetness. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IVw-5, dryland, and IVw-11, irrigated. The Ipage soil is in Sandy Lowland range site and windbreak suitability group 5. The Els soil is in Subirrigated range site and windbreak suitability group 2S.

Jm—Janude fine sandy loam, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is on high bottom lands. It is subject to rare flooding. The soil formed in loamy alluvium. Areas range from 15 to more than 600 acres in size.

Typically, the surface layer is very dark grayish brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is very dark grayish brown, very friable fine sandy loam about 10 inches thick. The transition layer is dark grayish brown, very friable fine sandy loam about 15 inches thick. The underlying material is light brownish gray sandy loam in the upper part, light brownish gray loamy fine sand in the middle part, and light gray fine sand in the lower part to a depth of more than 60 inches. In some places the dark colored surface soil is less than 18 inches thick. In some places, the soil contains more silt, and in other places, it contains more clay. In some places, layers of sandy clay loam or clay loam are below a depth of 40 inches.

Included with this soil in mapping are small areas of Gibbon and Wann soils. These soils are calcareous, somewhat poorly drained, and lower than the Janude soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Janude soil. Available water capacity is moderate. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 4 feet in most wet seasons to about 6 feet in most dry seasons. Organic matter content is moderate. Natural fertility is medium. The rate of water intake is moderately high. Tilth is good. The soil is easily tilled throughout a wide range of moisture content. It releases moisture readily to plants.

Nearly all the acreage of this soil is cultivated. Some areas are irrigated.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. In the spring, the water table is highest and provides supplemental moisture for deep-rooted crops. Soil blowing is a moderate hazard if the surface is not adequately protected by crops or crop residue. Late in the growing season, droughtiness is a hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and conserve soil moisture. Returning crop residue to the soil and applying manure help to maintain tilth and increase the organic matter content.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Soil blowing is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and conserve soil moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil helps to increase the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil reduces runoff at the end of the field and minimizes deep percolation.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in soil blowing. Rotation grazing and proper stocking rates help to maintain the pasture in good condition. Sprinkler or gravity irrigation systems can be used.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in slightly sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and timely cultivation with conventional equipment between the tree rows. Appropriate herbicides can be used in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

Rare flooding is a limitation to use of this soil as sites for sanitary facilities and buildings. Constructing septic tank absorption fields on fill material helps to raise the absorption field to a sufficient distance above the seasonal high water table. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding. Constructing buildings on elevated, well compacted fill material prevents the damage caused by flooding. Constructing 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 the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to reduce the damage caused by frost action.

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

Jn—Janude loam, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is on high bottom lands. It is subject to rare flooding. It formed in loamy and sandy alluvium. Areas range from 5 to several hundred acres in size.

Typically, the surface layer is dark grayish brown, very friable loam about 8 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 7 inches thick. The transition layer is grayish brown, very friable fine sandy loam about 21 inches thick. The underlying material is grayish brown fine sandy loam in the upper part and light gray, mottled fine sand in the lower part to a depth of more than 60 inches. In some places, the soil contains more silt. In other places, the dark colored surface soil is more than 20 inches thick.

Included with this soil in mapping are small areas of Boel, Inavale, and Wann soils. Boel and Wann soils are somewhat poorly drained and slightly lower than the Janude soil in the landscape. Inavale soils are somewhat excessively drained and slightly higher than the Janude soil in the landscape. The included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Janude soil. Available water capacity is moderate. Runoff is slow. The apparent seasonal high water table ranges from a depth of 4 feet in most wet years to 6 feet in most dry years. Organic matter content is moderate. Natural fertility is medium. The rate of water intake is moderately high. Tilth is good. The soil is easily tilled throughout a wide range of moisture content. It releases moisture readily to plants.

Nearly all the acreage of this soil is cultivated. Much of the acreage is irrigated. Some small areas are in grasses and are used for pasture or hay.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. In the spring, the water table is highest and provides supplemental moisture for deep-rooted crops. Soil blowing is a moderate hazard if the surface is not adequately protected by crops or crop residue. Late in the growing season, droughtiness is a hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil and applying manure help to maintain tilth and increase the organic matter content.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Soil blowing is the principal hazard. Conservation tillage practices, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil helps to increase the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil reduces runoff at the end of the field and minimizes deep percolation.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler or gravity irrigation systems can be used.

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses, such as big bluestem, little bluestem, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly Kentucky bluegrass, tall dropseed, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and cultivation with conventional equipment between the tree rows. Appropriate herbicides can be used in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

Rare flooding is a limitation to use of this soil as sites for sanitary facilities and buildings. This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. Constructing septic tank absorption fields on fill material helps to raise the absorption field to a sufficient distance above the seasonal high water table. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding. Constructing buildings on elevated, well compacted fill material helps to prevent the structural damage caused by flooding. Constructing 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 the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to reduce the damage to roads caused by frost action.

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

Kz—Kezan silt loam, 0 to 2 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands of upland drainageways. It formed in silty alluvium. It is subject to frequent flooding. Areas range from 5 to 100 acres in size.

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

Included with this soil are small areas of Colo, Hobbs, Shell, and Zook soils. Colo soils are somewhat poorly drained and are in positions in the landscape similar to those of the Kezan soil. Hobbs soils are well drained and are slightly higher than the Kezan soil in the landscape. Shell soils are well drained and are higher than the Kezan soil in the landscape. Zook soils have a darker colored surface layer, have more clay in the subsoil, and are at slightly lower elevations than the Kezan soil. The included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Kezan soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 1 foot in most wet seasons to about 3 feet in most dry seasons. Organic matter content is moderate. Natural fertility is medium. Tilth is poor.

Nearly all the acreage of this soil is in introduced or native grasses and is generally used for grazing. Some areas are used as habitat for wetland wildlife. A few small areas are cultivated.

If used for dryland farming, this soil is poorly suited to common cultivated crops because of flooding and the seasonal high water table. The best suited crops are alfalfa and grain sorghum. Installing V-ditches improves drainage, and land leveling improves surface drainage. The soil is not suited to irrigation because of wetness and flooding. It is slow to warm up in the spring, and tillage is commonly delayed.

This soil is poorly suited to introduced grasses for pasture because of wetness. Creeping foxtail and reed canarygrass are best suited to this soil. Artificial drainage with V-ditches or perforated tile is needed for most common introduced grasses.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

This soil is suited to the trees and shrubs grown as windbreaks. The best suited species are those that are tolerant of wetness and flooding. Weeds and grasses can be controlled by disking between the tree rows and hoeing by hand or rototilling in the rows. Installing V-ditches, if needed, improves drainage.

This soil is not suited to septic tank absorption fields, sewage lagoons, or dwellings because of flooding and wetness. An alternative site should be selected. Bridges and culverts are common on roads that cross areas of this soil. Constructing roads and streets 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 wetness. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability unit is IVw-4, dryland; Subirrigated range site; windbreak suitability group 2W.

La—Lamo silty clay loam, 0 to 1 percent slopes. This deep, somewhat poorly drained, nearly level soil is on bottom lands of Shell Creek, larger upland drainageways, and bottom lands of the Loup River. It formed in silty, calcareous alluvium. It is subject to occasional flooding. Areas range from 10 to 200 acres in size.

Typically, the surface layer is dark gray, firm silty clay loam about 7 inches thick. The subsurface layer is dark gray, firm silty clay loam about 15 inches thick. The transition layer is gray, firm silty clay loam about 7 inches thick. The underlying material is silty clay loam. It is gray in the upper part and light gray in the lower part to a depth of more than 60 inches. In some areas, the dark surface soil is 10 to 20 inches thick.

Included with this soil in mapping are small areas of Zook soils. Zook soils are poorly drained, have more clay in the subsoil than the Lamo soil, and are slightly lower in the landscape. The included soils make up 5 to 10 percent of the map unit.

Permeability is moderately slow in the Lamo soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 2 feet in most wet seasons to about 3 feet in most dry seasons. Organic matter content is moderate. Natural fertility is high. The soil releases moisture readily to plants. Shrink-swell potential is high. The rate of water intake is low. The soil releases moisture readily to plants.

This soil is used for cultivation and is in native or introduced grasses and is used for grazing or haying. The cultivated areas are used for dryland or irrigated crops.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, grain sorghum, and alfalfa. Row crops can be grown in consecutive years under a high level of management. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Wetness and occasional flooding in the spring commonly delay tillage. Tile drainage or V-ditches help to improve drainage.

If irrigated, this soil is suited to corn, soybeans, and grain sorghum and to such close-growing crops as alfalfa. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. The main limitation is wetness caused by the seasonal high water table. The soil is somewhat difficult to work because it tends to form hard clods if tilled when wet. Perforated tile improves drainage, and V-ditches remove surface water. Gravity and sprinkler irrigation systems can be used. Land leveling improves surface drainage and increases the efficiency of irrigation.

This soil is suited to introduced grasses for pasture. Pastures are usually smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Proper stocking rates, rotation grazing, and restricted use during wet periods help to keep the pasture in good condition. Fertilizer helps to increase the growth and vigor of the grasses.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

This soil is suited to the trees and shrubs grown as windbreaks. The only suited species are those that are tolerant of a moderately high water table. Competition from weeds and undesirable grasses is an important management concern. Weeds and grasses can be controlled by cultivation between the tree rows and use of selected herbicides in the rows.

This soil is not suited to use as sites for septic tank absorption fields or buildings because of occasional flooding and wetness. An alternative site should be selected. On sites for sewage lagoons, dikes protect the lagoon from flooding. Constructing the lagoon on fill material helps to raise the bottom of the lagoon to a sufficient height above the seasonal high water table.

Constructing roads and streets 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 wetness. The surface pavement and base material should be thick enough to compensate for the low strength of this soil. Providing coarser grained base material and mixing in additives, such as hydrated lime, help to prevent excessive shrinking and swelling.

The capability units are IIw-4, dryland, and IIw-3, irrigated; Subirrigated range site; windbreak suitability group 2S.

Lc—Lamo silty clay loam, wet, 0 to 1 percent slopes. This deep, poorly drained soil is on bottom lands of major upland drainageways. It is subject to occasional flooding. It formed in silty, calcareous alluvium. Areas range from 10 to 20 acres in size.

Typically, the surface layer is very dark gray, firm silty clay loam about 6 inches thick. The subsurface layer is dark gray, firm silty clay loam about 17 inches thick. The transition layer is dark gray, firm silty clay loam about 7 inches thick. The underlying material is gray silty clay loam to a depth of more than 60 inches. In places the soils are better drained.

Included with this soil in mapping are small areas of Kezan soils. Kezan soils are stratified, do not have free carbonates in the surface layer, and are in positions in the landscape similar to those of the Lamo soil. The included soils make up 5 to 10 percent of the unit.

Permeability is moderately slow in the Lamo soil. Available water capacity is high. Runoff is very slow or ponded. The apparent seasonal high water table ranges from a depth of 0.5 foot below the surface in most wet seasons to about 1.5 feet in most dry seasons. Organic matter content is high. Natural fertility is medium. Shrink-swell potential is moderate.

Nearly all of the acreage of this soil is in native grasses. The soil is used for grazing and as habitat for wetland wildlife.

This soil is not suited to any of the cultivated crops commonly grown in the area because of wetness and flooding.

This soil is poorly suited to pasture because of wetness. Reed canarygrass or prairie cordgrass is commonly grown in the area. Artificial drainage is needed for most tame pasture grasses.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as prairie cordgrass, bluejoint reedgrass, northern reedgrass, and various sedges. Also, timothy, redtop, reed canarygrass, clovers, or all of these may be overseeded. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, Kentucky bluegrass, sedges, and rushes. If the plants are grazed in early spring or overgrazed, small mounds develop and interfere with grazing or haying.

This soil is not suited to the trees and shrubs grown as windbreaks because of flooding and the seasonal high water table.

Because of flooding and the seasonal high water table, this soil is not suited to use as sites for sanitary facilities or buildings. Special design and installation are needed. An alternative site generally should be selected. On sites for sanitary facilities, seepage into the ground water is a hazard. In places, roads and streets can be constructed on fill material. Bridges and culverts are commonly needed on roads that cross areas of this soil.

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

Ld—Lawet silt loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands near Lost Creek. It is subject to occasional flooding. It formed in loamy, calcareous alluvium. Areas range from 20 to 250 acres in size.

Typically, the surface layer is dark gray, very friable silt loam about 7 inches thick. The subsurface layer is gray, very friable loam about 8 inches thick. The subsoil is about 19 inches thick. It is light brownish gray, friable loam in the upper part and light gray, friable sandy clay loam in the lower part. The underlying material is light brownish gray sandy clay loam in the upper part and light brownish gray silt loam in the lower part to a depth of more than 60 inches. In some places, the dark color of the surface layer extends to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Gayville, Gibbon, and Lamo soils. Gayville soils are strongly affected by saline-alkali reaction. Gibbon soils are somewhat poorly drained. Lamo soils are lower than the Lawet soil in the landscape and support wetland vegetation. The included soils make up 10 to 15 percent of the unit.

Permeability is moderately slow in the Lawet soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 1 foot in most wet seasons to about 2 feet in most dry seasons. Organic matter content is moderate. Natural fertility is medium. The rate of water intake is low. The soil can be tilled within only a narrow range of moisture content to maintain good tilth.

Most areas of this soil are in native grasses and are used for grazing or haying. Some areas are used for cultivated crops. Drainage is generally needed before row crops, small grain, or introduced grasses can be grown.

If used for dryland farming, this soil is poorly suited to corn, soybeans, small grain, and alfalfa. Wetness caused by the seasonal high water table is the principal limitation. Tillage is generally delayed in the spring. Conservation tillage systems, such as ridge till-plant, that leave maximum amounts of crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil and applying manure help to improve tilth, increase the organic matter content and the rate of water intake, and improve fertility.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Proper stocking rates, rotation grazing, and restricted use during wet periods help keep the pasture in good condition. Fertilizer helps to maintain fertility.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

This soil is suited to the trees and shrubs grown as windbreaks. The only suited species are those that are tolerant of a moderately high water table. Competition from weeds and undesirable grasses is an important management concern. Weeds and grasses can be controlled by cultivating between the tree rows and applying appropriate herbicides in the rows.

This soil is not suited to use as sites for septic tank absorption fields or buildings because of flooding and the seasonal high water table. An alternative site should be selected. On sites for sewage lagoons, dikes protect the lagoon from flooding. Fill material is needed to raise the bottom of the lagoon to a sufficient height above the seasonal high water table.

Constructing roads and streets 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 the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability unit is IVw-4, dryland; Subirrigated range site; windbreak suitability group 2W.

Lo—Loup loam, wet, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil is on bottom lands along the Platte and Loup Rivers. It is subject to rare flooding. It formed in recent sandy alluvium. Areas are long and narrow and range from 5 to 80 acres in size.

Typically, the surface layer is dark gray, friable loam about 3 inches thick. The subsurface layer is friable, mottled loam about 10 inches thick. It is dark gray in the upper part and very dark gray in the lower part. The underlying material is light gray, mottled fine sand to a depth of more than 60 inches.

Included with this soil in mapping are small areas of Boel and Wann soils. Boel soils are somewhat poorly drained and are slightly higher in the landscape than the Loup soil. Wann soils are somewhat poorly drained, contain more silt and less sand between depths of 20 and 40 inches than the Loup soil, and are slightly higher in the landscape. Included areas make up 5 to 10 percent of the unit.

Permeability is rapid in the Loup soil. Available water capacity is low. Runoff is slow. The apparent seasonal high water table ranges from about 0.5 foot above the surface in most wet seasons to about 1.0 foot below the surface in most dry seasons. Organic matter content is high. Natural fertility is low.

Nearly all of the acreage of this soil is in native grasses and is used for grazing or haying. A few small areas have a few willow trees along the edge of the unit.

This soil is not suited to cultivation because of wetness.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as prairie cordgrass, bluejoint reedgrass, northern reedgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, Kentucky bluegrass, sedges, and rushes. If the plants are grazed in early spring or overgrazed, small mounds develop and interfere with grazing and haying.

Because of the seasonal high water table and frequent flooding, this soil is generally not suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Onsite investigation is needed to determine if small areas are suitable for planting.

This soil is not suited to use as sites for sanitary facilities or buildings because of frequent flooding and the seasonal high water table. The soil does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. A suitable alternative site is needed. Constructing roads and streets on suitable, well compacted fill material helps to prevent the damage caused by flooding and the seasonal high water table. Bridges and culverts are commonly needed on roads that cross areas of this soil.

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

Me—Merrick loam, 0 to 1 percent slopes. This deep, nearly level, moderately well drained soil is on high bottom lands. It is subject to rare flooding. It formed in silty and loamy alluvium. Areas range from 35 to 200 acres in size.

Typically, the surface layer is dark grayish brown, very friable loam about 11 inches. The subsurface layer is friable loam about 18 inches thick. It is dark gray in the upper part and dark grayish brown in the lower part. The underlying material is grayish brown loam in the upper part and light brownish gray clay loam in the lower part to a depth of more than 60 inches. In some places, the dark colored surface soil is less than 20 inches thick. In places, carbonates are above a depth of 30 inches.

Included with this soil in mapping are small areas of Gibbon soils. Gibbon soils are somewhat poorly drained and calcareous throughout and are lower than the Merrick soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Merrick soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 4 feet in most wet seasons to about 6 feet in most dry seasons. Organic matter content is moderate. Natural fertility is high. The rate of water intake is moderate. Tilth is good, and the soil is easily tilled throughout a wide range of moisture content.

Nearly all of the acreage of this soil is cultivated. Most areas are used for irrigated crops. A few areas are used for dryland crops. A few small areas are in introduced grasses and are used for pasture.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil and applying manure maintain tilth and increase the organic matter content.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Soil blowing is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Fertilizers, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil increases the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil reduces runoff at the end of the field and minimizes deep percolation. Constructing a tailwater recovery system helps to conserve water.

This soil is suited to introduced grasses for pasture. Pasture and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover and causes low plant vigor. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler or gravity irrigation systems can be used.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and cultivation with conventional equipment between the tree rows. Appropriate herbicides can be used in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

Rare flooding is a limitation to use of this soil as sites for sanitary facilities and buildings. Constructing septic tank absorption fields on fill material helps to raise the absorption field to a sufficient distance above the seasonal high water table. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by flooding.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained base material helps to ensure better performance.

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

Mo—Moody silty clay loam, 0 to 1 percent slopes. This deep, well drained, nearly level soil is on a high terrace. It formed in loess. Areas range from 15 to more than 500 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 22 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material is pale brown. It is silty clay loam in the upper part and silt loam in the lower part to a depth of more than 60 inches. In some places, the dark color of the surface layer extends to a depth of more than 20 inches. In places, carbonates are above a depth of 30 inches.

Included with this soil in mapping are small areas of Fillmore soils. Fillmore soils are poorly drained and in shallow depressions. The included soils make up 5 to 10 percent of the unit.

Permeability is moderately slow in the Moody soil. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. Shrink-swell potential is moderate. The rate of water intake is low. The surface layer can be tilled only within a narrow range of moisture content to maintain good tilth.

Nearly all of the acreage of this soil is cultivated (fig. 10). Most areas are used for dryland farming, and some areas are irrigated. A few small areas are in introduced grasses and are used for pasture.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil and applying manure help to maintain tilth, increase the organic matter content and the rate of water intake, and improve fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Fertilizer, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil increases the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep

Figure 10.—An area of Moody silty clay loam, 0 to 1 percent slopes. The crops are corn and soybeans.

percolation. Constructing a tailwater recovery system helps to conserve water.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Continuous overgrazing or grazing when the soil is wet can cause surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. They require care after planting to survive. Weeds can be controlled by cultivation between the tree rows and by use of appropriate herbicides in the rows. Newly planted trees need watering if rainfall is insufficient.

The moderately slow permeability is a limitation to use of this soil as sites for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Strengthening foundations for buildings and backfilling with coarse material help to prevent the damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

MoB—Moody silty clay loam, 1 to 3 percent slopes. This deep, well drained, very gently sloping soil is on broad ridgetops of loess uplands and on high terraces. Areas range from 5 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 8 inches thick. The subsoil is friable silty clay loam about 29 inches thick. It is dark grayish brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material is light yellowish brown silty clay loam in the upper part and light yellowish brown silt loam in the lower part to a depth of more than 60 inches. In some places, carbonates are above a depth of 30 inches. In places, the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Belfore and Fillmore soils and small areas of eroded Moody soils. Belfore soils have more clay in the subsoil than the Moody soil and are in positions in the landscape similar to those of the Moody soil. Fillmore soils are poorly drained and very poorly drained and in shallow depressions. The eroded Moody soils are on shoulders at the lower elevations. The included soils make up 3 to 10 percent of the unit.

Permeability is moderately slow in the Moody soil. Available water capacity is high. Runoff is medium. The organic matter content is moderate. Natural fertility is high. Shrink-swell potential is moderate. The rate of water intake is low. Tilth is good. This soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most areas are used for dryland farming, but some are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Water erosion is the principal hazard. Water conservation is an important management concern, especially during years of below average rainfall. Terraces help to control erosion and to reduce the loss of surface water. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to control soil blowing.

If irrigated, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Water erosion is the principal hazard. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to increase the rate of water intake. Bench leveling is suited to this soil. Contour furrows are suited if used in combination with terraces and grassed waterways. Center-pivot sprinkler systems are well suited. The application rate of water should be carefully controlled so that it does not exceed the rate of water intake.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Proper stocking rates, rotation grazing, and nitrogen fertilizer help keep the pasture in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. They require care after planting to survive. Weeds can be controlled by cultivation between the tree rows and by use of appropriate herbicides in the rows. Watering of newly planted trees is needed when rainfall is insufficient. Planting windbreaks on the contour, in combination with terraces, helps to conserve water and to control erosion.

The moderately slow permeability is a limitation to use of this soil as sites for septic tank absorption fields. It generally can be overcome by increasing the size of the absorption field. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. Strengthening foundations for buildings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

MoC—Moody silty clay loam, 3 to 6 percent slopes. This deep, well drained, gently sloping soil is on ridgetops and side slopes in the loess uplands. Areas range from 5 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 25 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material is pale brown silty clay loam in the upper part and light yellowish brown silt loam in the lower part to a depth of more than 60 inches. In some places, free carbonates are above a depth of 30 inches. In places the soil is dark to a depth of more than 20 inches.

Included with this soil in mapping are small areas of Fillmore soils and eroded Moody and Nora soils. Fillmore soils are poorly drained and very poorly drained and in shallow depressions at the lower elevations. Eroded Moody and Nora soils are on the steeper side slopes. The included soils make up 3 to 10 percent of the map unit.

Permeability is moderately slow in the Moody soil. Available water capacity is high. Runoff is medium. Organic matter content is moderate. Natural fertility is high. Shrink-swell potential is moderate. The rate of water intake is low. Tilth is good. The soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most areas are used for dryland farming, but some are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa (fig. 11). Water erosion is the principal hazard. Water conservation is an important management concern, especially during years of below average rainfall. Terraces help to control soil erosion and to reduce loss of surface water. Conservation tillage systems that leave crop residue on the surface help to conserve soil moisture and to control soil erosion.

If irrigated, this soil is suited to such row crops as corn and soybeans and to such close-growing crops as alfalfa. Water erosion is the principal hazard. Conservation tillage systems that leave crop residue on the surface help to conserve soil moisture and to control erosion. Bench leveling is suited to this soil. Contour furrows are suited if used with terraces and grassed waterways. Center-pivot sprinkler systems are well suited. The application rate of water should be carefully controlled so that is does not exceed the water intake rate.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can cause surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range. A cover of range plants is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. They require care after planting to survive. Weeds can be controlled by cultivation between the tree rows and by use of appropriate herbicides in the row. Watering of newly planted trees is needed if rainfall is insufficient. Planting windbreaks on the contour, in combination with terraces, helps to conserve water and to control erosion.

The moderately slow permeability is a limitation to use of this soil as sites for septic tank absorption fields. It can generally be overcome by increasing the size of the absorption field. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. Strengthening foundations for buildings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

MoC2—Moody silty clay loam, 3 to 6 percent slopes, eroded. This deep, well drained, gently sloping

Figure 11.—A field of alfalfa in an area of Moody silty clay loam, 3 to 6 percent slopes. Alfalfa helps to control water erosion.

soil is on side slopes and ridgetops in the loess uplands. Rills are common after heavy rains. Areas range from 5 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 6 inches thick. In most of the areas of the soil, erosion has partly removed the original darkened surface layer and tillage is in the remaining surface layer and the subsoil. The subsoil is friable silty clay loam about 28 inches thick. It is brown in the upper part and yellowish brown in the lower part. The underlying material is light yellowish brown silt loam to a depth of more than 60 inches. In some places, carbonates are above a depth of 30 inches.

Included with this soil in mapping are areas of Alcester and Crofton soils. Alcester soils are dark to a depth of more than 20 inches. They are lower than the Moody soil in the landscape and are along intermittent drainageways. Crofton soils are calcareous at or near the surface and are in positions in the landscape similar to those of the Moody soil. The included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow in the Moody soil. Available water capacity is high. Runoff is medium. Organic matter content is moderately low. Natural fertility is medium. Shrink-swell potential is moderate. The rate of water intake is low. Tilth is fair.

Most of the acreage of this soil is cultivated. Most areas are used for dryland farming, but some are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Water erosion is the major hazard. During periods of prolonged drought, water conservation is important. Terraces and grassed waterways in combination with contour farming help to control erosion and to reduce the evaporation rate. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to control water erosion.

If irrigated, this soil is suited to corn and soybeans. It is better suited to close-growing crops, such as alfalfa. Water erosion is the principal hazard. Contour furrows can be used in combination with terraces and grassed waterways. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to control erosion. Bench leveling is also suited to this soil. Sprinkler irrigation systems are well suited. Also, center-pivot systems are well suited because the application rate of water can be controlled so that it does not exceed the water intake rate.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome and orchardgrass or a mixture of smooth brome and legumes. Overgrazing or grazing when the soil is wet can cause surface compaction. Rotation grazing, proper stocking rates, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range. A cover of range plants is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for many years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species planted in a well prepared site survive and grow well. Weeds can be controlled by cultivating between the trees rows and by applying appropriate herbicides in the rows. Watering of seedlings is needed when rainfall is insufficient.

The moderately slow permeability is a limitation to use of this soil as sites for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Sealing the lagoon helps to prevent seepage. Strengthening building foundations and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

MoD2—Moody silty clay loam, 6 to 11 percent slopes, eroded. This deep, well drained, strongly sloping soil is on side slopes of loess uplands. Rills are common after heavy rains. Areas range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 5 inches thick. Erosion has removed most of the original surface layer, and tillage is in the remaining surface layer and the subsoil. The subsoil is friable silty clay loam about 26 inches thick. It is brown in the upper part and yellowish brown in the lower part. The underlying material is light yellowish brown silty clay loam in the upper part and light yellowish brown silt loam in the lower part to a depth of more than 60 inches. In some places, carbonates are above a depth of 30 inches.

Included with this soil in mapping are small areas of Crofton soils and areas of uneroded Moody and Nora soils in similar landscape positions. Crofton soils are calcareous at or near the surface and are on the steeper part of side slopes. The included soils make up 5 to 10 percent of the unit.

Permeability is moderately slow in the Moody soil. Available water capacity is high. Runoff is medium. Organic matter content is moderately low. Natural fertility is medium. Shrink-swell potential is moderate. The soil readily releases moisture to plants. The rate of water intake is low. Tilth is fair.

Most of the acreage of this soil is farmed. Most areas are used for dryland farming, but a few areas are irrigated. A few small areas, generally near farmsteads, are in introduced or native grasses.

If used for dryland farming, this soil is suited to such row crops as corn, soybeans, and grain sorghum. It is better suited to such close-growing crops as alfalfa and small grain. Water erosion is the principal hazard. Conserving water is a major management concern. Growing crops in rotation helps to lower susceptibility to insects and diseases. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to control water erosion and to conserve soil moisture. Terraces and grassed waterways help to control erosion and to conserve surface water.

If irrigated, this soil is poorly suited to such row crops as corn and grain sorghum. It is better suited to such close-growing crops as alfalfa and small grain. Water erosion is the principal hazard. Terraces and grassed waterways help to control erosion. Sprinkler systems are well suited because the water application rate can be controlled and less land shaping is needed to modify the slope for irrigation.

This soil is suited to introduced grasses for pasture. Pastures are generally smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes surface compaction. Rotation grazing, nitrogen fertilizer, and proper stocking rates help to keep the pasture in good condition.

The soil is suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if planted in a well prepared site, survive and grow well. Planting trees on the contour, in combination with terraces, and growing a cover crop help to control erosion. Weeds can be controlled by cultivating between the tree rows and by applying appropriate herbicides in the rows. Watering of young trees is needed when rainfall is insufficient.

The moderately slow permeability of this soil is a limitation as sites for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. Land shaping and installing the absorption field on the contour help to ensure that the system operates properly. On sites for sewage lagoons, extensive grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. Strengthening foundations for buildings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Mp—Moody silty clay loam, terrace, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on high stream terraces. Areas range from 10 to 300 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 6 inches thick. The subsurface layer is dark grayish brown, friable silty clay loam about 6 inches thick. The subsoil is friable silty clay loam about 30 inches thick. It is dark brown in the upper part, brown in the middle part, and pale brown in the lower part. The underlying material is light yellowish brown silty clay loam to a depth of more than 60 inches. In some places, the surface layer is more than 20 inches thick.

Included with this soil in mapping are small areas of Hobbs soils and areas of eroded soils. Hobbs soils are stratified in the upper 10 inches and are in positions in the landscape similar to those of the Moody soil. The included soils make up 5 to 10 percent of the unit.

Permeability is moderately slow in the Moody soil. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. Shrink-swell potential is moderate. The rate of water intake is low. Tilth is good. This soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most areas are used for dryland farming, but some areas are irrigated. A few small areas, generally near farmsteads, are in introduced grasses.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Conserving water is an important management concern. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture.

If irrigated, this soil is suited to such row crops as corn, soybeans, and grain sorghum and to such close-growing crops as alfalfa and small grain. This soil tends to form clods if tilled when wet. Gravity and sprinkler irrigation systems are suited to row crops. Land leveling and a tailwater recovery system increase the efficiency of water use for gravity systems. Center-pivot systems are well suited. The application rate of water needs to be adjusted so that it does not exceed the water intake rate. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to increase the rate of water intake.

This soil is suited to introduced grasses for pasture. Pastures commonly consist of a mixture of smooth brome or orchardgrass and alfalfa. Overgrazing when the soil is wet can cause surface compaction. Rotation grazing, nitrogen fertilizer, and proper stocking rates help to keep the pasture in good condition.

This soil is suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. They need care after planting to survive. Weeds can be controlled by cultivation between the tree rows and by use of appropriate herbicides in the rows. Watering of newly planted trees is needed when rainfall is insufficient.

The moderately slow permeability of this soil is a limitation to use as sites for septic tank absorption fields. It can generally be overcome by increasing the size of the absorption field. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Strengthening building foundations and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarse grained subgrade or base material helps to ensure better performance. A surface drainage system helps to reduce the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

MtC2—Moody-Thurman complex, 2 to 6 percent slopes, eroded. These deep, gently sloping soils are on high terraces. The Moody soil is well drained and formed in loess, mainly on side slopes and foot slopes. The Thurman soil is somewhat excessively drained and formed in eolian sand, mainly on convex shoulder slopes and ridgetops. Erosion has removed most of the original surface layer of these soils. Areas range from 6 to 110 acres in size. They are 50 to 65 percent Moody soil and 30 to 40 percent Thurman soil. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Moody soil has a surface layer of dark grayish brown, firm silty clay loam about 6 inches thick. The subsoil is brown, firm silty clay loam about 25 inches thick. The underlying material is pale brown silt loam to a depth of 48 inches and very pale brown very fine sandy loam to a depth of more than 60 inches. In some places, the subsoil contains more sand. In places, the soil is dark to a depth of more than 20 inches. In some places, carbonates are above a depth of 30 inches.

Typically, the Thurman soil has a surface layer of brown, very friable loamy fine sand about 6 inches thick. The transition layer is brown, very friable loamy fine sand about 9 inches thick. The underlying material is very pale brown fine sand to a depth of more than 60 inches. In some places, the surface layer is silt loam.

Included with these soils in mapping are small areas of soils affected by high alkalinity and areas where the sandy or silty underlying material is at the surface. The included areas make up 5 to 20 percent of the unit.

Permeability is moderately slow in the Moody soil and rapid in the Thurman soil. Available water capacity is high in the Moody soil and low in the Thurman soil. Runoff is medium on the Moody soil and slow on the Thurman soil. Organic matter content is moderately low in the Moody soil and low in the Thurman soil. Natural fertility of both soils is medium. The Moody soil can be tilled within a moderately wide range in moisture content to maintain good tilth. Tilth is good in the Thurman soil. The rate of water intake is low for the Moody soil and very high for the Thurman soil.

Most of the acreage of these soils is cultivated and is used for dryland or irrigated crops. A few small areas are in native or introduced grasses and are used for pasture or range.

If used for dryland farming, these soils are suited to corn, soybeans, small grain, and alfalfa. Water erosion and soil blowing are the principal hazards where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control water erosion and soil blowing and conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content and the rate of water intake, and improves fertility. Terraces, contour farming, and grassed waterways help to control water erosion.

If irrigated, these soils are suited to corn, soybeans, and alfalfa. Water erosion is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control water erosion and to conserve soil moisture. If slopes are uniform, level benches or parallel terraces constructed at the proper grade help to control erosion. In irrigation, efficient management of water is a concern because of slope and, on the Thurman soil, the very high rate of water intake.

Sprinkler irrigation systems are best suited to these soils. Adjusting the rate at which water is applied to the water intake rate of the soil helps to reduce runoff and to control erosion. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue to the soil increases the organic matter content.

These soils are suited to introduced grasses for pasture. Pastures are generally a single species or a mixture of cool-season grasses, such as smooth brome or orchardgrass, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the grasses, and on Thurman soils, results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Applications of nitrogen fertilizer and irrigation water increase the growth and vigor of the grasses.

These soils are suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community. In places, blowouts develop on the Thurman soil.

These soils are suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Healthy seedlings of adapted species, if properly planted on a well prepared site, survive and grow well if plant competition is controlled or eliminated. Weeds and grasses can be controlled by cultivation between the tree rows and use of appropriate herbicides in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient. Windbreaks on the contour in combination with terraces help to conserve water and to control erosion. Cover crops between the tree rows help to control soil blowing.

Onsite investigation is needed before sanitary facilities or buildings are constructed in areas of these soils. On the Moody soil, the moderately slow permeability is a limitation on sites for septic tank absorption fields. This limitation generally can be overcome by increasing the size of the absorption field. The Thurman soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage.

The Thurman soil is suited to use as sites for buildings and roads. Revegetating disturbed areas helps to control soil blowing. On the Moody soil, shrinking and swelling, low strength, and the hazard of frost action are limitations to use as sites for buildings and local roads and streets. Strengthening building foundations and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IIIe-8, dryland, and IIIe-3, irrigated. The Moody soil is in Silty range site and windbreak suitability group 3. The Thurman soil is in Sandy range site and windbreak suitability group 5.

MtD2—Moody-Thurman complex, 6 to 11 percent slopes, eroded. These deep, strongly sloping soils are on convex side slopes of high terraces adjacent to valleys. The Moody soil is well drained and formed in loess. The Thurman soil is somewhat excessively drained and formed in eolian sand. Erosion has removed most of the original surface layer of these soils. Areas range from 20 to more than 600 acres in size. They are 40 to 60 percent Moody soil and 35 to 50 percent Thurman soil. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Moody soil has a surface layer of dark grayish brown, firm silty clay loam about 6 inches thick. The subsoil is firm silty clay loam about 17 inches thick. It is brown in the upper part and yellowish brown in the lower part. The underlying material is pale brown silty clay loam and light yellowish brown silt loam to a depth of 46 inches, light yellowish brown fine sandy loam to a depth of 52 inches, and light gray fine sand to a depth of more than 60 inches. In some places, the subsoil contains more sand. Also, in places, carbonates are above a depth of 30 inches.

Typically, the Thurman soil has a surface layer of brown, very friable fine sandy loam about 6 inches thick. The underlying material is fine sand. It is very pale brown in the upper part and white in the lower part to a depth of more than 60 inches. In some places, the surface layer is silt loam.

Included with these soils in mapping are small areas where the silty or sandy underlying material is exposed at the surface. The included areas make up 5 to 20 percent of the unit.

Permeability is moderately slow in the Moody soil and rapid in the Thurman soil. Available water capacity is high in the Moody soil and low in the Thurman soil. Runoff is medium on both soils. Organic matter content is moderately low in the Moody soil and low in the Thurman soil. Natural fertility of both soils is medium, and tilth is good. The Moody soil can be tilled within a moderately wide range in moisture content to maintain good tilth.

Most of the acreage of these soils is cultivated and is used for dryland farming. A few cultivated areas are irrigated. Some areas are in native or introduced grasses and are used for pasture or range.

If used for dryland farming, these soils are poorly suited to corn and grain sorghum. They are best suited to close-growing crops, such as alfalfa and small grain. Water erosion and soil blowing are the principal hazards. Conserving water and maintaining fertility are major management concerns. Terraces and grassed waterways help to conserve moisture and to control erosion. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to control water erosion. Returning crop residue to the soil, adding manure, and applying commercial fertilizer help to improve fertility.

If irrigated, these soils are poorly suited to corn. They are better suited to such close-growing crops as alfalfa. Erosion is the principal hazard. Conserving water and improving fertility are major management concerns. Conservation tillage systems, such as disking, chiseling, and no-till, that leave crop residue on the surface help to conserve soil moisture, to improve fertility, and to control erosion. Contour farming in combination with terraces and grassed waterways helps to control erosion and to conserve water. Center-pivot sprinkler systems are suited.

These soils are suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with alfalfa or other legumes or with warm-season grasses, such as switchgrass or big bluestem. Overgrazing reduces the protective cover, causes deterioration of the grasses, and results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Applications of nitrogen fertilizer and irrigation water increase the growth and vigor of the grasses.

These soils are suited to range. A permanent cover of grass is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community. In places, blowouts develop on the Thurman soil.

These soils are suited to the trees and shrubs grown as windbreaks. Planting healthy seedlings of adapted species on the contour, in combination with terraces, and growing a cover crop between the tree rows help to control erosion. Appropriate herbicides can be used to control weeds. Watering of newly planted trees is needed during extended periods of drought.

Onsite investigation is needed before sanitary facilities or buildings are constructed in areas of these soils. Revegetating disturbed areas helps to control wind and water erosion. On the Moody soil, the moderately slow permeability is a limitation to use as sites for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. The Thurman soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, extensive grading is required to modify the slope and to shape the lagoon. Lining and sealing the lagoon helps to prevent seepage.

On the Thurman soil, slope is a limitation to use as sites for buildings and local roads and streets. The design of buildings should accommodate the slope, or the site should be graded.

On the Moody soil, slope is a limitation to use as sites for dwellings and small commercial buildings. In addition, shrinking and swelling is a limitation for dwellings. The design of dwellings and buildings should accommodate the slope, or the site should be graded. Strengthening foundations and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling.

On the Moody soil, low strength and the hazard of frost action are limitations for roads and streets. The surface pavement and base material should be thick enough to compensate for the low strength. Providing coarser grained subgrade and base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IVe-8, dryland, and IVe-3, irrigated. The Moody soil is in Silty range site and windbreak suitability group 3. The Thurman soil is in Sandy range site and windbreak suitability group 7.

Mu—Muir silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil is on terraces along the major streams. It is subject to rare flooding. It formed in silty alluvium. Areas range from 5 to more than 500 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 12 inches thick. The subsoil is friable silt loam about 19 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The underlying material is pale brown silt loam to a depth of more than 60 inches. In some places, free carbonates are above a depth of 40 inches. Also, in places, the soil is stratified at a depth of 20 inches. In places, the dark color of the surface layer extends to a depth of less than 20 inches.

Included with this soil in mapping are small areas of Grigston, Hobbs, and Lamo soils and soils that have high alkalinity. Grigston soils are dark to a depth of less than 20 inches and are lower than the Muir soil in the landscape. Hobbs soils are stratified in the upper 10 inches and are in narrow drainageways that cross the Muir soil. Lamo soils are somewhat poorly drained and lower than the Muir soil in the landscape. Soils that have high alkalinity are in the same position in the landscape as the Muir soil. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Muir soil. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. The rate of water intake is moderately low. Tilth is good. This soil readily releases moisture to plants.

Nearly all of the acreage of this soil is cultivated. Most areas are used for irrigated crops. Some areas are used for dryland crops.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Water erosion is a slight hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content and the rate of water intake, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Water erosion is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Fertilizer, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue to the soil helps to increase the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep percolation. Constructing a tailwater recovery system helps to conserve water.

This soil is suited to introduced grasses and legumes for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Irrigation and nitrogen fertilizer increase the growth and vigor of the grasses. Weeds can be controlled by applying appropriate herbicides.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Healthy seedlings of adapted species, if properly planted on a well prepared site, survive and grow well if moisture is conserved and weeds and grasses are controlled. Weeds and grasses can be controlled by timely cultivation between the tree rows and by use of appropriate herbicides in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

Rare flooding is a hazard of this soil on sites for septic tank absorption fields. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by flooding.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained base material helps to ensure better performance.

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

Mx—Muir silt loam, sandy substratum, 0 to 1 percent slopes. This deep, well drained, nearly level soil is on stream terraces. It formed in silty sediment over sandy alluvium. It is subject to rare flooding. Areas range from 200 to more than 1,000 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 10 inches thick. The subsurface layer is grayish brown, very friable silt loam about 12 inches thick. The subsoil is about 20 inches thick. It is grayish brown, very friable silt loam in the upper 12 inches and brown, friable sandy clay loam in the lower 8 inches. The underlying material is pale brown fine sand in the upper part and light gray sand in the lower part to a depth of more than 60 inches. In some places, the depth to fine sand is less than 40 inches. Also, in places, the dark color of the surface layer extends to a depth of 12 to 20 inches. In some places, coarse sand or gravelly sand is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Wann and Zook soils. Wann soils are somewhat poorly drained, calcareous, and lower than the Muir soil in the landscape. Zook soils are poorly drained, contain more clay in the profile, and are lower in the landscape than the Muir soil. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Muir soil. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. The rate of water intake is moderately low. The surface layer can be tilled throughout a moderately wide range of moisture content to maintain good tilth. This soil releases moisture readily to plants.

Nearly all of the acreage of this soil is cultivated. Most areas are used for irrigated crops. Some areas are used for dryland farming. A few small areas are in introduced grasses and are used for pasture.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil and applying manure help to maintain tilth, increase the organic matter content and the rate of water intake, and improve fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Fertilizer, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil helps to increase the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep percolation. Constructing a tailwater recovery system helps to conserve water.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can cause surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. They require care after planting to survive. Weeds can be controlled by cultivation between the tree rows and by use of appropriate herbicides in the rows. Watering of newly planted trees is needed when rainfall is insufficient.

Rare flooding is a limitation to use of this soil as sites for septic tank absorption fields and dwellings. Constructing buildings on elevated, well compacted fill material helps to prevent the damage caused by flooding. Dikes protect septic tank absorption fields from flooding. Because of the rapid permeability in the underlying material, this soil does not adequately filter the effluent in waste disposal systems. Seepage from septic tank absorption fields can result in ground water pollution. Placing the septic tank on raised fill helps to provide adequate absorption for the effluent. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to reduce the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

NoC2—Nora silty clay loam, 2 to 6 percent slopes, eroded. This deep, well drained, gently sloping soil is on narrow ridgetops in the uplands. It formed in loess. Rills are common after heavy rains. Areas range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 6 inches thick. The subsoil is friable and about 15 inches thick. It is brown silty clay loam in the upper part and pale brown, calcareous silt loam in the lower part. The underlying material is calcareous, light gray, mottled silt loam to a depth of more than 60 inches. In most places, erosion has removed the original surface layer and tillage is mainly in the subsoil. In some places, the depth to carbonates is more than 30 inches.

Included with this soil in mapping are small areas of Crofton soils. These soils are in landscape positions similar to those of the Nora soil. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Nora soil. Available water capacity is high. Runoff is medium. Organic matter content is moderately low. Natural fertility is medium. Shrink-swell potential is moderate. The rate of water intake is moderately low. Tilth is fair. This soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most areas are used for dryland crops, but a few areas are irrigated. A few small areas, generally near farmsteads, are in introduced or native grasses.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, grain sorghum, and legumes, mainly alfalfa. Water erosion is the principal hazard. Growing row crops on the contour helps to reduce runoff and to control erosion. Conserving water is an important management concern. Terraces and grassed waterways also help to control erosion. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or most of the crop residue on the surface help to control water erosion and to conserve soil moisture. Applying manure to the soil improves fertility.

If irrigated, this soil is suited to row crops, such as corn, and to close-growing crops, such as alfalfa. Water erosion is the main hazard. Sprinkler and gravity irrigation systems are suited to this soil. Center-pivot systems are well suited. Conservation tillage systems, such as disking, chiseling, and no-till, that leave crop residue on the surface help to control water erosion and to conserve soil moisture. Bench leveling and contour furrows with terraces are both suited. This soil is low in nitrogen. Fertilizer, manure, and cover crops improve fertility.

This soil is suited to grasses for pasture. Pastures generally are smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Overgrazing or grazing when the soil is too wet causes surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. They require care after planting to survive. Weeds can be controlled by cultivating between the tree rows and by applying appropriate herbicides in the rows. Newly planted trees need watering when rainfall is insufficient. Planting trees on the contour, in combination with terraces, helps to control erosion.

The moderate permeability of this soil is a limitation to use as sites for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Strengthening building foundations and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to reduce the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

NoD—Nora silty clay loam, 6 to 11 percent slopes. This deep, well drained, strongly sloping soil is on side slopes in the uplands. It formed in loess. Areas range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 7 inches thick. The subsurface layer is dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is friable silty clay loam about 17 inches thick. It is pale brown in the upper part and calcareous and light yellowish brown in the lower part. The underlying material is very pale brown silt loam in the upper part and light gray silt loam in the lower part to a depth of more than 60 inches. In some places, the depth to carbonates is more than 30 inches.

Included with this soil in mapping are small areas of Alcester and Crofton soils. Alcester soils are dark to a depth of 24 to 30 inches. They are lower than the Nora soil in the landscape and are on foot slopes along intermittent drainageways. Crofton soils are calcareous at or near the surface and are in positions in the landscape similar to those of the Nora soil. The included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Nora soil. Available water capacity is high. Runoff is medium. Organic matter content is moderate. Natural fertility is high. This soil releases moisture readily to plants. Shrink-swell potential is moderate. The rate of water intake is moderately low. Tilth is good.

Most of the acreage of this soil is used for introduced grasses, but a few areas are range. Areas of this soil are generally used for grazing, but some are used for haying. A few small areas are cultivated.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, winter wheat, and alfalfa. It is better suited to close-growing crops than to row crops because erosion is a hazard. Conserving water is an important management concern. Conservation tillage systems, such as disking, chiseling, and a no-till, that leave all or part of the residue on the surface help to conserve soil moisture and to control water erosion. Terraces, contour farming, crop rotation, and grassed waterways also help to control erosion and to conserve soil moisture.

If irrigated, this soil is poorly suited to such row crops as corn and grain sorghum. It is better suited to such close-growing crops as alfalfa, introduced pasture grasses, and small grain. Water erosion is the principal hazard. Conservation tillage systems, such as disking, chiseling, and no-till, that keep all or part of the crop residue on the surface help to control water erosion and to conserve soil moisture. Contour farming, grassed waterways, and terraces help to control erosion. Sprinkler systems are generally better suited than other irrigation systems because the water is easier to control and apply. Center-pivot sprinkler systems are well suited.

This soil is suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet causes surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. Weeds can be controlled by cultivating between the tree rows or by applying appropriate herbicides in the rows. Planting trees on the contour, in combination with terraces, helps to control erosion. Watering of newly planted trees is needed when rainfall is insufficient.

The moderate permeability of this soil is a limitation to use as sites for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. Land shaping and installing the septic tank absorption field on the contour help to ensure that the system operates properly. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. Strengthening building foundations and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. The design of dwellings and small commercial buildings should accommodate the slope, or the site should be graded.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained material for subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost heave. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

NpD2—Nora-Crofton complex, 6 to 11 percent slopes, eroded. These deep, well drained, strongly sloping soils formed in loess on uplands. Erosion has removed most of the original surface layer of these soils. On the Nora soil, the remaining surface layer and the upper part of the subsoil have been mixed by tillage. Rills and small gullies are common after heavy rains. Areas range from 5 to 200 acres in size. They are 50 to 70 percent Nora soil, generally on the less steep, lower side slopes, and 20 to 40 percent Crofton soil, generally on the steeper side slopes and knobs. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Nora soil has a surface layer of brown, friable silty clay loam about 5 inches thick. The subsoil is friable silty clay loam about 20 inches thick. It is brown in the upper part and pale brown in the lower part. The underlying material is light yellowish brown, calcareous silty clay loam to a depth of more than 60 inches. In some places, the depth to carbonates is more than 30 inches. Also, in places, the underlying material has a strong brownish or reddish color.

Typically, the Crofton soil has a surface layer of pale brown, friable, calcareous silt loam about 5 inches thick. The transition layer is pale brown, friable, calcareous silt loam about 6 inches thick. The underlying material is brown, calcareous silt loam to a depth of more than 60 inches. In some places, the soil has a reddish color.

Included with these soils in mapping are small areas of Alcester and Hobbs soils. Alcester soils have a thick, dark surface layer and are on foot slopes lower than the Nora and Crofton soils in the landscape. Hobbs soils are stratified in the surface layer. They are lower in the landscape than the Nora and Crofton soils and are along intermittent drainageways. The included soils make up 10 to 25 percent of the unit.

Permeability is moderate in the Nora and Crofton soils. Available water capacity is high in both soils. Runoff is medium on both soils. In the Nora soils, organic matter content is moderately low and natural fertility is medium. In the Crofton soil, organic matter content and natural fertility are low. Shrink-swell potential is moderate in the Nora soil and low in the Crofton soil. The rate of water intake is low for the Nora soil and moderately low for the Crofton soil. Tilth for both soils is fair.

Most of the acreage of these soils is cultivated. Most areas are used for dryland farming, but a few areas are irrigated. A few areas are in introduced or native grasses and are used for grazing.

If used for dryland farming, these soils are poorly suited to corn and grain sorghum. They are best suited to close-growing crops, such as alfalfa and small grain. Water erosion is the principal hazard. Conserving water and maintaining fertility are major management concerns. Terraces and grassed waterways help to conserve moisture and to control erosion (fig. 12). Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture and to control water erosion. Returning crop residue to the soil and applying manure and fertilizer help to improve fertility. On the Crofton soil, the high amount of carbonates binds phosphorus and makes it unavailable for use by plants. The Crofton soil requires phosphate fertilizer to ensure the best growth of most crops, especially legumes and small grain.

If irrigated, these soils are poorly suited to corn. They are better suited to such close-growing crops as alfalfa. Erosion is the principal hazard. Conserving water and improving fertility are major management concerns. Conservation tillage systems, such as disking, chiseling, and no-till, that leave crop residue on the surface help to conserve soil moisture, to improve fertility, and to control water erosion. Contour farming, in combination with terraces and grassed waterways, helps to control erosion and to conserve water. Center-pivot systems are well suited to these soils.

These soils are suited to introduced grasses for pasture. Pastures generally consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Grazing when the soil is wet or overgrazing can cause surface compaction. Proper stocking rates, nitrogen fertilizer, and rotation grazing help to keep the pasture in good condition.

These soils are suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses,

Figure 12.—Terraces and contour farming help to conserve moisture and to control water erosion on the Nora-Crofton complex, 6 to 11 percent slopes, eroded.

such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

These soils are suited to the trees and shrubs grown as windbreaks. Planting healthy seedlings of adapted species on the contour, in combination with terraces, and a cover crop between the tree rows help to control erosion. Appropriate herbicides can be used to control weeds in the rows. Newly planted trees in some areas need watering during extended periods of drought. The best suited trees and shrubs are those that can tolerate the high calcium content of the Crofton soil.

The moderate permeability of these soils is a limitation to use as sites for septic tank absorption fields. This limitation can generally be overcome by increasing the size of the absorption field. Land shaping and installing the septic tank absorption fields on the contour help to ensure that the system operates properly. On sites for sewage lagoons, extensive grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. Strengthening foundations for buildings and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. The design of dwellings and small commercial buildings should accommodate the slope, or the site should be graded.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of these soils. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

NpE2—Nora-Crofton complex, 11 to 15 percent slopes, eroded. These deep, well drained, moderately steep soils formed in loess on side slopes in the uplands. Erosion has removed most of the original surface layer of these soils. Tillage has mixed the remaining surface layer and the upper part of the subsoil or the underlying material (fig. 13). Rills and small gullies are common after heavy rains. Areas range from 5 to 100 acres in size. They are 40 to 60 percent Nora soil on the less steep parts of side slopes and 30 to 50 percent Crofton soil on the steeper side slopes and knobs. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Nora soil has a surface layer of dark brown, friable silty clay loam about 5 inches thick. The subsoil is 22 inches thick. It is brown, firm silty clay loam in the upper part and light yellowish brown, friable silt loam in the lower part. The underlying material is light yellowish brown, calcareous silt loam to a depth of more than 60 inches. In some places, the depth to carbonates is more than 30 inches.

Typically, the Crofton soil has a surface layer of brown, friable, calcareous silt loam about 5 inches thick. The transition layer is pale brown, friable, calcareous silt loam about 8 inches thick. The underlying material is light yellowish brown, calcareous silt loam to a depth of more than 60 inches. In some places, the soil has a reddish brown color.

Included with these soils in mapping are small areas of Alcester and Hobbs soils. Alcester soils have a thick, dark surface layer and are on foot slopes lower than the Nora and Crofton soils in the landscape. Hobbs soils are stratified in the surface layer. They are along intermittent drainageways and are lower than the Nora and Crofton soils in the landscape. The included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the Nora and Crofton soils. Available water capacity is high in both soils. Runoff is rapid on both soils. Organic matter content is moderately low in the Nora soil and low in the Crofton soil. Natural fertility is medium in the Nora soil and low in the Crofton soil. Shrink-swell potential is moderate in the Nora soil and low in the Crofton soil. Tilth is fair.

Most of the acreage of these soils is cultivated. Most areas are used for dryland farming. A few areas are irrigated. Some small areas are in introduced or native grasses and are used for grazing or haying.

Figure 13.—An area of the Nora-Crofton complex, 11 to 15 percent slopes, eroded. Erosion has removed much of the original surface layer of these soils. The Crofton soil is in the lighter colored areas.

If used for dryland farming, these soils are poorly suited to corn and grain sorghum. Because of the hazard of water erosion, the soils are better suited to close-growing crops, such as alfalfa and small grain. Conserving water and improving fertility are major management concerns. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to control water erosion and to conserve soil moisture. Contour farming in combination with terraces and grassed waterways help to conserve moisture and to control erosion. Applying feedlot manure and fertilizer and leaving crop residue on the surface help to improve fertility. On the Crofton soil, the abundant free carbonates bind phosphorus and make it unavailable for plant use. The Crofton soil requires phosphate fertilizer to ensure the best growth of most legumes and close-growing crops.

Irrigation is not suited to these soils because erosion is a severe hazard and irrigation water management is too difficult.

These soils are suited to introduced grasses for pasture. Pastures consist of smooth brome or a mixture of smooth brome or orchardgrass and alfalfa. Grazing when the soil is wet or overgrazing can cause surface compaction. Rotation grazing, proper stocking rates, and nitrogen fertilizer help to keep the pasture in good condition.

These soils are suited to range. A cover of native grasses is effective in controlling water erosion. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, porcupinegrass, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly sideoats grama, tall dropseed, Kentucky bluegrass, and annual and perennial weeds. If overgrazing continues for several years, Kentucky bluegrass, buckbrush, snowberry, and sumac invade the plant community.

These soils are suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if planted on the contour in combination with terraces and a cover crop, help to control erosion. Appropriate herbicides can be used to control weeds. Watering of newly planted trees is needed when rainfall is insufficient. The best suited trees and shrubs are those that tolerate the high calcium content of the Crofton soil.

The moderate permeability of these soils is a limitation to use as sites for septic tank absorption fields. It can be overcome by increasing the size of the absorption field. Land shaping and installing the septic tank absorption fields on the contour generally help to ensure that the system operates properly. On sites for sewage lagoons, extensive grading is required to modify the slope and to shape the lagoon. Lining or sealing the lagoon helps to prevent seepage. Strengthening building foundations and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. The design of dwellings and small commercial buildings should accommodate the slope, or the site should be graded.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of these soils. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability unit is IVe-8, dryland. The Nora soil is in Silty range site and windbreak suitability group 3. The Crofton soil is in Limy Upland range site and windbreak suitability group 8.

Nv—Novina fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on bottom lands. It is subject to rare flooding. It formed in loamy alluvium. Areas range from 10 to more than 600 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 9 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 8 inches thick. The transition layer is grayish brown, very friable fine sandy loam about 8 inches thick. The underlying material is grayish brown loam in the upper part; light gray, calcareous loam in the middle part; and light gray fine sandy loam and loamy fine sand in the lower part to a depth of more than 60 inches. In some places, the dark color of the surface layer extends to a depth of more than 20 inches. Also, in places, the soil contains more clay.

Included with this soil in mapping are small areas of Gibbon, Ipage, and Wann soils. Gibbon and Wann soils are somewhat poorly drained and are lower in the landscape than the Novina soil. Ipage soils do not have a dark surface layer and contain more sand and less silt and clay than the Novina soil. Also, they are slightly higher in the landscape. The included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the Novina soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 3 feet in most wet seasons to about 6 feet in most dry seasons. Organic matter content is moderately low. Natural fertility is medium. The rate of water intake is moderately high. Tilth is good. The soil is easily tilled throughout a wide range of moisture content.

Nearly all of the acreage of this soil is cultivated. Most areas are used for irrigated crops. A few areas are used for dryland farming. A few small areas are in introduced grasses and are used for pasture.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Soil blowing is a moderate hazard if the surface is not adequately protected by crops or crop residue. The water table is highest in spring and supplements moisture for deep-rooted crops. Late in the growing season, the soil is droughty. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture (fig. 14). Returning crop residue to the soil helps to maintain tilth, increases the organic matter content and the rate of water intake, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Soil blowing is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the residue on the surface help to control soil blowing and to conserve soil moisture. Fertilizer, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil increases the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil reduces runoff at the end of the field and minimizes deep percolation.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler or gravity systems can be used.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of occasional wetness in spring. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and by cultivation with conventional equipment between the tree rows. Appropriate herbicides can be used in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

Figure 14.—Conservation tillage on Novina fine sandy loam, 0 to 2 percent slopes, helps to conserve soil moisture and to control soil blowing.

Rare flooding is a hazard of this soil as sites for sanitary facilities and buildings. Constructing septic tank absorption fields on fill material helps to raise the absorption field to a sufficient distance above the seasonal high water table. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Constructing buildings on elevated, well compacted fill material helps to prevent the structural damage caused by flooding.

Constructing roads and streets on suitable, well compacted fill material above flood levels, establishing side ditches, and installing culverts help to prevent the damage caused by flooding and the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action.

The capability units are IIw-6, dryland, and IIw-8, irrigated; Subirrigated range site; windbreak suitability group 2S.

On—O'Neill fine sandy loam, 0 to 2 percent slopes. This soil is moderately deep over coarse sand, nearly level, and well drained. It is on stream terraces. It formed in loamy sediment over coarse sand. Areas range from 15 to more than 500 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 4 inches thick. The subsoil is about 14 inches thick. It is grayish brown, very friable sandy loam in the upper part and grayish brown, loose loamy sand in the lower part. The underlying material is very pale brown coarse sand to a depth of more than 60 inches. In some places, the surface layer is 10 to 20 inches thick. Also, in places, the underlying material is fine sand. In other small areas, the soil is gently sloping. Some small areas have coarse sand and gravel between a depth of 10 to 20 inches.

Included with this soil in mapping are small areas of Blendon, Grigston, and Janude soils. Blendon soils are deep, are dark to a depth of more than 20 inches, and are in the same position in the landscape as the O'Neill soil. Grigston soils have more silt and clay in the lower part of the profile and are lower than the O'Neill soil in the landscape. Janude soils are moderately well drained and lower than the O'Neill soil in the landscape. The included soils make up 10 to 15 percent of the unit.

Permeability in the O'Neill soil is moderately rapid in the surface layer, subsurface layer, and subsoil and very rapid in the underlying material. Available water capacity is low. Runoff is slow. Organic matter content is moderately low. Natural fertility is medium. Tilth is good. The soil can be easily tilled throughout a wide range of moisture content.

Nearly all of the acreage of this soil is cultivated. Most areas are used for irrigated crops. A few areas are used for dryland farming. A few small areas are in introduced grasses and are used for pasture.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Soil blowing is a moderate hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil and applying manure help to maintain tilth, increase the organic matter content, and improve fertility.

If irrigated, this soil is suited to corn and alfalfa. Soil blowing is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and to conserve soil moisture.

Sprinkler systems are best suited to this soil. Frequent, light applications of water are needed because of the low available water capacity and the hazard of excessive leaching of plant nutrients. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. Deep cuts that expose the coarse underlying material should be avoided. Short irrigation runs are needed because of the rapid permeability. In areas that have been cut by land leveling, returning crop residue to the soil helps to increase the organic matter content.

This soil is suited to introduced grasses for pasture. Pasture and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler systems can be used.

This soil is suited to range. A cover of native grasses is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for several years, the less desirable plants increase, sand movement becomes very active, and blowouts develop in some areas.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in slightly sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the tree rows. Weeds can be controlled by applying appropriate herbicides in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. The soil is generally suited to building site development.

A surface drainage system helps to prevent the damage to roads and streets caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IIIe-3, dryland, and IIIe-9, irrigated; Sandy range site; windbreak suitability group 6G.

Pd—Pits and Dumps. This map unit consists mainly of piles of reworked gravel, sand, overburden, and the adjacent, water-filled pits. It also consists of areas commonly occupied by pump equipment, roads, and loading docks. The sand and gravel are stockpiled for use in construction. Areas are on bottom lands and are subject to rare flooding. They range from 5 to 270 acres in size.

Typically, the material in this map unit consists of mixed fine, medium, and coarse sand and gravel to a depth of more than 60 inches. The soil profile has not developed.

Included in this map unit are small areas of Alda, Boel, Inavale, and Platte soils. Alda, Boel, and Platte soils are somewhat poorly drained and lower than Pits and Dumps in the landscape. Inavale soils are somewhat excessively drained, occasionally flooded, and slightly lower than Pits and Dumps in the landscape. The included soils make up 5 to 10 percent of the unit.

Permeability is rapid or very rapid in Pits and Dumps. Available water capacity is very low. Runoff is very slow. The apparent seasonal high water table is at a depth of about 2 to 10 feet. Organic matter content is very low. Natural fertility is low. Areas of sand and gravel are devoid of vegetation, except where no longer commercially mined.

Most areas are used for commercial mining of and for temporary storage of sand and gravel. Some areas where pumping of sand and gravel has ceased are used as sites for summer cottages and permanent homes. The water-filled pits are in recreation use.

Areas of this map unit are not suited to cultivation, grasses for pasture and range, windbreaks, or other agricultural uses. Onsite investigation is needed to determine if small areas are suitable for trees, shrubs, and grasses. Cottonwood, willow, and pine trees are the best suited trees for either individual or scattered plantings. They need special care after planting to survive. A cover of native grasses or wooden barriers help to protect plantings from blowing sand. In some years, watering of newly planted trees is needed. In landscaping around dwellings, trees, shrubs, and grasses generally are difficult to establish.

This map unit is suited to recreation use. Access roads can be built to lakes and picnic areas. The waste material of pits commonly consists of fine sand and is suitable for beaches. Some of the sand can be used to make a gradual slope on the bottom of the pits, which are 25 to 55 feet deep, and make them less hazardous for swimming. The areas provide opportunities for fishing, frogging, boating, water skiing, rock hunting, swimming, hiking, and picnicking.

These areas provide aquatic plants for food and cover for wetland wildlife.

This unit is not suited to use as sites for sanitary facilities because of seepage. The material readily absorbs but does not adequately filter the effluent in septic tank absorption fields and sewage lagoons. The poor filtering capacity can result in ground water pollution. An alternative site or disposal method should be selected. The walls or sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Constructing dwellings and buildings on elevated, well compacted fill material helps to prevent the structural damage caused by floodwater.

Constructing roads and streets 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 unit is VIIIs-8, dryland; windbreak suitability group 10. The unit is not assigned to a range site.

Pt—Platte loam, 0 to 2 percent slopes. This soil is shallow over coarse sand and gravelly sand. It is nearly level and somewhat poorly drained. It is on bottom lands. It formed in loamy alluvium over coarse sand and gravelly coarse sand. It is subject to occasional flooding. Areas range from 70 to 200 acres in size.

Typically, the surface layer is dark gray, friable loam about 5 inches thick. The subsurface layer is also dark gray, friable loam about 5 inches thick. The underlying material is light gray. It is coarse sand in the upper part and gravelly coarse sand in the lower part to a depth of more than 60 inches. In some places, the depth to coarse sand or gravelly coarse sand is 20 to 40 inches.

Included with this soil in mapping are small areas of Gothenburg and Loup soils. Gothenburg soils are very shallow over coarse sand and are in the same position in the landscape as the Platte soil. Loup soils are poorly drained and support wetland vegetation. The included soils make up about 10 to 15 percent of the unit.

Permeability is moderate in the upper part of the Platte soil and very rapid in the lower part. Available water capacity is low. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 1 foot in most wet seasons to about 2 feet in most dry seasons. Organic matter content is moderately low. Natural fertility is low. The root zone is restricted by coarse sand and gravelly coarse sand in the underlying material. The surface can be tilled throughout a moderately wide range of moisture content to maintain fair tilth.

Most of the acreage of this soil is range and is used for grazing. Some areas are cultivated and are used for irrigated or dryland crops. A few areas are in introduced grasses and are used for pasture.

If used for dryland farming, this soil is poorly suited to crops, including corn, soybeans, small grain, and alfalfa. Wetness caused by the seasonal high water table is the principal limitation. Tillage is generally delayed in spring. In late summer, the water table recedes and the soil becomes droughty. Soil blowing is a moderate hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

If irrigated, this soil is poorly suited to corn, soybeans, and alfalfa. Sprinkler systems can be used. Soil blowing is the principal hazard. Wetness caused by the seasonal high water table is the principal limitation. Tillage is generally delayed in the spring. Conservation tillage systems, such as ridge till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and to conserve soil moisture. In irrigation, small, frequent applications of water are needed because of the low available water capacity.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Reed canarygrass and creeping foxtail are suited to this soil. Floodwater deposits sediment, which in some areas partly covers the grasses and reduces their vigor and growth. Grazing when the water table is highest results in damage to the grass stand and a rough soil surface and impedes mowing for hay. Rotation grazing and proper stocking rates help to keep the pasture in good condition.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are tolerant of a moderately high water table. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation, tilling the soil, and planting seedlings after the soil has begun to dry. Cultivating after planting also helps to control competition from weeds. Conventional equipment can be used to cultivate between the tree rows. Rototilling can be used near the trees. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil is not suited to use as sites for septic tank absorption fields because of flooding, the seasonal high water table, and the hazard of ground water pollution. An alternative site should be selected. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoons from flooding. Constructing the lagoon on fill material helps to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving if shoring is done during the dry season. This soil is not suited to use as building sites because of flooding. An alternative site should be selected.

Constructing roads and streets 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 the seasonal high water table.

The capability units are IVw-4, dryland, and IVw-13, irrigated; Subirrigated range site; windbreak suitability group 2S.

Px—Platte-Inavale complex, channeled. These soils are on bottom lands of the Platte River Valley (fig. 15). Areas consist mainly of old, shallow channels that alternate with slightly higher, uneven areas. Slopes range from 0 to 3 percent. The Platte soil is in the lowest part of the landscape. It is somewhat poorly drained and is subject to frequent flooding. It formed in loamy alluvium that is shallow over coarse sand and gravelly coarse sand. The Inavale soil is somewhat excessively drained and is subject to frequent flooding. It formed in sandy alluvium. Areas of these soils range from 70 to 750 acres in size. They are 50 to 65 percent Platte soil and 30 to 45 percent Inavale soil. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Platte soil has a surface layer of dark grayish brown, friable fine sandy loam about 5 inches thick. The subsurface layer is dark gray, friable fine sandy loam about 7 inches thick. The underlying material

Figure 15.—The Platte-Inavale complex, channeled, is commonly in areas with scattered trees adjacent to rivers. Most areas of these soils are used for grazing or haying.

is light gray. It is coarse sand in the upper part and gravelly coarse sand in the lower part to a depth of more than 60 inches.

Typically, the Inavale soil has a surface layer of dark grayish brown, friable loamy fine sand about 5 inches thick. The transition layer is grayish brown, loose loamy fine sand about 9 inches thick. The underlying material is light gray fine sand to a depth of more than 60 inches.

Included with these soils in mapping are small areas of Gothenburg and Boel soils. Gothenburg soils are very shallow over coarse sand and in the same position in the landscape as the Platte and Inavale soils. Boel soils are deep, somewhat poorly drained, and slightly higher than the Platte and Inavale soils in the landscape. The included soils make up 5 to 10 percent of the unit.

Permeability is moderately rapid in the upper part of the Platte soil and very rapid in the lower part. It is rapid in the Inavale soil. Available water capacity is low in both soils. The organic matter content is moderately low in the Platte soil and low in the Inavale soil. Natural fertility is low in both soils. The seasonal high water table in the Platte soil is at a depth of 1 foot in most wet years and 2 feet in most dry years and that in the Inavale soil is at a depth of more than 6 feet. Both soils release moisture readily to plants. Runoff is slow.

Most areas of these soils are used for grazing or haying. Some areas are used for recreation or as wildlife habitat. Most areas are in native grasses and have many scattered native trees, shrubs, and forbs.

These soils are not suited to cultivated crops, either dryland or irrigated. Frequent flooding and wetness in the spring and droughtiness in the summer are the main hazards.

These soils are poorly suited to introduced grasses for pasture. Flooding in the spring and droughtiness in the summer are the main hazards.

These soils are suited to range. The natural plant community on the Platte soil is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed, the plant community is mostly timothy, redtop, foxtail barley, clovers, sedges, and rushes. A permanent cover of grass is effective in controlling soil blowing on the Inavale soil. The natural plant community on this soil is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, and switchgrass. If the plants are continuously overgrazed, the plant community is mostly blue grama, hairy grama, sand dropseed, Scribner panicum, and annual and perennial weeds.

These soils are generally not suited to the trees and shrubs grown as windbreaks. Flooding, droughtiness, and the seasonal high water table in the Platte soil limit the planting of and the survival of trees and shrubs. Onsite investigation is needed to determine if small areas are suitable for planting by hand.

These soils are not suited to use as sites for septic tank absorption fields, sewage lagoons, and buildings because of frequent flooding and the seasonal high water table in the Platte soil. If the Inavale soil is used as a site for septic tank absorption fields or sewage lagoons, seepage of effluent into the ground water is a severe hazard. An alternative site should be selected.

Constructing roads and streets 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 the seasonal high water table.

The capability unit is VIw-7, dryland. The Platte soil is in Subirrigated range site, and the Inavale soil is in Sandy Lowland range site. Both soils are in windbreak suitability group 10.

Rw—Riverwash. This map unit consists of sandbars and islands adjacent to channels of the Loup River. Areas are poorly drained and are subject to frequent flooding. They are commonly reworked and shifted by floodwater. They range from 5 to 50 acres in size and are commonly channeled and sparsely vegetated. Slopes range from 0 to 2 percent.

Typically, the soil material is fine sand and coarse sand and has a small percentage of gravel. It commonly contains thin strata of silty, clayey, and loamy material.

Included with this unit in mapping are small areas of Inavale soils. These soils are slightly higher in the landscape than areas of Riverwash.

Permeability is very rapid in areas of Riverwash. Available water capacity is very low. Runoff is slow. The apparent seasonal high water table ranges from about 1 foot above the surface in most wet seasons to about 2 feet below the surface in most dry seasons. Organic matter content is very low. Natural fertility is low.

Most of the acreage of this unit is adjacent to river channels and supports little or no vegetation. Some areas that have been in place for several years support sparse stands of grass, shrubs, willow, or cottonwood. Most areas are used as habitat for wetland wildlife.

This unit is not suited to cultivated crops, pasture, range, or the trees and shrubs grown as windbreaks because of frequent flooding and the seasonal high water table.

This unit is not suited to use as sites for sanitary facilities or to building site development because of flooding and the seasonal high water table. An alternative site should be selected.

The capability unit is VIIIw-8, dryland; windbreak suitability group 10. The unit is not assigned to a range site.

So—Shell silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on bottom lands. It is subject to occasional flooding. Areas range from 15 to more than 640 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, very friable silt loam about 17 inches thick. The underlying material is brown silt loam to a depth of more than 60 inches. In some places, the underlying material is not stratified.

Included with this soil in mapping are small areas of Colo, Hobbs, and Lamo soils. Colo and Lamo soils are somewhat poorly drained and are slightly lower than the Shell soil in the landscape. Hobbs soils are stratified in the surface layer and are slightly lower than the Shell soil in the landscape. The included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Shell soil. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. The rate of water intake is moderate. Tilth is good. This soil readily releases moisture to plants.

Nearly all of the acreage of this soil is cultivated. Most areas are irrigated, but some areas are used for dryland farming. A few small areas are in introduced or native grasses.

If used for dryland farming, this soil is suited to corn, soybeans, oats, winter wheat, and alfalfa. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or most of the crop residue on the surface help to conserve soil moisture.

If irrigated, this soil is suited to corn and soybeans and to such close-growing crops as alfalfa. Gravity and sprinkler systems are suited. Land leveling and constructing a tailwater recovery system increase the efficiency of water use under gravity systems. Conservation tillage systems, such as disking, chiseling, and no-till, that leave all or part of the crop residue on the surface help to conserve soil moisture. The application rate of water needs to be adjusted to the water intake rate of the soil. Surface drainage with V-ditches helps to remove floodwater; however, flood damage generally is slight.

This soil is suited to introduced grasses for pasture. Overgrazing when the soil is wet can cause surface compaction. Rotation grazing, nitrogen fertilizer, and proper stocking rates help to keep the pasture in good condition.

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses, such as big bluestem, little bluestem, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly Kentucky bluegrass, tall dropseed, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. Care after planting is needed to control competition from weeds. Conventional equipment can be used to cultivate between the tree rows. Appropriate herbicides can be used in the rows. Watering of newly planted trees is needed when rainfall is insufficient.

This soil is generally not suited to use as sites for septic tank absorption fields or buildings because of occasional flooding. An alternative site should be selected. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage.

Constructing roads and streets on suitable, compacted fill material above flood levels, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding. The surface pavement and base material should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Sp—Shell silt loam, clayey substratum, 0 to 1 percent slopes. This deep, moderately well drained, nearly level soil is on bottom lands of broad drainageways of major upland streams. This soil is subject to occasional flooding. Areas range from 10 to 50 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 8 inches thick. The subsurface layer is friable silt loam about 18 inches thick. It is dark gray in the upper part and grayish brown in the lower part. The underlying material is grayish brown silt loam in the upper part and dark gray silty clay loam and silty clay in the lower part to a depth of more than 60 inches. In places, the clayey part of the underlying material is above a depth of 40 inches.

Included with this soil in mapping are areas where the substratum is not clayey. The included areas make up 3 to 10 percent of the unit.

Permeability in the Shell soil is moderate in the upper part and slow in the lower part. Available water capacity is high. Runoff is slow. Organic matter content is moderate. Natural fertility is high. The perched seasonal high water table generally is at a depth of 2.5 to 4.0 feet during the wet season. The rate of water intake is moderate. This soil releases moisture readily to plants. Tilth is good.

Nearly all of the acreage of this soil is cultivated. A few small areas adjacent to farmsteads are in introduced grasses. Most areas are used for dryland crops. A few areas are irrigated, generally by gravity systems.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. Conserving water is a major management concern. Conservation tillage systems that leave crop residue on the surface help to conserve soil moisture. The clayey substratum of this soil allows the upper part of the profile to hold moisture for use by crops during periods of low rainfall. The soil tends to dry more slowly in the spring than better drained soils.

If irrigated, this soil is suited to such row crops as corn, soybeans, and sorghum and to such close-growing crops as alfalfa and small grain. Gravity and sprinkler systems can be used. Land leveling and constructing a tailwater recovery system increase the efficiency of water use under gravity systems. The application rate of water needs to be adjusted to the water intake rate. Wetness caused by the seasonal high water table generally delays planting crops in the early spring.

This soil is suited to introduced grasses for pasture. Overgrazing when the soil is wet causes surface compaction and reduces the rate of water intake. Rotation grazing, nitrogen fertilizer, and proper stocking rates help to keep the pasture in good condition.

This soil is suited to range and native hay. The natural plant community is mostly mid and tall grasses, such as big bluestem, little bluestem, sideoats grama, and switchgrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly Kentucky bluegrass, tall dropseed, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks. Healthy seedlings of adapted species, if properly planted in a well prepared site, survive and grow well. Care after planting is needed to control competition from weeds. Conventional equipment can be used to cultivate between the tree rows, and appropriate herbicides can be used in the rows. Newly planted trees need watering when rainfall is insufficient.

This soil is generally not suited to use as sites for septic tank absorption fields or buildings because of occasional flooding. An alternative site should be selected. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoons from flooding. Fill material can raise septic tank absorption fields a sufficient distance above the perched seasonal high water table.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. Constructing roads on suitable, well compacted fill material, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding and the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IIw-4, dryland, and IIw-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

Sr—Simeon loamy sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, excessively drained soil is on high stream terraces and uplands. It formed in sandy alluvium and outwash material. Areas range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy sand about 9 inches thick. The transition layer is pale brown, loose sand about 10 inches thick. The underlying material is white coarse sand to a depth of more than 60 inches. It is 12 percent gravel, by volume. In some places, the underlying material contains smaller amounts of gravel.

Included with this soil in mapping are small areas of Thurman soils. Thurman soils are somewhat excessively drained, have a dark surface layer more than 10 inches thick, and are in the same position in the landscape as the Simeon soil. The included soils make up 5 to 15 percent of the map unit.

Permeability is rapid in the Simeon soil. Available water capacity is low. Runoff is very slow. Organic matter content is low. Natural fertility is low. The rate of water intake is very high. Tilth is fair.

Most of the acreage of this soil is in native grasses and is used for range. A few small areas, most of which are irrigated, are used for cultivated crops.

Because of the low available water capacity, this soil generally is not suited to dryland farming. If irrigated, it is suited to corn, grain sorghum, and alfalfa. Sprinkler systems can be used. Soil blowing is a severe hazard. Conservation tillage systems that keep the soil covered with residue most of the time help to control soil blowing and to conserve soil moisture. In irrigation, small, frequent applications of water are needed because of the low available water capacity and the hazard of excessive leaching of plant nutrients. Returning crop residue to the soil helps to improve tilth, increases the organic matter content, and improves fertility.

This soil is suited to introduced grasses for pasture. Pasture and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Overgrazing reduces the protective cover, causes deterioration of the stands, and results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler systems can be used.

This soil is suited to range. A cover of native grasses is effective in controlling soil blowing. The natural plant community is mostly big bluestem, blue grama, hairy grama, little bluestem, needleandthread, sideoats grama, and prairie sandreed. If the plants are continuously overgrazed, the plant community is mostly blue grama, hairy grama, sand dropseed, and needleandthread. If overgrazing continues for many years, sand dropseed, sand paspalum, hairy grama, plains pricklypear, brittle pricklypear, and clubmoss invade the plant community.

This soil is not suited to the trees and shrubs grown as windbreaks because of droughtiness, the coarse texture, and the restricted root zone. Onsite investigation is needed to determine if small areas are suitable for planting.

This soil is well suited to use as sites for buildings and local roads and streets. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving.

The capability units are VIe-4, dryland, and IVe-14, irrigated; Sandy range site; windbreak suitability group 7.

ThB—Thurman loamy fine sand, 1 to 3 percent slopes. This deep, somewhat excessively drained, nearly level or very gently sloping soil is on uplands and high stream terraces. It formed in sandy, eolian material. Areas range from 5 to 500 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is grayish brown, very friable loamy fine sand about 6 inches thick. The transition layer is brown, loose fine sand about 6 inches thick. The underlying material is fine sand. It is pale brown in the upper part and very pale brown in the lower part to a depth of more than 60 inches. In some places, the soil is dark to a depth of more than 20 inches. In places, the soil contains more silt and clay between a depth of 20 and 40 inches. In places, dark colored, buried horizons are below a depth of 36 inches.

Included with this soil in mapping are small areas of Simeon and Valentine soils. Simeon soils are excessively drained and contain from 2 to 15 percent gravel, by volume, within a depth of 10 to 20 inches. They are in the same position in the landscape as the Thurman soil. Valentine soils have a dark surface layer less than 10 inches thick and are higher than the Thurman soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Thurman soil. Available water capacity is low. Runoff is slow. Organic matter content is moderately low. Natural fertility is medium. The rate of water intake is very high. Tilth is good. This soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Most cultivated areas are used for dryland crops, and some areas are used for irrigated crops. Some areas are in native or introduced grasses and are used for range or pasture.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Soil blowing is a severe hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture (fig. 16). Returning crop residue to the soil and applying manure help to maintain tilth, increase the organic matter content, and improve fertility.

If irrigated, this soil is suited to corn and alfalfa. Sprinkler systems can be used. Soil blowing is the principal hazard. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and conserve soil moisture. Frequent, light applications of water are needed because of the low available water capacity and the hazard of excessive leaching of plant nutrients. Returning crop

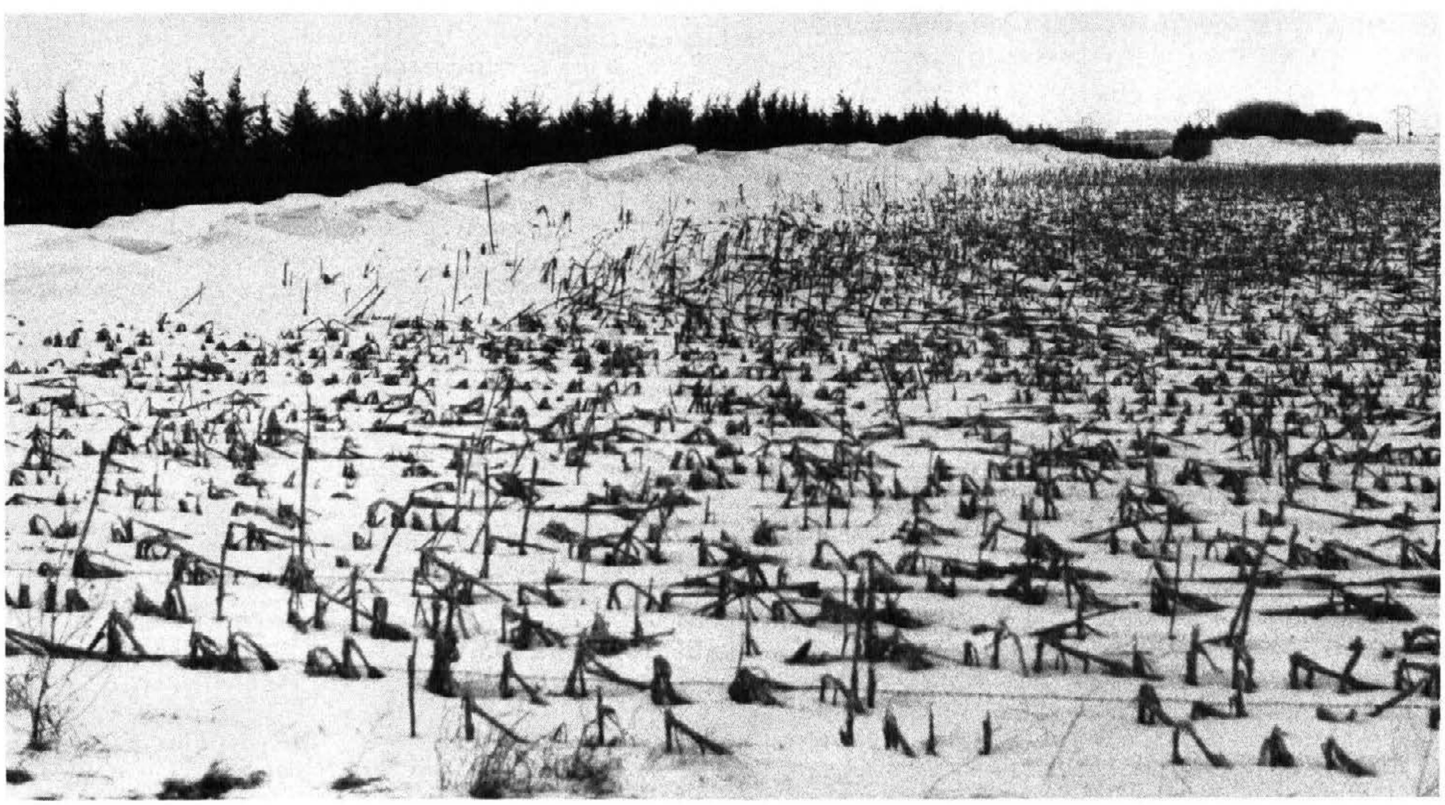

Figure 16.—A field windbreak and crop residue left on the surface help to conserve moisture and to control soil blowing. The soil is Thurman loamy fine sand, 1 to 3 percent slopes.

residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

This soil is suited to introduced grasses for pasture or hay. Pasture and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler irrigation systems can be used.

This soil is suited for range. A cover of native grasses is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for several years, the less desirable plants invade the plant community, sand movement becomes very active, and blowouts develop in some areas.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately drought-resistant and can be grown in sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the tree rows. Appropriate herbicides can be used to control weeds in the rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. Constructing septic tank absorption fields on raised fill helps to ensure adequate absorption of the effluent. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. This soil is generally suited to use as sites for dwellings and local roads and streets.

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

ThC—Thurman loamy fine sand, 3 to 6 percent slopes. This deep, somewhat excessively drained, gently sloping soil is on uplands and high stream terraces. It formed in sandy, eolian material. Areas range from 5 to more than 500 acres in size.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 7 inches thick. The subsurface layer is grayish brown, very friable loamy fine sand about 5 inches thick. The transition layer is grayish brown, loose fine sand about 5 inches thick. The underlying material is pale brown fine sand in the upper part and grayish brown and light brownish gray fine sand in the lower part to a depth of more than 60 inches. In some places, the soil is dark to a depth of more than 20 inches. Also, in some places, the soil contains a small amount of gravel between a depth of 10 and 20 inches.

Included with this soil in mapping are small areas of Boelus and Valentine soils. Boelus soils contain more silt and clay and less sand between depths of 20 and 40 inches and are lower in the landscape than the Thurman soil. Valentine soils do not have a dark surface layer and are higher than the Thurman soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Thurman soil. Available water capacity is low. Runoff is slow. Organic matter content is moderately low. Natural fertility is medium. The rate of water intake is very high. Tilth is good. This soil releases moisture readily to plants.

Most of the acreage of this soil is cultivated. Many cultivated areas are used for dryland crops, and the rest are used for irrigated crops. Some areas are in native or introduced grasses and are used for range or pasture.

If used for dryland farming, this soil is poorly suited to corn, small grain, and alfalfa. Soil blowing is a severe hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil and applying manure help to maintain tilth, increase the organic matter content, and improve fertility.

If irrigated, this soil is suited to corn and alfalfa. Sprinkler systems can be used. Conservation tillage systems that keep the soil covered with residue most of the time help to control soil blowing and to conserve soil moisture. Frequent, light applications of water are needed because of the hazard of excessive leaching of plant nutrients and the low available water capacity. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

This soil is suited to introduced grasses for pasture. Pastures and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler irrigation systems can be used.

This soil is suited to range. A cover of grasses is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for several years, the less desirable plants invade the plant community, sand movement becomes very active, and blowouts develop in some areas.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately drought-resistant and can be grown in sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and by application of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the tree rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. Constructing septic tank absorption fields on raised fill helps to ensure adequate absorption of the effluent. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. This soil is generally suited to use as sites for dwellings and local roads and streets.

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

Tx—Thurman loamy fine sand, loamy substratum, 0 to 3 percent slopes. This deep, well drained, nearly level and very gently sloping soil is on uplands and high stream terraces. It formed in sandy, eolian material. Areas range from 80 to 300 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is dark grayish brown, very friable loamy fine sand about 4 inches thick. The transition layer is brown, very friable loamy fine sand about 10 inches thick. The upper part of the underlying material is pale brown fine sand about 21 inches thick, the next part is brown and light gray clay loam about 8 inches thick, and the lower part is very pale brown sand to a depth of more than 60 inches. In some places, the soil is dark to a depth of more than 20 inches. The loamy layer is commonly at a depth of 36 to more than 60 inches and is commonly 4 to 12 inches thick.

Included with this soil in mapping are small areas of Simeon and Valentine soils. Simeon soils contain 3 to 15 percent gravel, by volume, within a depth of 10 to 20 inches and are in positions in the landscape similar to those of the Thurman soil. Valentine soils are excessively drained, have a dark surface layer less than 7 inches thick, and are higher than the Thurman soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability in the Thurman soil is rapid in the upper part and moderate in the loamy layer. Available water capacity is moderate. This soil is less droughty than the typical Thurman soil. Runoff is slow. Organic matter content is moderately low. Natural fertility is medium. The rate of water intake is high. Tilth is good. The surface layer can be easily tilled throughout a wide range of moisture content.

Most of the acreage of this soil is cultivated and is irrigated by sprinkler systems. A few areas are in native or introduced grasses and are used for pasture or range.

If used for dryland farming, this soil is suited to corn, soybeans, small grain, and alfalfa. Soil blowing is a severe hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Returning crop residue to the soil helps to maintain tilth, increases organic matter content, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Sprinkler systems can be used. Soil blowing is the principal hazard. Conservation tillage practices, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Fertilizer, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production. Frequent, light applications of water are needed because of the hazard of excessive leaching of nutrients and the moderate available water capacity. Returning crop residue to the soil helps to maintain tilth, increases the organic matter content, and improves fertility.

This soil is suited to introduced grasses for pasture. Pasture and hayland can be alternated with other crops as part of the crop rotation. Cool-season grasses, such as smooth brome or orchardgrass, are suited, either alone or in a mixture with legumes, such as alfalfa or trefoil, or with warm-season grasses, such as switchgrass or big bluestem. Continuous overgrazing reduces the protective cover, causes deterioration of the stands, and results in severe soil blowing. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler systems can be used.

This soil is suited to range. A cover of native grasses is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, prairie sandreed, sand bluestem, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for several years, the less desirable plants invade the plant community, sand movement becomes very active, and blowouts develop in some areas.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in sandy soils. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the tree rows. Appropriate herbicides can be used to control weeds in the rows. A drip system or another method of irrigation can provide supplemental water when rainfall is insufficient.

This soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. Constructing the septic tank absorption field on raised fill helps to ensure adequate absorption. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. This soil is generally suited to use as sites for dwellings and local roads and streets.

The capability units are IIIe-5, dryland, and IIIe-10, irrigated; Sandy range site; windbreak suitability group 5.

Us—Ustorthents, level. These deep, somewhat excessively drained soils are on stream terraces and bottom lands. They formed where soil material was stockpiled and used as fill material for houses. The fill material is mostly fine sand and coarse sand. These soils are subject to rare flooding. Areas surround a lake from which material was excavated and stockpiled to form a lake. A soil profile has not developed. Areas range from 10 to 60 acres in size.

Permeability is rapid or very rapid. Available water capacity is low. Organic matter content is very low. Natural fertility is very low. Runoff is slow. The water level in the lake is generally 4 to 6 feet lower than the lakeshore of filled land.

Most areas of these soils are used as sites for dwellings and streets. Some areas near the lake are used as beaches and for boat ramps. The lake provides opportunities for swimming, fishing, and other water recreation.

Areas of these soils are not suited to farming, range, the trees and shrubs grown as windbreaks, or other agricultural uses. Trees can be hand planted to enhance and shade an area. Open areas are suited to grasses for lawns.

These soils are not suited to use as sites for sanitary facilities. Sanitary facilities of single housing units should be connected to a city sewer or have a special design. On sites for sanitary facilities, the rapid permeability can result in ground water pollution. Constructing buildings on the highest parts of the fill area helps to prevent the damage caused by flooding. These soils are well suited to roads and streets.

These soils are not assigned to a capability unit, range site, or windbreak suitability group.

UtG—Ustorthents, steep. These deep, somewhat excessively drained and excessively drained soils are on uplands, stream terraces, and bottom lands. They formed where soil material was excavated and stockpiled during the construction of the Loup Public Power Canal. Areas are long, narrow, and parallel to the canal. They range from 10 to 40 acres in size.

The texture, color, and thickness of the layers of these soils differ from one area to another. On uplands, the soils are mainly silt loam or silty clay loam to a depth of more than 60 inches. Areas on terraces and bottom lands contain sandy, loamy, silty, and gravelly layers.

Included with these soils in mapping are small areas of somewhat poorly drained and poorly drained soils between the stockpiles. Also included are areas of less sloping Ustorthents. The included soils make up 5 to 10 percent of the unit.

Permeability in Ustorthents, steep, is moderate on uplands and moderately rapid to very rapid on stream terraces and bottom lands. Runoff is medium or rapid. Available water capacity is moderate in the silty soils and low or very low in the loamy and sandy soils. In all areas organic matter content is low.

Most areas support grasses, weeds, shrubs, and trees in sparse to dense stands and are used as wildlife habitat. In most places, the grasses have seeded naturally. These soils are not suited to farming or range because of the steep slope, inaccessibility to large machinery, and the severe hazard of erosion.

These soils are generally not suited to the trees and shrubs commonly grown as windbreaks because of slope. In some areas used as wildlife habitat, trees and shrubs can be grown if they are hand planted and given special care.

These soils are generally not suited to use as sites for sanitary facilities and to building site development. An alternative site should be selected.

The capability unit is VIIs-8, dryland; windbreak suitability group 10. The soils are not assigned to a range site.

VaC—Valentine fine sand, 3 to 9 percent slopes. This deep, gently sloping, excessively drained soil is on uplands and high stream terraces. Areas range from 10 to 200 acres in size.

Typically, the surface layer is grayish brown, very friable fine sand about 4 inches thick. The transition layer is pale brown, loose fine sand about 6 inches thick. The underlying material is pale brown fine sand to a depth of more than 60 inches. In some places, the dark surface layer is more than 10 inches thick. Also, in places, the underlying material contains 2 to 15 percent gravel, by volume.

Included with this soil in mapping are small areas of Els and Ipage soils. Els soils are somewhat poorly drained and lower than the Valentine soil in the landscape. Ipage soils are moderately well drained and lower than the Valentine soil in the landscape. The included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is very slow. Organic matter content is low. Natural fertility is low. The rate of water intake is very high. Tilth is fair.

Most of the acreage of this soil is in native grasses and is used for range. Some areas are used for cultivated crops and are irrigated by sprinkler systems.

This soil is generally not suited to dryland farming because of droughtiness. If the soil is not protected, severe soil blowing is a hazard. These problems are generally not practical to overcome if the soil is used for dryland crops.

If irrigated, this soil is poorly suited to corn and alfalfa. Sprinkler systems can be used. Soil blowing is a severe hazard. Conservation tillage practices that keep the soil covered with residue most of the time help to control soil blowing and to conserve soil moisture. In irrigation, small, frequent applications of water are needed because of the low available water capacity and the hazard of excessive leaching of plant nutrients. Returning crop residue to the soil helps to improve tilth, increases the organic matter content, and improves fertility.

This soil is well suited to range. A cover of native grasses is very effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, sandy bluestem, prairie sandreed, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for several years, the less desirable plants invade the plant community, sand movement becomes very active, and blowouts develop in some areas.

This soil is suited to coniferous trees grown in farmsteads, as feedlot windbreaks, and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are tolerant of drought and can be grown in sandy soils. Adapted species have a fair chance of survival and growth. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation. In addition, the trees should be planted in a shallow furrow where the soil has been disturbed as little as possible or in a strip where the vegetation has been killed by nonselective herbicides. Maintaining sod between the tree rows helps to control soil blowing. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil is suited to use as sites for buildings and local roads and streets. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. The design of small commercial buildings should accommodate the slope, or the site should be graded. In shaped areas stubble mulching and reseeding to desirable grasses help to control soil blowing.

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

VaE—Valentine fine sand, rolling. This deep, strongly sloping to steep, excessively drained soil is on dunes on uplands and stream terraces. Slopes range from 9 to 24 percent. Areas range from 10 to more than 1,000 acres in size.

Typically, the surface layer is light brownish gray, loose fine sand about 5 inches thick. The transition layer is pale brown, loose fine sand about 6 inches thick. The underlying material is very pale brown fine sand to a depth of more than 60 inches.

Included with this soil in mapping are small areas of Boelus, Els, Ipage, and Thurman soils. These soils are lower in the landscape than the Valentine soils. Also, Boelus soils have more silt and clay below a depth of 20 inches. Els soils are somewhat poorly drained. Ipage soils are moderately well drained. Thurman soils are dark to a depth of 10 to 20 inches. The included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Valentine soil. Available water capacity is low. Runoff is slow. Organic matter content is low. Natural fertility is low.

Most of the acreage of this soil is in native grasses and is used for range. Some areas have been taken out of range and are used for cultivated crops irrigated by sprinkler systems.

This soil is generally not suited to farming because of droughtiness and excessive slopes. If the soil is disturbed, severe soil blowing is a hazard. These limitations are generally not practical to overcome if the soil is used for cultivated crops.

This soil is suited to range. A cover of native grasses is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, sandy bluestem, prairie sandreed, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for several years, the less desirable plants invade the plant community, sand moves very actively, and blowouts develop in some areas.

This soil is suited to some of the trees and shrubs grown as windbreaks. The only suitable species are those that can grow well in a sandy, droughty soil. A lack of sufficient moisture and soil blowing are the main problems. Irrigation is needed during periods of low rainfall. The soil is so loose that the trees should be planted in shallow furrows with as little disturbance of the surface as possible. Maintaining strips of sod or other vegetation between the tree rows helps to control soil blowing. Windblown sand can damage young seedlings. Competition for moisture from weeds and undesirable grasses can be controlled by mowing between the tree rows or by applying appropriate herbicides.

Because of slope, this soil is limited for use as sites for buildings and sanitary facilities. The steeper areas are not suitable for use as sites for sanitary facilities. An alternative site should be selected. The design of dwellings and small commercial buildings should accommodate the slope. Because of the rapid permeability of the underlying material, the soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. On sites for sewage lagoons, lining or sealing the lagoon helps to prevent seepage. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. Cutting and filling are generally needed to provide a suitable grade for roads and streets.

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

VbC—Valentine-Thurman complex, 3 to 9 percent slopes. These deep, gently sloping to strongly sloping soils formed in eolian sand on uplands and high stream terraces between the Loup and the Platte Rivers. The Valentine soil is excessively drained, and the Thurman soil is somewhat excessively drained. Areas range from 15 to 200 acres in size. They are 50 to 70 percent Valentine soil on convex slopes and 20 to 40 percent Thurman soil on concave slopes at slightly lower positions. The two soils occur as areas so intricately mixed or so small in size that mapping them separately was not practical.

Typically, the Valentine soil has a surface layer of grayish brown, soft fine sand about 7 inches thick. The transition layer is pale brown, loose fine sand about 6 inches thick. The underlying material is very pale brown fine sand to a depth of more than 60 inches. In some places, the underlying material contains 2 to 15 percent gravel, by volume.

Typically, the Thurman soil has a surface layer of grayish brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is dark grayish brown, very friable loamy fine sand about 7 inches thick. The transition layer is pale brown, very friable loamy fine sand about 6 inches thick. The underlying material is very pale brown fine sand to a depth of more than 60 inches.

Included with these soils in mapping are small areas of Boelus, Els, and Ipage soils. Boelus soils have more silt and clay and less sand in the lower part of the profile than the Valentine and Thurman soils and are in concave positions. Els soils are somewhat poorly drained and lower than the Valentine and Thurman soils in the landscape. Ipage soils are moderately well drained and lower than the Valentine and Thurman soils in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Valentine and Thurman soils. Available water capacity is low. Runoff is slow. Organic matter content is low for the Valentine soil and moderately low for the Thurman soil. Natural fertility is low for the Valentine soil and medium for the Thurman soil. The rate of water intake is very high. Tilth is fair for the Valentine soil and good for the Thurman soil.

Most of the acreage of these soils is used for cultivated crops. In most areas, the crops are irrigated. A few small areas are used for dryland crops. Some areas are in native grasses and are used for range.

If used for dryland farming, these soils are poorly suited to corn, small grain, and alfalfa. Soil blowing is a severe hazard where the surface is not adequately protected by crops or crop residue. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave maximum amounts of crop residue on the surface help to control soil blowing and water erosion and to conserve soil moisture. Returning crop residue to the soil helps to improve tilth, increases the organic matter content, and improves fertility.

If irrigated, these soils are poorly suited to corn and alfalfa. Sprinkler systems can be used. Soil blowing is a severe hazard. Conservation tillage systems that keep residue on the soil most of the time help to control soil blowing and to conserve soil moisture. In irrigation, small, frequent applications of water are needed because of the low available water capacity and the hazard of excessive leaching of plant nutrients. Returning crop residue to the soil helps to improve tilth, increases the organic matter content, and improves fertility.

These soils are well suited to range. A cover of native grasses is effective in controlling soil blowing and water erosion. The natural plant community is mostly mid and tall grasses, such as indiangrass, little bluestem, sandy bluestem, prairie sandreed, sand lovegrass, and porcupinegrass. If the plants are continuously overgrazed or improperly harvested for hay, the plant community is mostly porcupinegrass, prairie junegrass, Scribner panicum, sand dropseed, and annual and perennial weeds. If overgrazing continues for several years, the less desirable plants invade the plant community, sand moves very actively, and blowouts develop in some areas.

These soils are suited to coniferous trees grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that are moderately tolerant of drought and can be grown in sandy soil. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and by cultivation or application of appropriate herbicides. Soil blowing can be controlled by maintaining strips of sod or an annual cover crop between the tree rows. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

These soils are generally suited to building site development and local roads and streets. The soils readily absorb but do not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in ground water pollution. Lining or sealing the lagoon helps to prevent seepage. On sites for sewage lagoons, grading is required to modify the slope and to shape the lagoon. Shaped areas can be stubble mulched and reseeded to desirable grasses. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving. The design of small commercial buildings should accommodate the slope, or the site should be graded. Shaped areas should be stubble mulched and reseeded to desirable grasses.

The capability units are IVe-5, dryland, and IVe-11, irrigated. The Valentine soil is in Sands range site, and the Thurman soil is in Sandy range site. Both soils are in windbreak suitability group 7.

Wn—Wann loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil is on bottom lands. It is subject to occasional flooding. It formed in stratified, loamy alluvium. Areas range from 5 to 200 acres in size.

Typically, the surface layer is dark gray, very friable loam about 9 inches thick. The subsurface layer is dark grayish brown, friable fine sandy loam about 7 inches thick. The transition layer is light brownish gray, friable fine sandy loam about 7 inches thick. The underlying material is stratified very pale brown, light brownish gray, and light gray sandy loam, fine sandy loam, and fine sand to a depth of more than 60 inches. In some places, heavier textured layers are below a depth of 28 inches. Also, in places, fine sand is at a depth of 10 to 20 inches. Some areas do not have mottles and are better drained.

Included with this soil in mapping are small areas of Inavale soils. Inavale soils do not have a dark surface layer and contain more sand and are higher in the landscape than the Wann soil. The included soils make up 5 to 15 percent of the unit.

Permeability is moderately rapid in the Wann soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 1.5 feet in most wet seasons to about 3.5 feet in most dry seasons. Organic matter content is moderate. Natural fertility is medium. The rate of water intake is moderately high. Tilth is good.

Most of the acreage of this soil is cultivated. It is used for irrigation or dryland crops. Some areas are in native or introduced grasses and are used for pasture and hay.

If used for dryland farming, this soil is suited to corn, small grain, and alfalfa. The principal limitation is wetness caused by the seasonal high water table. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and water erosion and to conserve soil moisture. Returning crop residue to the soil and applying manure help to maintain tilth, increase organic matter content and the rate of water intake, and improve fertility.

If irrigated, this soil is suited to corn, soybeans, small grain, and alfalfa. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. Fertilizer, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler irrigation systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue or applying manure to the soil increases the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep percolation. Constructing a tailwater recovery system helps to conserve water.

This soil is suited to introduced grasses for pasture. Pasture and hayland can be alternated with other crops as part of the crop rotation. Reed canarygrass and creeping foxtail are suited. Excessive wetness limits the choice of pasture grasses and legumes. Grazing when the water table is highest results in damage to the grass stand and a rough soil surface and impedes mowing for hay. Wetness makes seeding grass difficult. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Sprinkler or gravity systems can be used.

This soil is suited to range and native hay. The natural plant community is mostly tall and mid grasses and grasslike plants, such as big bluestem, little bluestem, indiangrass, switchgrass, prairie cordgrass, and various sedges. If the plants are continuously overgrazed or improperly harvested for hay, timothy, redtop, foxtail barley, clovers, sedges, and rushes invade the plant community.

This soil is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. The best suited species are those that tolerate a moderately high water table. Seedlings survive at a higher rate if competing vegetation is controlled or removed by good site preparation and by cultivation or application of appropriate herbicides. Maintaining strips of sod or an annual cover crop between the tree rows helps to control soil blowing. A drip system or another method of irrigation can supply moisture when rainfall is insufficient.

This soil is not suited to use as sites for septic tank absorption fields or buildings because of flooding and the seasonal high water table. An alternative site should be selected. Constructing sewage lagoons on fill material helps to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Lining or sealing the lagoon helps to prevent seepage. Dikes protect the lagoon from flooding. The sides of shallow excavations can be temporarily shored to prevent sloughing or caving if shoring is done during the dry season.

Constructing 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 the seasonal high water table. A surface drainage system helps to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

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

Zo—Zook silty clay loam, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on bottom lands of the Platte and the Loup River Valleys and major stream valleys. It is subject to occasional flooding. Areas range from 5 to 300 acres in size.

Typically, the surface layer is dark gray, firm silty clay loam about 8 inches thick. The subsurface layer is very dark gray and about 24 inches thick. It is firm silty clay loam in the upper part and very firm silty clay in the lower part. The subsoil is dark gray, very firm silty clay about 11 inches thick. The underlying material is gray, mottled silty clay to a depth of more than 60 inches.

Included with this soil in mapping are small areas of Gayville, Lamo, and Shell soils. Lamo soils are somewhat poorly drained and are in positions in the landscape similar to those of the Zook soil. Gayville soils are somewhat poorly drained, highly saline-alkali, and in positions in the landscape similar to those of the Zook soil. Shell soils are well drained and are higher than the Zook soil in the landscape. The included soils make up 5 to 15 percent of the unit.

Permeability is slow in the Zook soil. Available water capacity is high. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 1 foot in most wet seasons to about 3 feet in most dry seasons. Organic matter content is high. Natural fertility is medium. This soil releases moisture slowly to plants. Shrink-swell potential is high. The rate of water intake is very low. Tilth is fair.

Most of the acreage of this soil is cultivated. Most areas are used for dryland crops. Some areas are irrigated. A few areas are in introduced or native grasses and are generally used for haying.

If used for dryland farming, this soil is suited to corn, soybeans, grain sorghum, small grain, and alfalfa. The principal hazard is wetness caused by the seasonal high water table. Ponding in low areas lasts for several days after rains and thus delays tillage operations. Land leveling and shallow surface ditches improve surface drainage. In places, tile drains lower the water table and help to reduce wetness. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to control soil blowing and to conserve soil moisture. If the soil is not protected by snow or other cover in winter, soil blowing is a hazard.

If irrigated, this soil is suited to such row crops as corn, soybeans, and grain sorghum and to such close-growing crops as introduced grasses and alfalfa. Wetness caused mainly by the seasonal high water table is the main limitation. Land leveling improves surface drainage and increases the efficiency of the irrigation system. Shallow surface ditches can be used where a suitable outlet is available. Gravity and sprinkler irrigation systems can be used. Conservation tillage systems, such as ridge till-plant, that leave crop residue on the surface help to improve tilth and increase the rate of water intake.

This soil is suited to introduced grasses for pasture. Pastures generally are smooth brome or a mixture of orchardgrass and alfalfa. Overgrazing or grazing when the soil is wet can cause surface compaction. Proper stocking rates, rotation grazing, and nitrogen fertilizer help to keep the pasture in good condition.

This soil is suited to range. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, and switchgrass. If the plants are continuously overgrazed, the plant community is mostly tall dropseed, Kentucky bluegrass, western wheatgrass, and annual and perennial weeds. If the plants are overgrazed for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil is suited to the trees and shrubs grown as windbreaks. The best suited species are those that tolerate a moderately high water table and occasional flooding. Competition from weeds is a management concern. Cultivation helps to control weeds between the tree rows. If the soil cracks in dry weather, shallow cultivation can be used to close the cracks and to keep roots from drying out.

Because of flooding, wetness, and slow permeability, this soil is not suited to use as sites for septic tank absorption fields or buildings. An alternative site should be selected. Constructing sewage lagoons on fill material helps to raise the bottom of the lagoon to a sufficient height above the seasonal high water table. Dikes protect the lagoon from flooding.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarser grained subgrade or base material helps to ensure better performance. Constructing roads on suitable, well compacted fill material, establishing adequate side ditches, and installing culverts help to prevent the damage caused by flooding and the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface.

The capability units are IIw-4, dryland, and IIw-1, irrigated; Clayey Overflow range site; windbreak suitability group 2W.

Zp—Zook silty clay, 0 to 1 percent slopes. This deep, nearly level, poorly drained soil is on high bottom lands along the Loup River Valley. The soil is subject to occasional flooding. It formed in silty and clayey alluvium. Areas range from 20 to 100 acres in size.

Typically, the surface layer is very dark gray, firm silty clay about 8 inches thick. The subsurface layer is very dark gray, very firm silty clay about 7 inches thick. The subsoil is dark gray, very firm silty clay about 16 inches thick. The underlying material is silty clay to a depth of more than 60 inches. It is gray in the upper part and light gray in the lower part. In some places, free carbonates are at a depth of more than 50 inches and the dark surface colors extend to a depth of more than 36 inches.

Included with this soil in mapping are small areas of Grigston, Lamo, Muir, and Gayville soils. Grigston and Muir soils are well drained and are higher in the landscape than the Zook soil. Lamo soils are somewhat poorly drained and are in positions in the landscape similar to those of the Zook soil. Gayville soils are highly saline-alkali and are in positions in the landscape similar to those of the Zook soil. The included soils make up 5 to 15 percent of the unit.

Permeability is slow in the Zook soil. Available water capacity is moderate. Runoff is slow. The apparent seasonal high water table ranges from a depth of about 1 foot in most wet seasons to about 3 feet in most dry seasons. Organic matter content is high. Natural fertility is medium. The rate of water intake is very low. Shrink-swell potential is high. Tilth is poor.

Most of the acreage of this soil is cultivated. Most areas are used for irrigated crops. Some areas are used for dryland crops. Some areas are in introduced or native grasses and are used for grazing or haying.

If used for dryland farming, this soil is suited to corn, soybeans, and alfalfa. Wetness is the principal limitation and commonly delays tillage. Ponding in low areas lasts for several days after rains. Soil grading and drainage ditches improve surface drainage. Tile drains and open ditches can lower the seasonal high water table where suitable outlets are available. Conservation tillage systems, such as ridge till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Returning crop residue to the soil helps to improve tilth, increases the organic matter content and the rate of water intake, and improves fertility.

If irrigated, this soil is suited to corn, soybeans, and alfalfa. Wetness is the principal limitation and commonly delays tillage. Soil grading and open ditches improve surface drainage. Tile drains and open ditches can lower the seasonal high water table where suitable outlets are available. Conservation tillage systems, such as disk or chisel and plant, no-till, and till-plant, that leave all or part of the crop residue on the surface help to conserve soil moisture. Fertilizer, a high plant population, and an efficient irrigation system that controls the amount and time of water application sustain production.

Gravity or sprinkler systems can be used on this soil. Land leveling improves surface drainage. It establishes a suitable grade for a uniform distribution of water in areas irrigated by a gravity system. In areas that have been cut by land leveling, returning crop residue to the soil increases the organic matter content. Adjusting the rate at which water is applied to the water intake rate of the soil minimizes deep percolation.

This soil is suited to introduced grasses and legumes for pasture. Pastures and hayland can be alternated with the crops as part of the crop rotation. Reed canarygrass and creeping foxtail are suited to this soil. Overgrazing or grazing when the soil is wet causes surface compaction, poor soil tilth, and reduces the rate of water intake. Excessive wetness limits the choice of pasture grasses and legumes. Grazing when the water table is highest results in damage to the grass stand and a rough soil surface and impedes haying. Seeding of grasses can be difficult because of the seasonal high water table. Proper stocking rates, rotation grazing, and restricted grazing during wet periods help to keep the pasture in good condition. Nitrogen and phosphate fertilizers increase the growth and vigor of the grasses. Weeds can be controlled by timely spraying with appropriate herbicides.

This soil is suited to range. The natural plant community is mostly mid and tall grasses, such as big bluestem, indiangrass, little bluestem, and switchgrass. If the plants are continuously overgrazed, the plant community is mostly tall dropseed, Kentucky bluegrass, western wheatgrass, and annual and perennial weeds. If overgrazing continues for several years, snowberry and buckbrush invade the plant community. Brush management helps to control woody plants.

This soil generally is suited to the trees and shrubs grown as windbreaks and as plantings that enhance recreation areas or wildlife habitat. Healthy seedlings of adapted species survive and grow well if tolerant of occasional wetness, if properly planted on a well prepared site, and if competition from weeds and grasses is controlled or eliminated. Weeds and grasses can be controlled by cultivating and maintaining annual cover crops between the tree rows and by applying appropriate herbicides in the rows. Shrinking and swelling can cause the soil to crack in the summer. Shallow cultivation and supplemental watering help to close the cracks and to keep plant roots from drying out.

Because of wetness, slow permeability, and flooding, this soil is generally not suited to use as a site for septic tank absorption fields. It is not suitable as a site for dwellings and small commercial buildings because of flooding, wetness, and shrinking and swelling. Alternative sites should be selected. On sites for sewage lagoons, dikes constructed with a suitable material protect the lagoon from flooding. Constructing the lagoon on fill material helps to raise the bottom of the lagoon to a sufficient height above the seasonal high water table.

The surface pavement and base material of roads and streets should be thick enough to compensate for the low strength of this soil. Providing coarse grained base material helps to ensure better performance. Constructing 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 the seasonal high water table. A surface drainage system and a gravel moisture barrier in the subgrade help to prevent the damage caused by frost action. Grading and crowning the road and establishing adequate side ditches help to drain the surface. Mixing the base material with additives, such as hydrated lime, helps to prevent excessive shrinking and swelling.

The capability units are IIIw-1, dryland, and IIIw-1, irrigated; Clayey Overflow range site; windbreak suitability group 2W.

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 to produce a sustained high yield of crops in an economic manner. 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.

About 205,800 acres in the survey area, or nearly 47 percent of the total acreage, meets the soil requirements for prime farmland.

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 (fig. 17). The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, difficult to cultivate, and generally less productive.

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

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

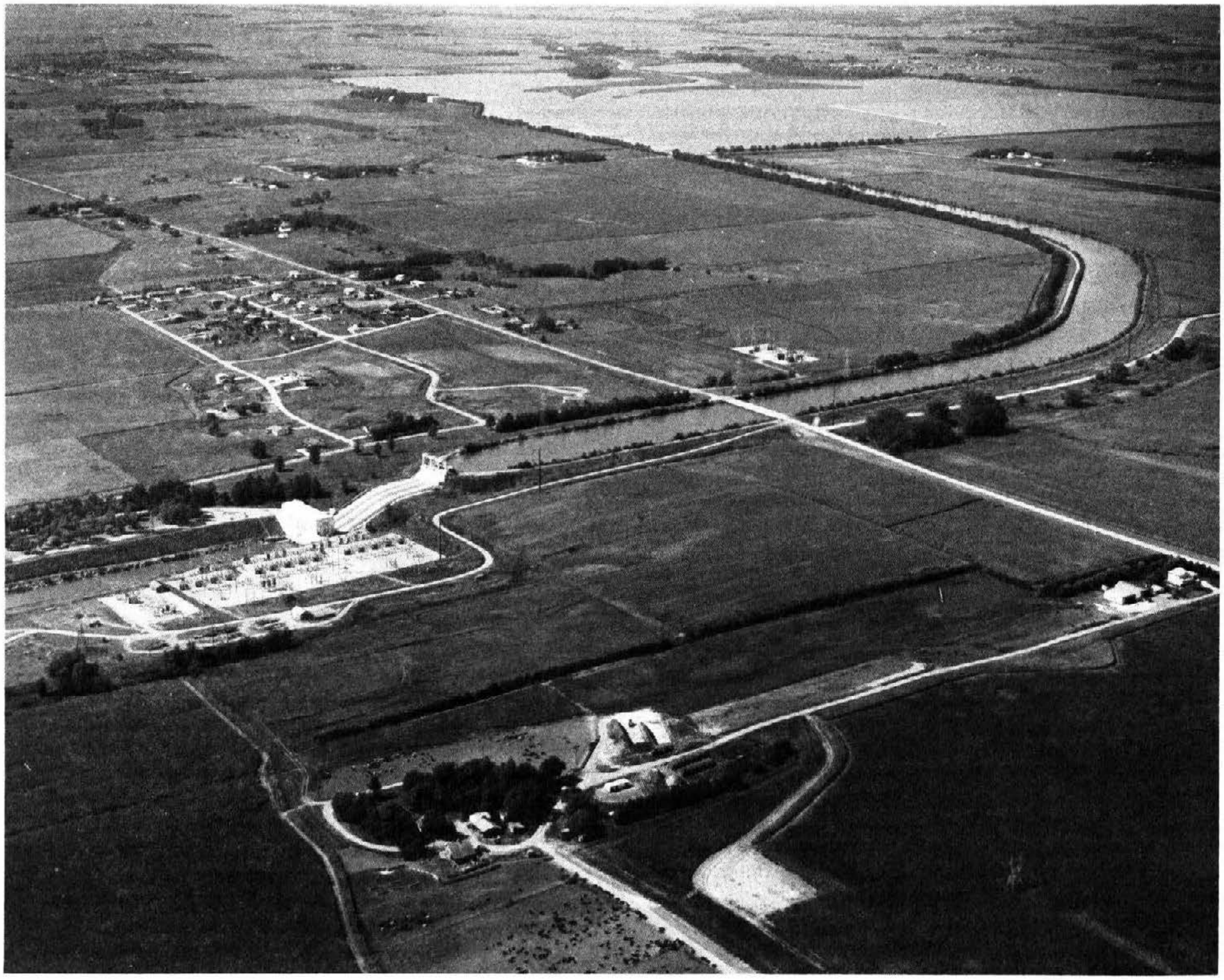

Figure 17.—An area of mostly prime farmland in multiple land uses. Moody and Muir are the dominant soils in this area.

such measures as drainage, flood control, or irrigation. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

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

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

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

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

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

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

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

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

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

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

Dryland Management

Good management practices on dryland soils help to reduce runoff, to control erosion, to conserve soil moisture, and to improve tilth. Many soils in the county are suitable for crop production. In places, however, erosion is a severe hazard and conservation practices are needed to protect the soils.

Terraces, contour farming, grassed waterways, and a conservation tillage system that leaves crop residue on the surface help to control water erosion, to increase the rate of water intake, to reduce runoff, and to conserve moisture for crop use. Leaving crop residue on the surface or growing a protective plant cover minimizes sealing and crusting of the soil during and after heavy rains. In winter, standing stubble catches drifting snow, which provides additional moisture.

Soil blowing is a major hazard on Thurman, Inavale, and Valentine soils that are used for farming. Crop residue management and conservation tillage systems help to control soil blowing. Generally, the hazard of erosion can be reduced if the more productive soils are used for row crops and the steeper, more erodible soils are used for close-growing crops, such as small grain, alfalfa (fig. 18), or grasses for hay and pasture. A cover of pasture or range plants is effective in controlling erosion.

Insufficient rainfall is the main limitation for dryland crops. A cropping system and conservation practices

Figure 18.—Alfalfa helps to control water erosion in areas of the Nora-Crofton complex.

help to conserve moisture and to control water erosion and soil blowing. Conservation tillage systems leave a protective cover of crop residue on the surface. They conserve soil moisture by reducing the evaporation rate, increasing the rate of water intake, and reducing runoff.

A cropping system is a planned sequence of crops grown on a field, in combination with the practices needed for the management and conservation of the soil. Under dryland farming, management practices and the cropping sequence should maintain tilth, fertility, and the plant cover that protects the soil from erosion. Management of cropland varies with the soils on which the crops are grown. For example, on Moody silty clay loam, 1 to 3 percent slopes, in row crop production, crop residue management and a conservation tillage system are needed. However, in areas of the Nora-Crofton complex, 6 to 11 percent slopes, eroded, where row crops are included in the crop rotation, terraces, contour farming, and crop residue management are needed to help to control water erosion and soil blowing and to maintain fertility and tilth.

On class I soils, such as Belfore silty clay loam, 0 to 1 percent slopes, the best management practices for cultivated fields include proper use of crop residue, addition of fertilizers or feedlot manure, and good agronomic practices. On class IVe-5 soils, such as Inavale loamy fine sand, 0 to 3 percent slopes, the best practices are those that keep crop residue on the soil in the winter and a conservation tillage system that leaves 30 percent of the surface covered with residue from corn, sorghum, or small grain after planting the crop to help to control water erosion and soil blowing.

When planting crops, the soils may need to be worked to prepare a seedbed, to control weeds, and to provide a favorable place for plants to grow. Excessive tillage, however, breaks down the granular structure in the surface layer that is needed for good soil tilth. Only essential steps in the tillage process should be used. Conservation tillage practices, such as no-till, till-plant, and disk or chisel and plant, are well suited to row crops. An example of a no-till conservation tillage system is corn planted into soybeans residue without tillage. Grasses can be established by drilling into a cover of stubble without further seedbed preparation.

Additional nutrients are needed in some of the soils used for dryland cropland. The kind and amount of fertilizer to be applied should be based on the results of soil tests and on the moisture content of the soil at the time when fertilizer is applied. If the subsoil is dry or if rainfall is below normal, the amount of nitrogen fertilizer applied should be slightly less than the recommended amount. Nitrogen fertilizer stimulates the growth of nonlegume crops on all soils. Phosphorus and zinc are needed on the more eroded soils and in cut areas after construction of terraces or diversions. Dryland soils require smaller amounts of fertilizer than irrigated soils because the plant population is generally lower.

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

Saline-alkali soils, such as Gayville silt loam, are naturally not suitable for many climatically adapted plants. Surface or subsurface drainage can make these soils suitable for some crops if suitable outlets are available. Crops and forage plants that have a high degree of salt tolerance can be grown. Barley and wheat are more salt tolerant than soybeans or corn. Tall wheatgrass and birdsfoot trefoil are more salt tolerant than alfalfa and orchardgrass.

Herbicides can be used to control weeds. The correct kind of herbicide at the proper rate must be applied to correspond to the soil conditions. Chemical activity in the soil takes place mostly in the collodial clay and humus fraction of the soil. Therefore, crop damage from herbicides more likely occurs on the coarse and moderately coarse soils that are low in collodial clay and in eroded areas where the organic matter content is low. On these soils, herbicides need to be applied at correspondingly lower rates and in accordance with the instructions on the label. Keeping field boundaries on the contour helps to ensure uniformity of soils in a field, and thus reduces the hazard of damage from herbicides.

Irrigation Management

According to Nebraska Agriculture Statistics, 40 percent of all cropland in Platte County was irrigated in 1979. Corn was grown on more than 70 percent of the irrigated cropland, and soybeans and alfalfa were grown on a smaller acreage.

Furrow or sprinkler systems are suited to corn and other row crops. Alfalfa can be irrigated by borders, contour ditches, corrugations, or sprinklers.

The cropping sequence on soils that are well suited to irrigation consists mostly of row crops. A change from corn to soybeans, alfalfa, and grasses helps to control the plant diseases and insects that are common if the same crop is grown year after year. Thurman loamy fine sand, if used for cultivated crops, is subject to soil blowing. Where irrigation is used, soil blowing can be controlled on an acre of land by a minimum of 3,000 pounds of standing corn stalks 16 inches tall or 5,000 pounds left flat on the soil surface until the spring crop is planted. Conservation tillage systems and crop residue management leave a protective cover of crop residue on the surface after the crop is planted. They help to prevent excessive soil loss, and they conserve soil moisture by reducing the evaporation rate, increasing the rate of water intake, and reducing runoff.

If sprinkler systems are used, water should be applied at a rate that allows the soil to absorb the water and that will not produce runoff. Sprinkler systems can be used on the more sloping soils as well as the nearly level soils. Some coarse textured soils, such as Valentine fine sand, 3 to 9 percent slopes, are better suited to sprinkler systems if conservation practices are used to protect the soil from wind erosion. The water from sprinkler systems can be controlled, thus these systems have special use in conservation, for example, in establishing grass stands, checking soil blowing, and improving seed germination of most crops. In summer, when much water is lost because of evaporation and wind drift, some sprinkler systems apply water unevenly. Watering at night, when wind velocities and temperatures are lower, reduces the evaporation rate and improves water distribution.

Soil holds only a limited amount of water. Irrigation water or precipitation is needed at regular intervals to keep the soil moist. The application interval varies with the crop, the soil, and the amount of moisture in the soil. The water should be applied no faster than the soil can absorb it.

Irrigated silty clay loam soils in Platte County hold about 2 inches of available water per foot of soil. A depth of 3 feet is considered the zone of water application for most crops. Consequently, 3 feet of soil can hold about 6 inches of water available for crop use.

Maximum efficiency is obtained if irrigation is started when about half of the stored water has been used by plants. Thus, if a soil holds 6 inches of available water, irrigation should be started when about 3 inches of the water have been removed by the crop. An irrigation system should be planned to replace water at the rate that will provide a stable water supply for the crop. Constructing a tailwater recovery pit at the end of a furrow irrigation field traps runoff of excess irrigation tailwater. The water can then be pumped to the upper ends of the field and used again. This practice increases the efficiency of surface irrigation systems and helps to conserve the supply of underground water. Effective irrigation water management helps to control water and wind erosion, reduce water runoff and deep percolation, and provide uniform water distribution across the field.

Irrigated soils generally produce higher yields than dryfarmed soils. Consequently, more plant nutrients, particularly nitrogen and phosphorus, are removed in harvesting crops. Returning all crop residue to the soil and adding feedlot manure and commercial fertilizer help to maintain the needed plant nutrients. Most grain crops in the county respond to nitrogen fertilizer. Soils disturbed by land leveling, particularly if the topsoil has been removed, respond to phosphorus, zinc, and iron. The kinds and amounts of fertilizer needed for specific crops should be determined by soil tests.

The soils in Platte County that are suited to irrigation are assigned to an irrigated design group. These design groups are described in the Nebraska Irrigation Guide (*8*), which is part of the technical specifications for conservation in Nebraska. The Arabic numerals in the irrigation capability unit indicate the design group to which a soil belongs.

Assistance in planning and designing an irrigation system is available through the local office of the Soil Conservation Service or the county agricultural agent.

Pasture and Hayland Management

Areas that are in hay or pasture should be managed for maximum production. After the pasture has been established, the grasses need to be kept productive. A planned grazing system that meets the needs of the plants and that promotes uniform utilization of forage is important if high returns are expected. Most forage plants are a good source of minerals, vitamins, proteins, and other nutrients. A well managed pasture provides a balanced ration of green plants throughout the growing season.

A mixture of adapted grasses and legumes can be grown on many kinds of soils, and under proper management the soil can return a fair profit. Grasses and legumes can be alternated with grain crops in a crop rotation and are ideal for use in a conservation cropping system. They improve soil structure and tilth, add organic matter, and help to control erosion.

Grasses and legumes that are used for pasture and hay, either irrigated or nonirrigated, require additional plant nutrients for maximum vigor and growth. The kinds and amounts of fertilizer to be applied should be based on the results of soil tests. Smooth brome and orchardgrass are the species most commonly grown on irrigated pastures. Other grasses and legumes adapted to irrigation are intermediate wheatgrass, meadow brome, and creeping foxtail. Legumes that have potential for irrigated or nonirrigated pasture are alfalfa, birdsfoot trefoil, and cicer milkvetch.

Irrigated pasture is an economic alternative to irrigated cropland. Converting cropland to irrigated pasture helps to control erosion.

Smooth brome, intermediate wheatgrass, meadow brome, and tall fescue are adapted, cool-season grasses and legumes for use on nonirrigated pasture. If planted as a single species on nonirrigated land, some native, warm-season grasses, especially switchgrass, indiangrass, and big bluestem, can provide high-quality forage in the summer.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

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

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, 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 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. 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-3 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Rangeland

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

About 4 percent of the agricultural land in Platte County, or about 18,000 acres, is used for range. This acreage includes both native prairie never broken from sod and areas that were once cultivated but then were seeded to native grasses. It is largely in the sandhills area along the Loup River in the Valentine-Thurman and Els-Valentine-Ipage associations. Most of the range is in the Sandy, Sands, Sandy Lowland, Subirrigated, and Wetland range sites. The average size of a livestock farm is 320 acres.

On most of the livestock farms in the county, the range is used for raising small herds of cows and calves. The calves are sold as feeders in the fall. The cattle graze the range from late spring through early fall. They graze smooth brome in the spring and corn or grain sorghum (milo) stalks in the fall and early winter. They are fed alfalfa hay, native hay, silage, or a combination of these for the rest of the winter.

Much of the range has been depleted by continuous overgrazing by livestock. The overgrazed pastures frequently support low vigor, forage-producing plants. Commonly, these pastures have abundant weeds, shrubs, and trees. The productivity and condition of range can be increased by the use of sound management practices, for example, proper grazing use, planned grazing systems, and brush and weed control. Range seeding can convert cropland to range or restore depleted range.

At the end of each map unit description in this survey, the soil is assigned to an appropriate range site, depending on the kind and amount of vegetation grown on the soil when the site is in climax condition. Interpretations for each range site in the county are given in the Technical Guide, which is available at the local office of the Soil Conservation Service. This office also can provide technical assistance in developing a forage management system, reseeding cropland to grass, and setting up a planned grazing system.

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 each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. An explanation of the column headings in table 8 follows.

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

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

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

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

Windbreaks and Environmental Plantings

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

Most farmsteads in Platte County have windbreaks. The trees were planted since the farmstead was established. Siberian elm and eastern redcedar are the most common tree species, especially in the older windbreaks. Some of the other common species are green ash, Russian mulberry, lilac, hackberry, and eastern cottonwood.

Tree planting around the farmstead is a continuing process because old trees pass maturity and deteriorate and some trees are destroyed by insects, disease, or storms. Some new trees are needed in areas where the farmyard has been expanded, or where windbreaks need supplemental plantings to reinforce them and to restore their effectiveness for wind and snow control.

Field windbreaks or shelterbelts are numerous in the county. Shelterbelts consisting of 8 to 10 rows of trees and shrubs are mostly on the Boel-Inavale-Wann, Valentine-Thurman, and Els-Valentine-Ipage associations (fig. 19), although they are in scattered areas throughout the county. The common species grown as windbreaks are American plum, Russian mulberry, ponderosa pine, green ash, Russian-olive, northern catalpa, hackberry, honeylocust, eastern cottonwood, American elm, eastern redcedar, and Siberian elm.

Many one- or two-row field windbreaks have also been planted on the same associations as the multiple row shelterbelts. In addition, narrow field windbreaks are numerous on the Blendon-O'Neill association. Eastern redcedar is used for most single row field windbreaks, and honeylocust and eastern redcedar are used in double row belts.

Many old field windbreaks have reached maturity and are deteriorating. Renovation by thinning, removal, and replanting is needed to maintain the value and effectiveness of these windbreaks.

For windbreaks to fulfill their intended purpose, the species of trees or shrubs that are adapted to the soils on the site should be selected for planting. Matching the appropriate trees and shrubs with the soil type helps to ensure survival and maximum growth. Permeability, available water capacity, fertility, soil texture, soil depth, and drainage affect the survival and growth rates.

Trees and shrubs can be easily established in Platte County if the sites are properly prepared and competition from weeds and grasses are controlled after planting. During establishment, supplemental watering is needed when rainfall is insufficient.

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.

Figure 19.—Field windbreaks help to control soil blowing on cropland on the Boel-Inavale-Wann association.

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

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

Native Woodland

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

Approximately 1.6 percent of Platte County, or 6,720 acres, is forested. The wooded areas are along the Loup and Platte Rivers and along the major streams. Woodland also takes in a few small areas on the breaks along Shell Creek and some of the upland drainageways.

Along the Loup and Platte Rivers, the Boel-Inavale-Wann association supports mainly eastern cottonwood, black willow, and eastern redcedar. Most of the sawtimber in the county, approximately 75 percent of which is eastern cottonwood, is in these areas.

Along the major streams in the Shell-Hobbs-Muir association, the trees are mostly green ash, eastern cottonwood, black willow, and boxelder. An associated species is black walnut in small numbers. Bur oak is in small blocks on some of the steep breaks along Shell Creek.

Upland drainageways are not heavily wooded. Elms, black willow, eastern cottonwood, eastern redcedar, green ash, and Russian mulberry are scattered in these areas and increase in number in the lower reaches of drainageways.

Some of the trees, especially eastern cottonwood, green ash, bur oak, and black walnut, have commercial value for wood products. However, very few wooded areas in the county are managed for commercial production. Most wooded areas are small in size and privately owned and make up a small acreage of the farm units.

Since 1955, the acreage in forest land has declined approximately 20 percent. Most of the decline has resulted from clearing and converting woodland to cropland or pasture.

On many of the soils on bottom lands, the potential is good for production of sawtimber, firewood, Christmas trees, and other wood products. Most areas of these soils, however, are used as cropland and will not likely be converted to woodland.

Recreation

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

Ten kinds of private recreation areas have been evaluated by representatives of county, state, and federal agencies as well as by local private organizations (*6*). These areas were vacation cabins, cottages, and homesites; camping; picnic and sports areas; fishing waters; golf courses; hunting areas; natural, scenic, and historic areas; riding stables; shooting preserves; and vacation farms.

Most of the recreation enterprises had some potential for future development. The ratings were medium for all enterprises, except for miniature golf courses and riding stables, which were rated low.

Recreation facilities available include golf courses, camping areas, and shooting ranges.

A public recreation area, comprising Lakes Babcock and North, is owned by the Loup River Public Power District (LRPPD). The area comprises 1,250 acres and includes 150 acres of land, 200 acres of marshland, and 900 acres of water. It offers opportunities for picnicking, swimming, fishing, and boating. The area is a wildlife refuge for 1 mile outside the water areas and attracts migrating waterfowl. It provides waterfowl hunting on the private lands outside of refuge boundaries.

The LRPPD canal is open to public hunting and fishing during the regular seasons. Picnic areas are also located along the canal.

The Game and Parks Commission has acquired the Longbow Wildlife Management Area, a 420-acre tract adjacent to the Loup River in the southwest corner of the county. The area has been developed for upland game production and has nesting cover and food plots. Hunting for deer, pheasant, and quail is available during the regular season.

Mourning dove can be hunted throughout the county. Waterfowl can be hunted along the Loup and Platte Rivers and on private lands surrounding Lake Babcock.

The quality of the streams in Platte County is fair. The Loup River, LRPPD Canal, Platte River, Beaver Creek, and Shell Creek support fisheries. Water quality, however, is limited by dewatering for irrigation. Lake North also has a fishery. The fish species include largemouth bass, bluegill, catfish, walleye, and northern pike.

The farm ponds throughout the county are stocked with largemouth bass, bluegill, and channel catfish.

The wildlife species that inhabit the county are varied. They include ringnecked pheasant, bobwhite quail, cottontail, and white-tailed deer. Many songbirds and other nongame species live along the Loup and Platte Rivers. The bald eagle, which is an endangered species, uses the streams as travel lanes.

The Soil Conservation Service staff at the field office in Columbus can provide technical assistance for designing installations to improve wildlife habitat and recreation facilities. Otherwise, they can direct you to an appropriate agency that can provide the needed assistance.

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.

Wildlife Habitat

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

Wildlife habitat in Platte County varies with the soil, topography, slope, and drainage pattern. The northern half of the county provides habitat for openland wildlife, such as pheasant, bobwhite quail, cottontail, squirrel, meadowlark, and red fox (fig. 20).

Scattered clumps of trees and shrubs are found in the fence rows, drainages, road ditches, and field borders. Species include eastern redcedar, pine, chokecherry, plum, hackberry, mulberry, ash, elm, and boxelder. Farmstead shelterbelts and field windbreaks protect wildlife in winter. Species in these plantings include eastern redcedar, pine, hackberry, catalpa, ash, elm, honeysuckle, plum, chokecherry, and Russian-olive.

Some wildlife plantings with blocks of eastern redcedar, pine, and various shrubs are scattered throughout this area and provide winter cover for all wildlife species, including white-tailed deer.

Several stream corridors, including those of Beaver Creek, Looking Glass Creek, Shell Creek, and Loseke Creek, provide riparian habitat and wildlife travel lanes between the river systems and the upland areas.

In the southern half of the county, the Loup and Platte Rivers converge southeast of Columbus. Between and along these two rivers the wildlife habitat is diversified. Crops of small grain, corn, and milo on the stream terraces provide food, and the riparian habitat along the river channels provides heavy escape cover. White-tailed deer, squirrel, opossum, mink, muskrat, beaver, weasel, cottontail, badger, fox, bobwhite quail, and pheasant inhabit these areas. In addition, predatory hawks, owls, eagles, and songbirds are associated with the woodland. The tree and shrub species include cottonwood, willow, elm, oak, ash, boxelder, black walnut, hackberry, dogwood, plum, chokecherry, sumac, and buckbrush.

In the extreme southwest corner of the county, adjacent to Merrick County, there is an area of sandhills. In this area, the sandy soils are used as irrigated cropland or native range. Woody vegetation is limited, except where farmstead shelterbelts and field windbreaks are planted for protection from wind erosion. Prairie grouse and black-tailed jackrabbit inhabit this area.

Mourning doves are found throughout the county and provide hunting during the regular hunting season.

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

Figure 20.—Areas of the Shell-Hobbs-Muir association provide excellent habitat for wildlife.

established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, 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 bluestem, 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, cottonwood, and sumac. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are 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 honeysuckle, western snowberry, coralberry, and sumac.

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

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are wetness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, 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 herons, shore birds, muskrat, mink, and beaver.

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

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 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, sodium, and sulfidic materials 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. On sandy soils, cutbanks tend to cave, and thus interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 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, 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, 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, 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 and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil. 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.

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 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 and 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 typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

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

Engineering Index Properties

Table 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. 21). "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.

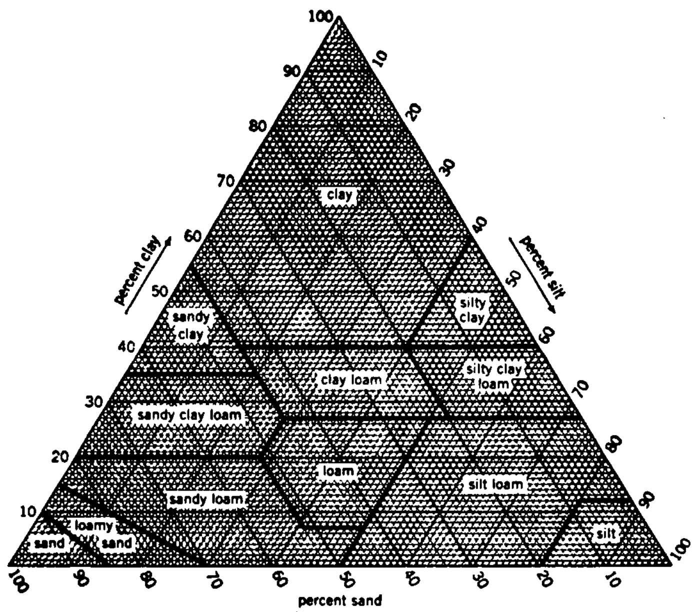

Figure 21.—The percentages of clay, silt, and sand in the basic USDA soil textural classes.

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 adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and 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 20 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 20 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.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; 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 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, Method A—T 99 (AASHTO), D 698 (ASTM).

The group index number that is part of the AASHTO classification is computed by the Nebraska Modified System.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. 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 has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Cumulic* identifies the subgroup that has a mollic epipedon more than 24 inches thick. An example is Cumulic 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 Cumulic 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* (*5*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*7*). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Alcester Series

The Alcester series consists of deep, well drained, moderately permeable soils on foot slopes. These soils formed in silty colluvial-alluvial material. Slopes range from 2 to 6 percent.

Alcester soils are similar to Muir and Shell soils and are commonly near Hobbs, Moody, Muir, Nora, and Shell soils in the landscape. Muir soils are nearly level and are on terraces on the lower parts of the landscape. Shell soils do not have a B horizon, have a thinner solum, and are lower in the landscape than the Alcester soils.

Hobbs soils are stratified above a depth of 18 inches and are on bottom lands lower in the landscape than the Alcester soils. Moody and Nora soils do not have cumulic horizons. Moody soils are nearly level and are in terrace positions at lower elevations than the Alcester soils. Nora soils are on convex side slopes higher in the landscape than the Alcester soils.

Typical pedon of Alcester silt loam, 2 to 6 percent slopes, 300 feet east and 2,400 feet north of the southwest corner of sec. 6, T. 18 N., R. 2 W.

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

A—8 to 18 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

BA—18 to 26 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

Bw—26 to 45 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure; hard, friable; neutral; clear smooth boundary.

BC—45 to 52 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; hard, friable; neutral; clear smooth boundary.

C—52 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; hard, friable; neutral.

The thickness of the solum and the depth to carbonates, where present, range from 36 to 60 inches. The mollic epipedon ranges from 24 to 50 inches in thickness and extends into the B horizon. The organic matter content decreases irregularly with depth.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon ranges from medium acid to neutral. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5 (2 to 4 moist), and chroma of 1 to 3 (dry or moist). It is slightly acid or neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3 (dry or moist). It is typically silty clay loam, but the range includes silt loam. This horizon ranges from neutral to moderately alkaline.

Alda Series

The Alda series consists of soils that are moderately deep over coarse sand or gravelly sand. They are somewhat poorly drained. Permeability is moderately rapid in the solum and very rapid in the underlying material. These soils formed in stratified alluvium on bottom lands of the Platte River. Slopes range from 0 to 2 percent.

Alda soils are commonly near Gothenburg, Novina, Platte, and Wann soils in the landscape. Gothenburg soils have coarse sand and gravelly sand at a depth of less than 10 inches and are generally near meandering stream channels lower in the landscape than the Alda soils. Novina and Wann soils are deep and are finer textured than the Alda soils above a depth of 40 inches. In addition, Novina soils are moderately well drained. Platte soils have gravelly coarse sand at a depth of 10 to 20 inches and are generally slightly lower in the landscape than the Alda soils.

Typical pedon of Alda loam, 0 to 2 percent slopes, 200 feet south and 100 feet east of the northwest corner of sec. 9, T. 16 N., R. 1 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate fine and very fine granular structure; slightly hard, friable; mildly alkaline; clear smooth boundary.

AC—10 to 16 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak subangular blocky; slightly hard, friable; mildly alkaline; clear smooth boundary.

C—16 to 28 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; common fine distinct dark brown (7.5YR 4/4 moist) mottles; massive; soft, very friable; moderately alkaline; abrupt smooth boundary.

2C1—28 to 35 inches; light gray (10YR 7/2) sand, grayish brown (10YR 5/2) moist; common fine distinct dark brown (7.5YR 4/4 moist) mottles; single grain; loose; mildly alkaline; abrupt smooth boundary.

2C2—35 to 50 inches; light gray (10YR 7/2) coarse sand, brown (10YR 5/3) moist; common medium distinct dark brown (7.5YR 4/4 moist) mottles; single grain; loose; neutral; gradual smooth boundary.

2C3—50 to 60 inches; light gray (10YR 7/2) coarse sand (and 4 percent gravel by volume), pale brown (10YR 6/3) moist; few fine distinct dark brown (7.5YR 4/4 moist) mottles; single grain; loose; neutral.

The mollic epipedon ranges from 10 to 20 inches in thickness. The depth to coarse sand or gravelly sand ranges from 20 to 40 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically loam, but the range includes silt loam and fine sandy loam. This horizon is neutral or mildly alkaline. The AC horizon has colors intermediate between the A horizon and the C horizon. Some pedons do not have an AC horizon. The C horizon has value of 4 to 8 (3 to 6 moist) and chroma of 1 to 3 (dry or moist). It is typically fine sandy loam, but the range includes sandy loam. Strata of finer or coarser textured materials are common. This horizon is mildly alkaline or moderately alkaline. The 2C horizon has a color range similar to that of the C horizon. It is typically coarse sand and sand that is 3 to 11 percent gravel, by volume, or is gravelly sand.

Belfore Series

The Belfore series consists of deep, well drained, moderately slowly permeable soils on uplands. These soils formed in loess on broad ridgetops in the uplands. Slopes are 0 to 1 percent.

Belfore soils are similar to Moody and Nora soils and are commonly near Butler, Crofton, Fillmore, Moody, and Nora soils in the landscape. Butler soils are somewhat poorly drained. Crofton soils do not have a mollic epipedon or a B horizon. They have free carbonates at a depth of less than 8 inches and are lower in the landscape than the Belfore soils. Fillmore soils are poorly drained, have more clay in the 10- to 40-inch control section, and are in shallow depressions lower in the landscape than the Belfore soils. Moody soils have less clay in the B horizon and are in a landscape position similar to that of the Belfore soils. Nora soils have free carbonates at a depth of less than 30 inches, have less clay in the B horizon, and are lower in the landscape than the Belfore soils.

Typical pedon of Belfore silty clay loam, 0 to 1 percent slopes, 150 feet east and 2,200 feet south of the northwest corner of sec. 34, T. 20 N., R. 2 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; hard, firm; slightly acid; abrupt smooth boundary.

A—9 to 14 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure parting to weak medium subangular blocky; hard, firm; slightly acid; clear smooth boundary.

Bt1—14 to 19 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, very firm; slightly acid; clear smooth boundary.

Bt2—19 to 28 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm; slightly acid; clear smooth boundary.

Bt3—28 to 37 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; slightly acid; clear smooth boundary.

BC—37 to 45 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; few fine faint yellowish brown (10YR 5/6) relict mottles; weak coarse prismatic structure parting to weak medium subangular blocky; hard, firm; slightly acid; clear smooth boundary.

C1—45 to 51 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; common medium faint yellowish brown (10YR 5/6) moist relict mottles; massive; hard, firm; slightly acid; gradual wavy boundary.

C2—51 to 60 inches; very pale brown (10YR 7/4) silt loam, yellowish brown (10YR 5/4) moist; many medium faint yellowish brown (10YR 5/6) relict mottles; massive; slightly hard, friable; neutral.

The mollic epipedon ranges from 10 to 20 inches in thickness. Carbonates are leached to a depth of more than 60 inches. The solum ranges from 33 to 60 inches in thickness.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is medium acid or slightly acid. The Bt horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3 (dry or moist). It is typically silty clay loam, but the range includes silty clay that has a clay content of 35 to 43 percent. This horizon is slightly acid or neutral. The BC horizon has value of 4 to 6 (3 to 5 moist) and chroma of 3 or 4 (dry or moist). Reaction is slightly acid or neutral. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 to 4 (dry or moist). It is typically silty clay loam in the upper part and silt loam in the lower part. It ranges from slightly acid to mildly alkaline. Some pedons contain relict mottles below a depth of 25 inches, and some have small very dark brown or black concretions.

Blendon Series

The Blendon series consists of deep, well drained soils on stream terraces and alluvial fans. Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. These soils formed in sandy alluvium reworked by wind. Slopes range from 0 to 2 percent.

Blendon soils are commonly near Boel, Merrick, O'Neill, and Thurman soils in the landscape. Boel soils are somewhat poorly drained, have a mollic epipedon less than 20 inches thick, and are lower in the landscape than the Blendon soils. Merrick soils are moderately well drained, have more clay in the 10- to 40-inch control section, and are slightly lower in the landscape than the Blendon soils. O'Neill soils have coarse sand at a depth of 20 to 40 inches and are slightly lower in the landscape than the Blendon soils. Thurman soils are somewhat excessively drained, have a mollic epipedon less than 20 inches thick, have more sand in the 10- to 40-inch control section, and are higher in the landscape than the Blendon soils.

Typical pedon of Blendon fine sandy loam, 0 to 2 percent slopes, 100 feet east and 2,300 feet south of the northwest corner of sec. 23, T. 17 N., R. 3 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

Bw—9 to 23 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to weak fine granular; slightly hard, friable; neutral; clear smooth boundary.

BC—23 to 29 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak fine granular; slightly hard, friable; neutral; clear smooth boundary.

C1—29 to 41 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; soft, very friable; neutral; clear smooth boundary.

C2—41 to 52 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; single grain; loose; neutral; clear smooth boundary.

C3—52 to 60 inches; light gray (10YR 7/2) sand, light brownish gray (10YR 6/2) moist; single grain; loose; mildly alkaline.

The mollic epipedon ranges from 20 to 40 inches in thickness. The thickness of the solum ranges from 24 to 50 inches.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically fine sandy loam, but the range includes sandy loam. This horizon ranges from medium acid to neutral. The Bw horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically fine sandy loam, but the range includes sandy loam. It is slightly acid or neutral. The BC horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3 (dry or moist). Some profiles do not have a BC horizon. The C horizon has value of 5 to 7 (3 to 5 moist) and chroma of 2 or 3 (dry or moist). It ranges from fine sandy loam to sand. It is neutral or mildly alkaline.

Boel Series

The Boel series consists of deep, somewhat poorly drained, rapidly permeable soils on bottom lands. These soils formed in recent sandy alluvium. Slopes range from 0 to 2 percent.

Boel soils are commonly near Inavale, Loup, Platte, and Wann soils in the landscape. Inavale soils are excessively drained, do not have a mollic epipedon, and are slightly higher in the landscape than the Boel soils. Loup soils are poorly drained and lower in the landscape than the Boel soils. Platte soils have gravelly coarse sand at a depth of 10 to 20 inches and are in a landscape position similar to that of the Boel soils. Wann soils have less sand in the control section and are in a landscape position similar to that of the Boel soils.

Typical pedon of Boel fine sandy loam, 0 to 2 percent slopes, 200 feet south and 1,700 feet east of the northwest corner of sec. 27, T. 17 N., R. 2 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/1) moist; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

A—8 to 12 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine prismatic structure parting to weak fine granular; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

AC—12 to 18 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; soft, very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C1—18 to 27 inches; light gray (10YR 7/2) fine sand, pale brown (10YR 6/3) moist; common medium distinct dark brown (7.5YR 4/4 moist) mottles; single grain; loose; mildly alkaline; abrupt smooth boundary.

C2—27 to 60 inches; white (10YR 8/2) fine sand, light brownish gray (10YR 6/2) moist; common medium distinct dark brown (7.5YR 4/4 moist) and yellowish brown (10YR 5/6 moist) mottles; single grain; loose; mildly alkaline.

The mollic epipedon is 7 to 16 inches thick. The solum ranges from 7 to 20 inches in thickness. The depth to free carbonates is less than 20 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically fine sandy loam, but the range includes loam and loamy fine sand. This horizon ranges from slightly acid to moderately alkaline. The AC horizon has value of 3 to 5 (2 to 4 moist) and chroma of 2 (dry or moist). It is typically loamy fine sand, but the range includes fine sandy loam. This horizon is neutral to moderately alkaline. Some pedons do not have an AC horizon. The C horizon has value of 6 to 8 (5 to 7 moist) and chroma of 2 or 3 (dry or moist). It is typically fine sand, but the range includes loamy fine sand, sand, and coarse sand. This horizon ranges from neutral to moderately alkaline.

Boelus Series

The Boelus series consists of deep, well drained soils on uplands. Permeability is rapid in the sandy part and moderate in the silty part. These soils formed in sandy eolian material deposited over loess. Slopes range from 2 to 6 percent.

Boelus soils are commonly near Thurman and Valentine soils in the landscape. Thurman soils contain more sand and less silt and clay in the 10- to 40-inch control section and are higher in the landscape than the Boelus soils. Valentine soils do not have a mollic epipedon, contain more sand and less silt and clay in the 10- to 40-inch control section, and are higher in the landscape than the Boelus soils.

Typical pedon of Boelus loamy fine sand, 2 to 6 percent slopes, 2,000 feet south and 2,600 feet east of the northwest corner of sec. 36, T. 17 N., R. 2 W.

Ap—0 to 6 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

A—6 to 14 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

Bw—14 to 23 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; weak medium subangular blocky structure; loose; neutral; abrupt smooth boundary.

2Bw—23 to 33 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable; mildly alkaline; clear smooth boundary.

2C—33 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, friable; mildly alkaline.

The mollic epipedon is 10 to 20 inches thick. The sandy surface soil is 20 to 36 inches thick. The solum is 30 to 55 inches thick.

The A horizon has a value of 3 to 5 (2 to 4 moist) and chroma of 1 to 3 (dry or moist). It is typically loamy fine sand, but the range includes loamy sand and fine sand. This horizon ranges from medium acid to neutral. The Bw horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). It is typically loamy fine sand, but the range includes loamy sand and fine sand. This horizon is slightly acid or neutral. The 2Bw horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 to 4 (dry or moist). It is typically silty clay loam, but the range includes silt loam and loam. This horizon is slightly acid to mildly alkaline. The 2C horizon has the same range in color as the 2Bw horizon. It is typically silt loam, but the range includes silty clay loam. This horizon is neutral to moderately alkaline.

Butler Series

The Butler series consists of deep, somewhat poorly drained, slowly permeable soils in level or slightly concave basins on uplands. These soils formed in loess. Slopes are 0 to 1 percent.

Butler soils are similar to Fillmore soils and are commonly near Belfore, Fillmore, and Moody soils in the landscape. Fillmore soils are poorly drained or very poorly drained, have a more distinct E horizon than that of the Butler soils, and are lower in the landscape than the Butler soils. Belfore and Moody soils are well drained, do not have an E horizon, and are higher in the landscape than the Butler soils.

Typical pedon of Butler silt loam, 0 to 1 percent slopes, 200 feet east and 900 feet south of the northwest corner of sec. 27, T. 19 N., R. 1 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, friable; strongly acid; abrupt smooth boundary.

E—9 to 12 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; moderate thick platy structure parting to moderate medium platy; slightly hard, friable; medium acid; clear smooth boundary.

Bt1—12 to 19 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate prismatic structure parting to moderate fine subangular blocky; very hard, very firm; medium acid; clear smooth boundary.

Bt2—19 to 29 inches; dark gray (10YR 4/1) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, very firm; medium acid; clear smooth boundary.

BC—29 to 38 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to weak medium subangular blocky; very hard, very firm; few fine manganese concretions; slightly acid; clear smooth boundary.

C1—38 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; common fine and medium distinct strong brown (7.5YR 5/6) mottles; massive; hard, firm; slightly acid; clear smooth boundary.

C2—48 to 57 inches; light olive gray (5Y 6/2) silty clay loam, olive gray (5Y 5/2) moist; many medium distinct yellowish brown (10YR 5/8) mottles; massive; hard, firm; few fine lime concretions; slightly acid; clear smooth boundary.

C3—57 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; many medium distinct yellowish brown (10YR 5/8) mottles; massive; hard, firm; neutral.

The solum is 24 to 50 inches thick. The mollic epipedon extends into the Bt horizon.

The Ap horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon ranges from strongly acid to neutral. The E horizon has value of 4 or 5. In some pedons, it is indistinct or absent. It ranges from strongly acid to neutral. The Bt horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silty clay and contains 45 to 55 percent clay, by volume. It 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 (dry or moist). It is typically silty clay, but the range includes silty clay loam. This horizon ranges from slightly acid to moderately alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (3 to 5 moist), and chroma of 1 to 3 (dry or moist). It is typically silty clay loam, but the range includes silt loam. This horizon ranges from slightly acid to moderately alkaline.

Colo Series

The Colo series consists of deep, somewhat poorly drained, moderately slowly permeable soils on bottom lands. These soils formed in noncalcareous silty alluvium. Slopes are 0 to 1 percent.

Colo soils are similar to Gibbon and Lamo soils and are commonly near Hobbs, Lamo, Kezan, and Shell soils in the landscape. Gibbon and Lamo soils are calcareous throughout the profile. Hobbs soils are well drained, are stratified throughout the profile, and are slightly higher in the landscape than the Colo soils. Kezan soils are poorly drained and are slightly lower in the landscape than the Colo soils. Shell soils are well drained and are higher in the landscape than the Colo soils.

Typical pedon of Colo silt loam, 0 to 1 percent slopes, 800 feet south and 2,400 feet west of the northeast corner of sec. 10, T. 20 N., R. 1 W.

A1—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, friable; neutral; abrupt smooth boundary.

A2—6 to 13 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, friable; neutral; abrupt smooth boundary.

A3—13 to 26 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, friable; neutral; clear wavy boundary.

BA—26 to 32 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, friable; neutral; clear wavy boundary.

Cg1—32 to 46 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; weak coarse prismatic structure parting to weak medium and fine subangular blocky; hard, friable; neutral; abrupt smooth boundary.

Cg2—46 to 60 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; massive; hard, friable; neutral.

The mollic epipedon is 36 to 60 inches thick. Carbonates are not in the solum and are commonly lacking to a depth of 60 inches. Reaction is medium acid to neutral throughout the profile.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 0 to 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. Some pedons have an AC horizon. Value of 3 or 4 extends to a depth of 36 inches or more; however, value of 5 and chroma of 0 or 1 are common in horizons below the A horizon. The content of clay ranges from 30 to 35 percent in the control section.

Crofton Series

The Crofton series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on uplands. These soils formed in loess (fig. 22). Slopes range from 2 to 30 percent.

Crofton soils are near Alcester, Geary, Moody, and Nora soils in the landscape. Alcester soils have a mollic epipedon more than 20 inches thick and are on foot slopes and stream terraces lower in the landscape than the Crofton soils. Geary soils formed in the brown loess of the Loveland Formation, have a B horizon, and are in positions on the landscape similar to those of the Crofton soils. Moody soils have a mollic epipedon, have free carbonates below a depth of 30 inches, and are higher in the landscape than the Crofton soils. Nora soils have a mollic epipedon, have carbonates at a depth of 10 to 30 inches, and are in positions on the landscape similar to those of the Crofton soils.

Typical pedon of Crofton silt loam, 15 to 30 percent slopes, 300 feet east and 2,450 feet south of the northwest corner of sec. 5, T. 17 N., R. 3 W.

A—0 to 4 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and fine granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.

AC—4 to 9 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable; strong effervescence; moderately alkaline; clear wavy boundary.

C1—9 to 24 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; few fine distinct strong brown (7.5YR 4/6 moist) relict mottles; weak coarse prismatic structure; slightly

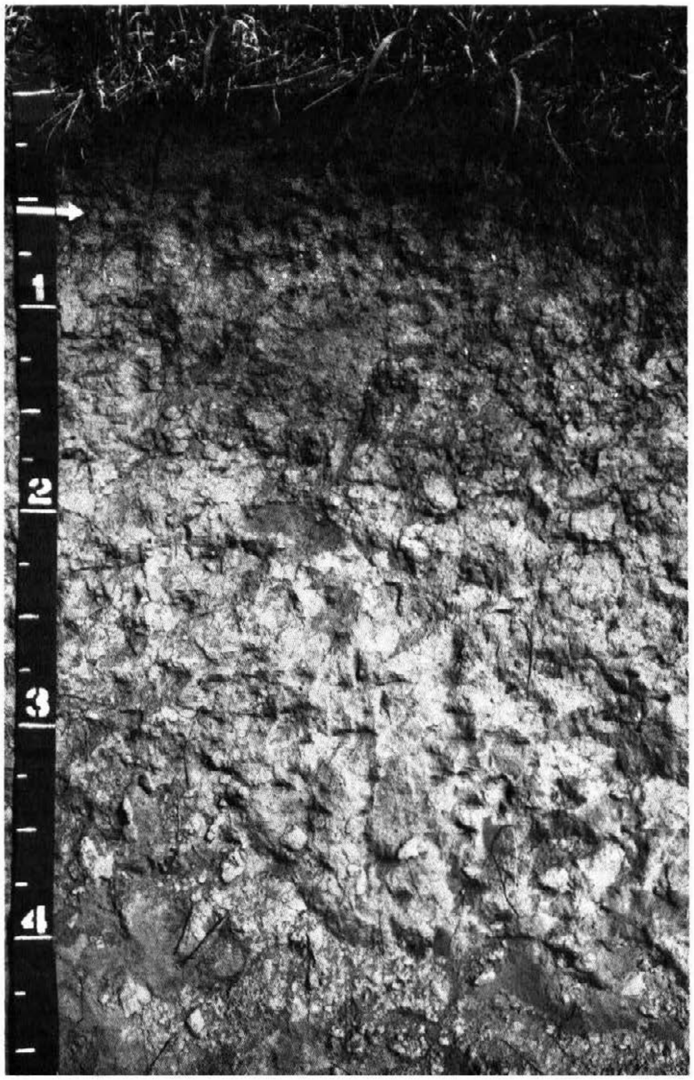

Figure 22.—Profile of Crofton silt loam, which formed in loess. Typically, this soil has a thin surface layer and is calcareous near the surface. Depth is marked in feet.

hard, friable; violent effervescence; moderately alkaline; clear wavy boundary.

C2—24 to 60 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; few fine distinct strong brown (7.5YR 4/6 moist) relict mottles; massive; slightly hard, friable; violent effervescence; moderately alkaline.

The solum is 6 to 15 inches thick. Free carbonates are within a depth of 8 inches.

The A horizon has value of 4 to 6 (3 or 4 moist) and chroma of 2 or 3 (dry or moist). It is mildly alkaline or moderately alkaline. The AC horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 2 or 3 (dry or moist). It is mildly alkaline or moderately alkaline. Some pedons do not have an AC horizon. 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 (dry or moist). It is mildly alkaline or moderately alkaline. Few to many, small or medium, limy concretions are common in all horizons of most pedons.

Els Series

The Els series consist of deep, somewhat poorly drained, rapidly permeable soils in upland sandhill valleys and on low stream terraces adjacent to the sandhills. These soils formed in eolian and alluvial sands. Slopes range from 0 to 3 percent.

Els soils are similar to Ipage soils and are near Ipage and Valentine soils. Ipage soils are moderately well drained. Valentine soils are excessively drained and higher in the landscape than the Els soils.

Typical pedon of Els loamy fine sand, in an area of Ipage-Els loamy fine sands, 0 to 3 percent slopes, 1,200 feet west and 2,500 feet north of the southeast corner of sec. 33, T. 17 N., R. 3 W.

A—0 to 8 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; strongly acid; clear smooth boundary.

AC—8 to 12 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; soft, very friable; medium acid; clear smooth boundary.

C1—12 to 23 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; few fine distinct strong brown (7.5YR 5/8 moist) mottles; single grain; loose; slightly acid; clear smooth boundary.

C2—23 to 50 inches; light gray (2.5Y 7/2) fine sand, light brownish gray (2.5Y 6/2) moist; common fine and medium distinct yellowish red (5YR 5/8 moist) mottles; single grain; loose; slightly acid; clear smooth boundary.

C3—50 to 60 inches; white (10YR 8/2) fine sand, pale brown (10YR 6/3) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; single grain; loose; slightly acid.

The A horizon is 4 to 8 inches thick. The solum is 7 to 14 inches thick.

The A horizon has value of 4 or 5 (3 moist) and chroma of 1 or 2 (dry or moist). It is dominantly loamy fine sand, but the range includes fine sand. This horizon ranges from strongly acid to neutral. The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). It is typically loamy fine sand, but the range includes fine sand. This horizon ranges from medium acid to neutral. The C horizon has value of 6 to 8 (4 to 7 moist) and chroma of 2 or 3 (dry or moist). It has few to common, fine to medium, faint or distinct mottles of high chroma. It is typically fine sand, but the range includes loamy sand. This horizon is slightly acid to mildly alkaline.

Fillmore Series

The Fillmore series consists of deep, poorly drained and very poorly drained, very slowly permeable soils in shallow depressions on loess uplands and high terraces. These soils formed in loess. Slopes are 0 to 1 percent.

Fillmore soils are similar to Butler soils and are commonly near Belfore, Butler, and Moody soils in the landscape. Butler soils are somewhat poorly drained. Belfore and Moody soils are well drained, do not have an E horizon, and are higher in the landscape than the Fillmore soils.

Typical pedon of Fillmore silt loam, 0 to 1 percent slopes, 150 feet north and 500 feet west of the southeast corner of sec. 6, T. 19 N., R. 1 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; medium acid; abrupt smooth boundary.

E—8 to 12 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; weak medium platy structure; slightly hard, very friable; medium acid; abrupt smooth boundary.

Bt1—12 to 26 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm; slightly acid; clear wavy boundary.

Bt2—26 to 41 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky; very hard, very firm; neutral; clear wavy boundary.

BC—41 to 52 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark gray (10YR 3/1) moist; weak medium subangular blocky structure parting to weak fine granular; slightly hard, friable; neutral; clear smooth boundary.

C—52 to 60 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; slightly hard, friable; mildly alkaline.

The solum is 30 to 60 inches thick. The depth to free carbonates ranges from 45 to more than 60 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon is slightly acid or medium acid. The E horizon has value of 5 to 7 (4 or 5 moist) and chroma of 1 (dry or moist). It is slightly acid or medium acid. The Bt horizon has value of 3 to 5 (2 to 4 moist) and chroma of 1 or 2 (dry or moist). It is typically silty clay that has an average of 40 to 55 percent clay, by volume. It is slightly acid to mildly alkaline. The BC horizon has hue of 10YR or 2.5Y, value of 4 to 6 (2 to 5 moist), and chroma of 2 or 3 (dry or moist). It is slightly acid to mildly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4 (dry or moist). It is typically silt loam, but the range includes silty clay loam and silty clay. This horizon is neutral or mildly alkaline.

Gayville Series

The Gayville series consists of deep, somewhat poorly drained soils on low terraces. Permeability is very slow in the subsoil and moderate in the underlying material. These soils are high in salinity and alkalinity. They formed in silty and clayey alluvium. Slopes range from 0 to 2 percent.

Gayville soils are near Grigston, Gibbon, Lamo, Muir, and Zook soils in the landscape. All of these soils have lesser amounts of soluble salts and sodium throughout the solum than the Gayville soils. Grigston soils are well drained and slightly higher in the landscape than the Gayville soils. Gibbon and Lamo soils do not have a B horizon, have less clay in the 10- to 40-inch control section than the Gayville soils, and are in positions in the landscape similar to those of the Gayville soils. Muir soils are well drained and higher in the landscape than the Gayville soils. Zook soils are poorly drained and are lower in the landscape than the Gayville soils. In Platte County, the Gayville soils are mapped only in a complex with Gibbon soils.

Typical pedon of Gayville silt loam, in an area of Gibbon-Gayville silt loams, 0 to 2 percent slopes, 200 feet west and 1,300 feet south of the northeast corner of sec. 3, T. 17 N., R. 2 W.

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

Btn1—6 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; strong effervescence; very strongly alkaline; clear smooth boundary.

Btn2—12 to 17 inches; brown (10YR 5/3) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; very strong effervescence; strongly alkaline; clear smooth boundary.

C1—17 to 35 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; strong effervescence; very strongly alkaline; clear smooth boundary.

C2—35 to 60 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; few fine faint olive gray (5Y 5/2 moist) mottles; massive; slightly hard, friable; strong effervescence; very strongly alkaline.

The solum is 10 to 30 inches thick. The depth to carbonates ranges from 0 to 16 inches. Some pedons have an E horizon that is 1.5 to 2.0 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam and less commonly silty clay loam. It is moderately alkaline or strongly alkaline. The Btn horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 to 4 moist), and chroma of 2 or 3 (dry or moist). It is typically silty clay or silty clay loam. It ranges from moderately alkaline to very strongly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (4 to 7 moist), and chroma of 2 to 4 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon is moderately alkaline to very strongly alkaline.

Geary Series

The Geary series consists of deep, well drained, moderately slowly permeable soils on uplands. These soils formed in brown loess of the Loveland Formation. Slopes range from 6 to 30 percent.

Geary soils are near Crofton and Nora soils in the landscape. Crofton soils do not have a B horizon or a mollic epipedon and are above the Geary soils in the landscape. Nora soils are shallower to lime than the Geary soils and are higher in the landscape. Also, they do not have hue as red as 7.5YR.

Typical pedon of Geary silty clay loam, 15 to 30 percent slopes, 1,000 feet south and 1,300 feet east of the northwest corner of sec. 21, T. 18 N., R. 1 W.

A—0 to 11 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

AB—11 to 16 inches; brown (7.5YR 4/2) silty clay loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to weak medium and fine granular; hard, firm; slightly acid; clear smooth boundary.

Bt—16 to 27 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; weak medium and fine subangular blocky structure; hard, firm; slightly acid; clear smooth boundary.

BC—27 to 34 inches; brown (7.5YR 5/4) silty clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure; hard, firm; scattered lime concretions; neutral; clear wavy boundary.

C—34 to 60 inches; light brown (7.5YR 6/4) silty clay loam, brown (7.5YR 5/4) moist; massive; hard, firm; mildly alkaline.

The solum is 30 to 60 inches thick. The mollic epipedon is 10 to 20 inches thick. The depth to carbonates ranges from 36 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 (2 or 3 moist), and chroma of 2 or 3 (dry or moist). It is typically silty clay loam, but the range includes loam and silt loam. This horizon is medium acid or slightly acid. The B horizon has hue of 5YR or 7.5YR, value of 5 or 6 (3 to 5 moist), and chroma of 3 to 6 (dry or moist). It is typically silty clay loam that is an average of 30 to 35 percent clay, by volume. It ranges from medium acid to mildly alkaline. The C horizon has hue of 5YR or 7.5YR, value of 5 to 7 (4 or 5 moist), and chroma of 3 to 6 (dry or moist). It ranges from slightly acid to moderately alkaline. It is typically silty clay loam, but in some pedons it is silt loam.

In map units GeD2 and GeE2, the A horizon is thinner and lighter colored than is defined as the range for the Geary series. This difference does not alter the usefulness or behavior of the soils.

Gibbon Series

The Gibbon series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. These soils formed in silty, calcareous, stratified alluvium. Slopes range from 0 to 2 percent.

Gibbon soils are similar to Colo and Lamo soils and are commonly near Grigston, Lamo, Wann, and Zook soils. Colo soils have a mollic epipedon more than 20 inches thick and do not have free carbonates in the solum. Lamo soils have free carbonates in the solum. Grigston soils are well drained and higher in the landscape than the Gibbon soils. Wann soils contain more sand than the Gibbon soils in the 10- to 40-inch control section. They are in positions in the landscape similar to those of the Gibbon soils. Zook soils are poorly drained, contain more clay and less silt than the Gibbon soils in the 10- to 40-inch control section, have a mollic epipedon more than 20 inches thick, and are in positions in the landscape similar to those of the Gibbon soils.

Typical pedon of Gibbon silt loam, 0 to 2 percent slopes, 400 feet south and 1,500 feet west of the northeast corner of sec. 5, T. 16 N., R. 1 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

A—8 to 18 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; violent effervescence; moderately alkaline; clear smooth boundary.

C1—18 to 27 inches; light gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; massive; slightly hard, friable; violent effervescence; moderately alkaline; clear smooth boundary.

C2—27 to 42 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; few medium faint olive brown (2.5Y 4/4 moist) mottles; massive; slightly hard, friable; common fine lime concretions; few fine limy snail shells; violent effervescence; moderately alkaline; clear smooth boundary.

C3—42 to 50 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; few large faint olive brown (2.5Y 4/4 moist) mottles; massive; soft, friable; few fine limy snail shells; violent effervescence; strongly alkaline; gradual smooth boundary.

C4—50 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; few large faint olive brown (2.5Y 4/4 moist) mottles; massive; soft, friable; few fine limy snail shells; violent effervescence; moderately alkaline.

The mollic epipedon is 10 to 20 inches thick. The solum is 11 to 24 inches thick. The depth to carbonates is less than 10 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon is mildly alkaline or moderately alkaline. The AC horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 1 or 2 (dry or moist). It is mildly alkaline or moderately alkaline. Some pedons do not have an AC horizon. The C horizon has hue of 10YR or 2.5Y, value of 5 to 8 (4 to 6 moist), and chroma of 1 or 2 (dry or moist). In most pedons, it has distinct mottles that have hue of 10YR, 5Y, or 2.5Y, value of 2 to 5 moist, and chroma of 1 to 6 moist. It is mildly alkaline to strongly alkaline. This horizon is typically silty clay loam or silt loam, but the range includes loam and thin strata of fine sandy loam. The texture commonly becomes coarser below a depth of 40 inches.

Gothenburg Series

The Gothenburg series consists of poorly drained, very rapidly permeable soils on bottom lands generally near meandering stream channels of the Platte River. These soils are very shallow over coarse sand or gravelly sand. They formed in recent alluvium. Slopes range from 0 to 3 percent.

Gothenburg soils are commonly near Alda and Platte soils in the landscape. Alda soils are somewhat poorly drained, have coarse sand or gravelly sand at a depth of 20 to 40 inches, and are higher in the landscape than the Gothenburg soils. Platte soils have a thicker mollic A horizon than the Gothenburg soils.

Typical pedon of Gothenburg soils, 0 to 3 percent slopes, 400 feet west and 600 feet north of the southeast corner of sec. 4, T. 16 N., R. 1 W.

A—0 to 4 inches; dark gray (10YR 4/1) sandy loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.

2C1—4 to 14 inches; stratified light gray (10YR 7/2) coarse sand, pale brown (10YR 6/3) and grayish brown (10YR 5/2) moist; few fine faint strong brown (7.5YR 5/6 moist) mottles; single grain; loose; mildly alkaline; abrupt smooth boundary.

2C2—14 to 60 inches; light gray (10YR 7/2) coarse sand, pale brown (10YR 6/3) moist; single grain; loose; about 6 percent gravel; neutral.

The thickness of the A horizon and that of the solum range from 1 to 6 inches. Reaction is neutral or mildly alkaline throughout the profile.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It differs from place to place and includes loamy sand, sandy loam, fine sandy loam, loamy fine sand, gravelly sand, and fine sand. Some pedons have a thin C horizon of fine sand. The 2C horizon has value of 6 to 8 (4 to 7 moist) and chroma of 1 to 3 (dry or moist). The gravel content in this horizon ranges from 3 to 35 percent.

Grigston Series

The Grigston series consist of deep, well drained and moderately well drained, moderately permeable soils on stream terraces and high bottom lands. These soils formed in calcareous alluvium. Slopes range from 0 to 2 percent.

Grigston soils are commonly near Gayville, Lamo, Muir, and Wann soils in the landscape. Gayville soils are somewhat poorly drained, are affected by salinity and alkalinity, and are in positions in the landscape similar to those of the Grigston soils. Lamo soils are somewhat poorly drained and are slightly lower in the landscape than the Grigston soils. Muir soils are well drained, do not have free carbonates above a depth of 48 inches, have a mollic horizon more than 20 inches thick, and are in positions in the landscape similar to those of the Grigston soils. Wann soils are somewhat poorly drained, have more sand in the 10- to 40-inch control section, and are lower in the landscape than the Grigston soils.

Typical pedon of Grigston silt loam, 0 to 2 percent slopes, 2,100 feet east and 2,300 feet north of the southwest corner of sec. 5, T. 17 N., R. 2 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A—8 to 11 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) faces on peds, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, firm; neutral; clear smooth boundary.

Bw—11 to 19 inches; grayish brown (10YR 5/2) silty clay loam, brown (10YR 5/3) faces on peds, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; mildly alkaline; clear smooth boundary.

C1—19 to 24 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; slightly hard, firm; strong effervescence; moderately alkaline; clear smooth boundary.

C2—24 to 40 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm; many soft white accumulations of carbonates; violent effervescence; moderately alkaline; gradual smooth boundary.

C3—40 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable; violent effervescence; moderately alkaline.

The mollic epipedon is 10 to 20 inches thick. The solum is 15 to 40 inches thick. The depth to free carbonates is 15 to 48 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon is neutral or mildly alkaline. The B horizon has value of 5 or 6 (3 or 4 moist) and chroma of 2 or 3 (dry or moist). It is typically silty clay loam, but the range includes silt loam. This horizon is mildly alkaline or moderately alkaline. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 1 to 3 (dry or moist). It is typically silt loam and silty clay loam, but the range includes strata of loam and fine sandy loam. This horizon is mildly alkaline or moderately alkaline. Some pedons have buried soils. Some pedons have mottles below a depth of 40 inches.

In map unit Gs, the soil is a taxadjunct because it is moderately well drained and has a water table at a depth of 4 to 6 feet. These differences, however, do not affect the usefulness or behavior of the soil.

Hobbs Series

The Hobbs series consist of deep, well drained, moderately permeable soils on bottom lands of narrow drainageways in the uplands. These soils formed in noncalcareous, stratified, silty alluvium. Slopes range from 0 to 2 percent.

Hobbs soils are near Alcester, Colo, Kezan, Shell, and Zook soils in the landscape. Alcester soils have a mollic epipedon more than 24 inches thick, have a Bw horizon, and are on foot slopes higher in the landscape than the Hobbs soils. Colo soils are somewhat poorly drained and are lower in the landscape than the Hobbs soils. Kezan soils are poorly drained and are slightly lower in the landscape than the Hobbs soils. Shell soils are stratified at a depth of 20 to 40 inches and are slightly higher in the landscape than the Hobbs soils. Zook soils are poorly drained, have more clay in the 10- to 40-inch control section, and are lower in the landscape than the Hobbs soils.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes, 300 feet east and 2,000 feet north of the southwest corner of sec. 11, T. 18 N.; R. 2 W.

A—0 to 8 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; moderate medium platy structure parting to weak medium and fine subangular blocky; slightly hard, friable; slightly acid; abrupt smooth boundary.

C1—8 to 38 inches; stratified dark grayish brown (10YR 4/2) and pale brown (10YR 6/3) silt loam; very dark grayish brown (10YR 3/2) and dark brown (10YR 4/3) moist; moderate medium platy structure parting to moderate medium subangular blocky; slightly hard, friable; slightly acid; clear wavy boundary.

C2—38 to 53 inches; stratified dark grayish brown (10YR 4/2) and brown (10YR 5/3) silt loam; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; moderate medium platy structure parting to weak medium subangular blocky; slightly hard, friable; slightly acid; clear wavy boundary.

Ab—53 to 60 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable; slightly acid.

Free carbonates are typically lacking above a depth of 40 inches, but some pedons have thin, calcareous layers of recent deposition. The solum is less than 10 inches thick.

The A horizon has a value of 4 or 5 (2 to 4 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon ranges from slightly acid to mildly alkaline. The C horizon has value of 4 to 7 (3 to 6 moist) and chroma of 1 to 3 (dry or moist). Thin strata that have differing values are common. The C horizon is typically silt loam, but the range includes silty clay loam. This horizon ranges from slightly acid to mildly alkaline. Many pedons have buried soils.

Inavale Series

The Inavale series consist of deep, somewhat excessively drained, rapidly permeable soils on bottom lands. These soils formed in sandy alluvium that, in places, has been reworked by wind. Slopes range from 0 to 9 percent.

Inavale soils are similar to Ipage and Thurman soils and are commonly near Boel and Wann soils in the landscape. Ipage soils are moderately well drained and have mottles within a depth of 40 inches. Thurman soils have a surface layer that is darker and thicker than that of the Inavale soils. Boel soils are somewhat poorly drained, have a mollic epipedon, and are lower in the landscape than the Inavale soils. Wann soils are somewhat poorly drained, contain more silt and less sand in the 10- to 40-inch control section, and are lower in the landscape than the Inavale soils.

Typical pedon of Inavale loamy fine sand, 0 to 3 percent slopes, 100 feet east and 1,650 feet south of the northwest corner of sec. 21, T. 17 N., R. 1 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

AC—6 to 18 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose, very friable; neutral; clear smooth boundary.

C—18 to 60 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; single grain; loose; mildly alkaline.

The solum is 8 to 20 inches thick. The A horizon has value of 4 to 7 (3 to 5 moist) and chroma of 2 or 3 (dry or moist). It is typically loamy fine sand, but the range includes fine sandy loam and fine sand. This horizon ranges from neutral to moderately alkaline. The AC and C horizons have value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3 (dry or moist). The AC horizon is typically loamy fine sand, but the range includes fine sand. Reaction ranges from neutral to moderately alkaline. The C horizon is typically fine sand, but the range includes sand, loamy sand, and loamy fine sand. This horizon ranges from neutral to moderately alkaline.

Ipage Series

The Ipage series consists of deep, moderately well drained, rapid permeable soils in sandhill valleys and along stream terraces. These soils formed in eolian and alluvial sand. Slopes range from 0 to 3 percent.

Ipage soils are similar to Els and Inavale soils and near Els, Thurman, and Valentine soils in the landscape. Els soils are somewhat poorly drained. Inavale soils are somewhat excessively drained. Thurman soils have a mollic epipedon, are somewhat excessively drained, and are higher in the landscape than the Ipage soils. Valentine soils are excessively drained, do not have mottles above a depth of 40 inches, and are on hummocks higher in the landscape than the Ipage soils. In Platte County, the Ipage soils are mapped only in a complex with Els soils.

Typical pedon of Ipage loamy fine sand, in an area of Ipage-Els loamy fine sands, 0 to 3 percent slopes, 500 feet west and 1,700 feet north of the southeast corner of sec. 33, T. 17 N., R. 3 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; medium acid; clear smooth boundary.

AC—7 to 12 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; single grain; loose; medium acid; clear smooth boundary.

C1—12 to 31 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; medium acid; clear smooth boundary.

C2—31 to 50 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; few fine faint strong brown (7.5YR 5/8 moist) mottles; single grain; loose; medium acid; clear smooth boundary.

C3—50 to 55 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; few fine distinct strong brown (7.5YR 5/8 moist) mottles; single grain; loose; slightly acid; gradual smooth boundary.

C4—55 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; slightly acid.

The A horizon is 5 to 9 inches thick. The solum is 8 to 16 inches thick. Reaction ranges from medium acid to neutral throughout the profile.

The A horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 or 2 (dry or moist). It is typically loamy fine sand, but the range includes fine sand. The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). The C horizon has value of 6 to 8 (4 to 7 moist) and chroma of 2 or 3 (dry or moist). It is typically fine sand, but the range includes loamy sand. The lower part of this horizon has few or common distinct mottles of high chroma.

Janude Series

The Janude series consists of deep, moderately well drained, moderately permeable soils on bottom lands. These soils formed in loamy and sandy alluvial sediments. Slopes are 0 to 1 percent.

Janude soils are similar to Merrick and Novina soils and are commonly near Grigston, Gibbon, Merrick, and Novina soils in the landscape. Merrick soils contain more clay in the control section than the Janude soils. Novina soils have a mollic epipedon less than 20 inches thick. Grigston soils have more silt and clay in the 10- to 40-inch control section and are slightly lower in the landscape than the Janude soils. Gibbon soils are somewhat poorly drained, calcareous throughout the profile, and lower in the landscape than the Janude soils.

Typical pedon of Janude fine sandy loam, 0 to 1 percent slopes, 200 feet west and 2,400 feet south of the northeast corner of sec. 32, T. 17 N., R. 1 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist;

weak fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.
A—8 to 18 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak coarse prismatic structure parting to weak fine granular; slightly hard, very friable; neutral; clear smooth boundary.
AC—18 to 33 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable; mildly alkaline; clear smooth boundary.
C1—33 to 42 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; dark yellowish brown (10YR 4/6 moist) mottles; massive; hard, friable; mildly alkaline; clear smooth boundary.
C2—42 to 50 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; single grain; slightly hard, very friable; mildly alkaline; clear smooth boundary.
C3—50 to 60 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grain; loose; mildly alkaline.

The solum and the mollic epipedon are 22 to 40 inches thick. Reaction ranges from neutral to moderately alkaline throughout the profile.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically fine sandy loam, but the range includes loam and sandy loam. The AC horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is fine sandy loam or loam. The C horizon has value of 6 or 7 (4 to 6 moist) and chroma of 1 or 2 (dry or moist). Above a depth of 40 inches, it is typically sandy loam, but the range includes fine sandy loam.

Map unit In is a taxadjunct because the mollic epipedon is less than 20 inches thick. This difference, however, does not affect the usefulness or behavior of the soil.

Kezan Series

The Kezan series consists of deep, poorly drained, moderately permeable soils on bottom lands of upland drainageways. These soils formed in silty, alluvial sediments. Slopes range from 0 to 2 percent.

Kezan series are near Colo, Hobbs, Shell, and Zook soils in the landscape. Colo soils are somewhat poorly drained, have a mollic epipedon more than 24 inches thick, and are in positions in the landscape similar to those of the Kezan soils. Hobbs soils are well drained and are in positions in the landscape similar to those of the Kezan soils. Shell soils are well drained and are higher in the landscape than the Kezan soils. Zook soils have a mollic epipedon more than 24 inches thick and contain more clay in the 10- to 40-inch control section than the Kezan soils. Also, they are slightly lower in the landscape.

Typical pedon of Kezan silt loam, 0 to 2 percent slopes, 200 feet west and 1,500 feet south of the northeast corner of sec. 32, T. 20 N., R. 1 E.

A—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.
C1—6 to 17 inches; stratified grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; few fine faint strong brown (7.5YR 4/6 moist) mottles; moderate medium platy structure; slightly hard, very friable; neutral; clear smooth boundary.
C2—17 to 23 inches; light brownish gray (10YR 6/2) silt loam, stratified dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) moist; few fine faint strong brown (7.5YR 4/6 moist) mottles; massive; slightly hard, very friable; mildly alkaline; clear smooth boundary.
C3—23 to 33 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; few fine faint strong brown (7.5YR 4/6 moist) mottles; massive; slightly hard, very friable; mildly alkaline; clear smooth boundary.
Ab1—33 to 46 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; massive; slightly hard, friable; mildly alkaline; clear smooth boundary.
Ab2—46 to 60 inches; dark gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) moist; massive; slightly hard, very friable; mildly alkaline.

Typically, carbonates are not in the profile, but some pedons have carbonates below a depth of 15 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is neutral or mildly alkaline. It is typically silt loam, but the range includes silty clay loam. The C horizon has a hue of 10YR and 2.5Y, value of 4 to 6 (3 or 4 moist), and chroma of 1 or 2 (dry or moist). It is typically stratified with thin lenses of higher or lower values. It is typically silt loam, but the range includes silty clay loam. This horizon ranges from 22 to 35 percent clay, by volume, between depths of 10 and 40 inches. It is neutral or mildly alkaline. The Ab horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 (dry or moist). It is typically below a depth of 20 inches. It is neutral to moderately alkaline. Some pedons do not have an Ab horizon.

Lamo Series

The Lamo series consists of deep, somewhat poorly drained and poorly drained, moderately slowly permeable soils on bottom lands. These soils formed in calcareous alluvium. Slopes are 0 to 1 percent.

Lamo soils are similar to Colo and Gibbon soils and are commonly near Colo, Gibbon, Hobbs, Shell, and Zook soils in the landscape. Colo soils are not calcareous. Gibbon soils have a mollic epipedon less than 20 inches thick. Hobbs soils are well drained and in positions in the landscape similar to those of the Lamo soils. Shell soils are well drained and are slightly higher than the Lamo soils in the landscape. Zook soils have more clay in the 10- to 40-inch control section than the Lamo soils and are in positions in the landscape similar to those of the Lamo soils.

Typical pedon of Lamo silty clay loam, 0 to 1 percent slopes, 1,850 feet west and 2,350 feet south of the northeast corner of sec. 3, T. 17 N., R. 3 W.

Ap—0 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate fine and medium granular structure; hard, firm; violent effervescence; mildly alkaline; clear smooth boundary.

A—7 to 22 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; moderate fine subangular blocky structure parting to weak fine granular; hard, firm; violent effervescence; moderately alkaline; clear smooth boundary.

AC—22 to 29 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, firm; violent effervescence; moderately alkaline; clear smooth boundary.

C1—29 to 35 inches; gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; many distinct prominent brown (7.5YR 5/4 moist) mottles; massive; hard, firm; violent effervescence; moderately alkaline; gradual wavy boundary.

C2—35 to 60 inches; light gray (10YR 7/1) silty clay loam, gray (10YR 5/1) moist; many fine distinct strong brown (7.5YR 5/6 moist) mottles; massive; hard, firm; violent effervescence; moderately alkaline.

The solum and the mollic epipedon are 24 to 39 inches thick. The depth to carbonates is 10 inches or less. The calcium carbonate equivalent commonly is 5 to 10 percent and ranges from 1 to 15 percent. Reaction is mildly alkaline or moderately alkaline throughout the profile.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silty clay loam, but the range includes silt loam. In some pedons, this horizon is slightly lighter colored because of recent overwash. The AC horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is mottled in some pedons. It is typically silty clay loam, but the range includes silt loam. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 (3 to 6 moist), and chroma of 1 or 2 (dry or moist). It is typically silty clay loam, but the range includes silt loam. The 10- to 40-inch control section ranges from 28 to 35 percent clay, by volume.

Lawet Series

The Lawet series consists of deep, poorly drained, moderately slowly permeable soils on bottom lands. These soils formed in loamy, calcareous alluvium. Slopes are 0 to 1 percent.

Lawet soils are commonly near Gayville, Gibbon, Lamo, and Wann soils in the landscape. Gayville soils are affected by saline-alkali reaction and are slightly higher in the landscape than the Lawet soils. Gibbon and Wann soils are somewhat poorly drained and slightly higher in the landscape than the Lawet soils. Lamo soils contain more silt and less sand in the control section and are lower in the landscape than the Lawet soils.

Typical pedon of Lawet silt loam, 0 to 1 percent slopes, 600 feet east and 900 feet south of the northwest corner of sec. 7, T. 17 N., R. 1 E.

A1—0 to 7 inches; dark gray (10YR 4/1) silt loam, black (10YR 2/1) moist; moderate fine and medium granular structure; soft, very friable; violent effervescence (17 percent calcium carbonate); moderately alkaline; clear smooth boundary.

A2—7 to 15 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; moderate medium and fine granular structure; soft, very friable; violent effervescence (19 percent calcium carbonate); moderately alkaline; clear smooth boundary.

Bk—15 to 21 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; common fine faint olive brown (2.5Y 4/4 moist) mottles; weak medium prismatic structure; slightly hard, friable; violent effervescence (15 percent calcium carbonate); moderately alkaline; clear smooth boundary.

BCk—21 to 34 inches; light gray (10YR 7/1) sandy clay loam, light brownish gray (10YR 6/2) moist; few fine distinct black (2.5Y 2/0 moist) mottles; massive; slightly hard, friable; common medium calcium carbonate concretions; violent effervescence (20 percent calcium carbonate); strongly alkaline; clear smooth boundary.

C1—34 to 54 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; few fine faint olive brown (2.5Y 4/4 moist) mottles; massive; hard, firm; common medium calcium carbonate concretions; strong effervescence (12 percent calcium carbonate); moderately alkaline; clear smooth boundary.

C2—54 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; few fine faint olive brown (2.5Y 4/4 moist) mottles; massive; hard, firm; slight effervescence; moderately alkaline.

The mollic epipedon is 10 to 24 inches thick. The solum is 16 to 34 inches thick.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5 (2 or 3 moist), and chroma of 0 or 1 (dry or moist). It is typically silt loam, but the range includes loam and silty clay loam. This horizon is mildly alkaline or moderately alkaline. The B horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 0 to 2 (dry or moist). It is typically loam, but the range includes sandy clay loam, silt loam, and silty clay loam. This horizon is mildly alkaline or moderately alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 7 moist), and chroma of 0 to 2 (dry or moist). It is loam, sandy clay loam, silt loam, or silty clay loam. It ranges from neutral to moderately alkaline.

Loup Series

The Loup series consist of deep, very poorly drained, rapidly permeable soils on bottom lands. These soils formed in loamy and sandy alluvium. Slopes are 0 to 1 percent.

Loup soils are commonly near Boel, Inavale, and Wann soils in the landscape. Boel soils are somewhat poorly drained and are slightly higher in the landscape than the Loup soils. Inavale soils are somewhat excessively drained, do not have a mollic epipedon, and are higher in the landscape than the Loup soils. Wann soils are somewhat poorly drained, have less sand in the 10- to 40-inch control section, and are slightly higher in the landscape than the Loup soils.

Typical pedon of Loup loam, wet, 0 to 1 percent slopes, 700 feet east and 1,600 feet south of the northwest corner of sec. 18, T. 17 N., R. 2 W.

A1—0 to 3 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine granular structure; slightly hard, friable; mildly alkaline; clear smooth boundary.

A2—3 to 10 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; weak fine granular structure; slightly hard, friable; neutral; clear smooth boundary.

A3—10 to 13 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; weak fine granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

C1—13 to 27 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; single grain; loose; neutral; gradual smooth boundary.

C2—27 to 40 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; few fine faint yellowish brown (10YR 5/6 moist) mottles; single grain; loose; neutral; gradual smooth boundary.

C3—40 to 60 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; few fine faint brown (7.5YR 4/4 moist) mottles; single grain; loose; neutral.

The mollic epipedon is 7 to 20 inches thick. The solum is 10 to 20 inches thick.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically loam, but the range includes fine sandy loam. This horizon ranges from neutral to moderately alkaline. Some pedons have an AC horizon. The C horizon has value of 7 or 8 (5 to 7 moist) and chroma of 1 or 2 (dry or moist). It is typically fine sand, but the range includes sand. This horizon ranges from neutral to moderately alkaline.

Merrick Series

The Merrick series consists of deep, moderately well drained, moderately permeable soils on bottom lands. These soils formed in silty and loamy alluvial sediment. Slopes are 0 to 1 percent.

Merrick soils are similar to Janude and Novina soils and are commonly near Gibbon and Janude soils in the landscape. Janude soils contain more sand in the 10- to 40-inch control section. Novina soils contain less clay in the 10- to 40-inch control section than the Merrick soils and are in landscape positions similar to those of the Merrick soils. Gibbon soils are somewhat poorly drained, calcareous throughout, and lower in the landscape than the Merrick soils.

Typical pedon of Merrick loam, 0 to 1 percent slopes, 200 feet north and 2,500 feet west of the southeast corner of sec. 34, T. 17 N., R. 1 W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

A1—11 to 20 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; weak fine and medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

A2—20 to 29 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

C1—29 to 38 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; hard, friable; neutral; clear smooth boundary.

C2—38 to 49 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; few fine faint strong brown (7.5YR 4/6 moist) mottles; massive; hard, friable; strong effervescence; mildly alkaline; gradual smooth boundary.

C3—49 to 60 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; few fine faint strong brown (7.5YR 4/6 moist) mottles; massive; slightly hard, friable; mildly alkaline.

The mollic epipedon and the solum are 20 to 38 inches thick. Thin strata of calcareous material are at a depth of 30 to 60 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically loam, but the range includes silt loam. This horizon is slightly acid or neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 or 3 (dry or moist). It is typically clay loam and loam, but the range includes silt loam. Also, fine sandy loam and coarser textures are below a depth of 40 inches. This horizon is neutral or mildly alkaline.

Moody Series

The Moody series consist of deep, well drained, moderately slowly permeable soils on uplands and high terraces. These soils formed in loess (fig. 23). Slopes range from 0 to 11 percent.

Moody soils are similar to Belfore and Nora soils and are commonly near Alcester, Belfore, Crofton, Fillmore, and Nora soils in the landscape. Belfore soils have more clay in the B horizon than the Moody soils. Nora soils have free carbonates at a depth of 10 to 30 inches. Alcester soils have a mollic epipedon more than 20 inches thick and are on foot slopes. Crofton soils are calcareous within a depth of 10 inches, do not have a B horizon or a mollic epipedon, and are in positions in the landscape similar to those of the Moody soils. Fillmore soils are poorly drained or very poorly drained and in shallow depressions lower in the landscape than the Moody soils.

Typical pedon of Moody silty clay loam, 1 to 3 percent slopes, 300 feet west and 2,500 feet south of the northeast corner of sec. 20, T. 19 N., R. 2 W.

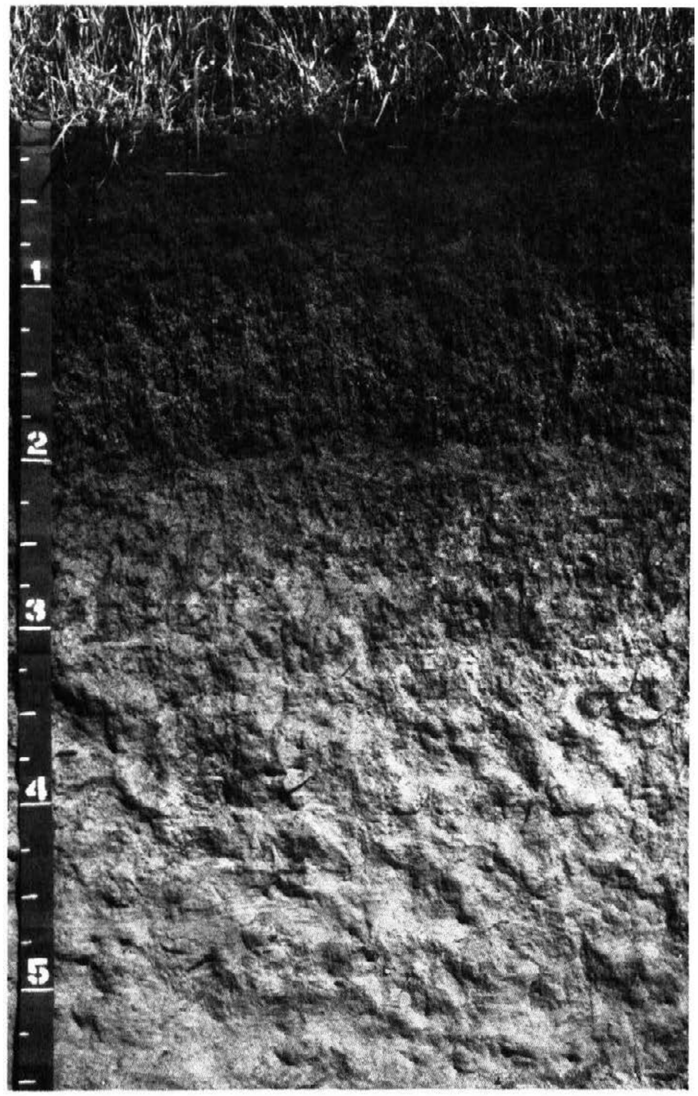

Figure 23.—Profile of Moody silty clay loam, which formed in loess. Depth is marked in feet.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

Bw1—8 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; slightly acid; clear smooth boundary.

Bw2—12 to 28 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

BC—28 to 37 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable; neutral; clear smooth boundary.

C1—37 to 53 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable; neutral; gradual smooth boundary.

C2—53 to 60 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; few fine faint yellowish brown (10YR 5/6) relict mottles; massive; slightly hard, friable; neutral.

The mollic epipedon is 10 to 20 inches thick and extends into the B horizon. The solum is 30 to 60 inches thick. The depth to free carbonates ranges from 30 to 60 inches or more.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 (dry or moist). It is typically silty clay loam, but the range includes silt loam. This horizon ranges from medium acid to neutral. The upper part of the Bw horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 or 3 (dry or moist). The lower part of the Bw horizon commonly has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 2 to 4 (dry or moist). The Bw horizon is slightly acid or neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 (dry or moist), and chroma of 2 to 4 (dry or moist). It is typically silty clay loam in the upper part and silt loam in the lower part. It is neutral to moderately alkaline. It has few to common relict mottles. In some pedons, accumulations of calcium carbonate are in the C horizon.

In map units MoC2 and MoD2 and in the Moody soil in map units MtC2 and MtD2, the A horizon is lighter in color and thinner than is defined as the range for the Moody series. These differences, however, do not alter the usefulness or behavior of the soils.

Muir Series

The Muir series consists of deep, well drained, moderately permeable soils on stream terraces. These soils generally formed in silty alluvium, but the lower part of Muir silt loam, sandy substratum, 0 to 1 percent slopes, formed in sandy alluvium. Slopes are 0 to 1 percent.

Muir soils are similar to Alcester and Shell soils and are commonly near Alcester, Grigston, Hobbs, Lamo, and Shell soils in the landscape. Alcester soils are on concave foot slopes above the Muir soils in the landscape. Shell soils have an irregular decrease in the content of organic matter and do not have a B horizon. Grigston soils are slightly lower in the landscape than the Muir soils, have carbonates above a depth of 30 inches, and have a mollic epipedon less than 20 inches thick. Hobbs soils do not have a mollic epipedon or a B horizon and are on flood plains. Lamo soils are somewhat poorly drained, calcareous, and lower in the landscape than the Muir soils.

Typical pedon of Muir silt loam, 0 to 1 percent slopes, 150 feet west and 2,400 feet south of the northeast corner of sec. 22, T. 18 N., R. 1 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A—6 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

BA—18 to 27 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

Bw—27 to 37 inches; brown (10YR 5/3) silt loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable; neutral; gradual wavy boundary.

C—37 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, friable; neutral.

The solum is 24 to 55 inches thick. The mollic epipedon is 20 to 35 inches thick. Free carbonates are not above a depth of 48 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically silt loam, but the range includes silty clay loam. This horizon is medium acid to neutral. The B horizon has value of 4 to 6 (2 to 4 moist) and chroma of 2 or 3 (dry or moist). It is typically silt loam, but the range includes silty clay loam. The C horizon has value of 4 to 7 (3 to 5 moist) and chroma of 2 or 3 (dry or moist). It is typically silt loam, but the range includes silty clay loam. In some pedons this horizon is fine sand below a depth of 40 inches. It ranges from slightly acid to mildly alkaline.

In map unit Mx, the subsoil and the substratum have more sand than is defined as the range for the series. This difference, however, does not affect the usefulness or behavior of the soil.

Nora Series

The Nora series consists of deep, well drained, moderately permeable soils on uplands. They formed in loess (fig. 24). Slopes range from 2 to 15 percent.

Nora soils are similar to Belfore and Moody soils and are commonly near Alcester, Belfore, Crofton, Geary, and Moody soils in the landscape. Alcester soils have a thicker A horizon, have carbonates at lower depths, and are on foot slopes lower in the landscape than the Nora soils. Belfore soils contain more clay in the B horizon than the Nora soils. Crofton soils have carbonates above a depth of 10 inches, do not have a mollic epipedon, and are in positions in the landscape similar to those of the Nora soils. Moody soils are leached of carbonates below a depth of 30 inches and have a thicker solum than the Nora soils. Geary soils formed in loess that has a strong brownish or reddish hue and are generally lower in elevation than the Nora soils.

Typical pedon of Nora silty clay loam, 6 to 11 percent slopes, 200 feet east and 800 feet north of the southwest corner of sec. 1, T. 18 N., R. 1 E.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

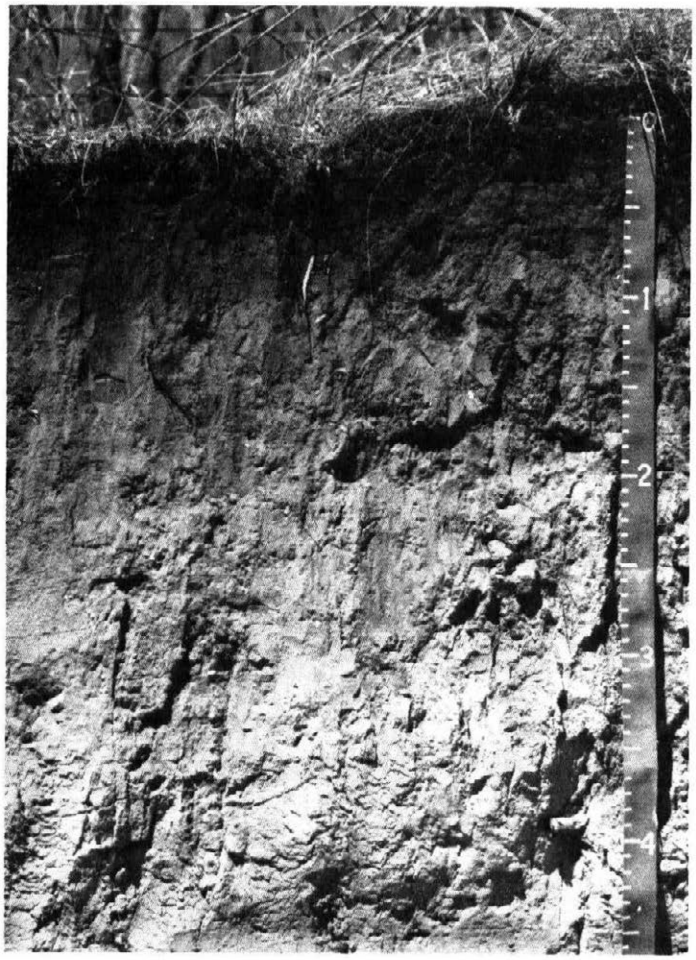

Figure 24.—Profile of Nora silty clay loam, which formed in loess. The depth to lime ranges from 13 to 30 inches. Depth is marked in feet.

A2—7 to 12 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, friable; neutral; clear wavy boundary.

Bw—12 to 25 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to weak medium subangular blocky; hard, friable; neutral; clear wavy boundary.

Bk—25 to 29 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; slightly hard, friable; few fine and medium limy concretions; violent effervescence; moderately alkaline; abrupt smooth boundary.

Ck—29 to 41 inches; very pale brown (10YR 7/4) silt loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable; few fine lime concretions; strong effervescence; moderately alkaline; clear smooth boundary.

C—41 to 60 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; massive; soft, friable; violent effervescence; moderately alkaline.

The solum is 20 to 36 inches thick. The depth to carbonates ranges from 13 to 30 inches. The mollic epipedon is 7 to 20 inches thick and in some pedons extends into the B horizon.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 2 (dry or moist). Typically, it is silty clay loam, but the range includes silt loam. This horizon is slightly acid or neutral. The B horizon has hue of 10YR or 2.5Y, value of 5 or 6 (3 to 5 moist), and chroma of 3 or 4 (dry or moist). It is typically silty clay loam, but the range includes silt loam. This horizon ranges from slightly acid to moderately alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 2 to 4 (dry or moist). It is typically silt loam, but the range includes very fine sandy loam and silty clay loam. This horizon is mildly alkaline or moderately alkaline.

In map unit NoC2 and in the Nora soil in map units CsC2, NpD2, and NpE2, the A horizon is lighter in color and thinner than is defined as the range for the Nora series. These differences, however, do not alter the usefulness or behavior of the soils.

Novina Series

The Novina series consists of deep, moderately well drained, moderately permeable soils on bottom lands. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Novina soils are similar to Janude and Merrick soils and are commonly near Alda, Gibbon, Janude, Merrick, and Wann soils in the landscape. Alda soils are somewhat poorly drained and have coarse sand or gravelly sand at a depth of 20 to 40 inches. Janude soils have a mollic epipedon more than 20 inches thick. Merrick soils contain more clay in the control section than the Novina soils and are in the same position in the landscape as the Novina soils. Wann and Gibbon soils are somewhat poorly drained and are lower in the landscape than the Novina soils.

Typical pedon of Novina fine sandy loam, 0 to 2 percent slopes, 150 feet south and 600 feet east of the northwest corner of sec. 5, T. 16 N., R. 1 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; abrupt smooth boundary.

A—9 to 17 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak fine granular; soft, very friable; neutral; clear smooth boundary.

AC—17 to 25 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak coarse and medium prismatic structure; soft, very friable; neutral; clear smooth boundary.

C1—25 to 37 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; slightly hard, friable; mildly alkaline; abrupt smooth boundary.

C2—37 to 48 inches; light gray (10YR 7/2) loam, light brownish gray (10YR 6/2) moist; few fine distinct brown (7.5YR 5/4 moist) mottles; massive; slightly hard, friable; soft white (10YR 8/1) calcium carbonate accumulations; violent effervescence; moderately alkaline; clear smooth boundary.

C3—48 to 52 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; few fine and medium faint brown (7.5YR 4/4 moist) mottles; massive; soft, very friable; mildly alkaline; clear smooth boundary.

C4—52 to 60 inches; light gray (10YR 7/2) loamy fine sand, light brownish gray (10YR 6/2) moist; single grain; loose; neutral.

The mollic epipedon is 7 to 20 inches thick. The solum is 18 to 28 inches thick. The depth to free carbonates typically is more than 36 inches, but it ranges from 18 to more than 60 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically fine sandy loam, but the range includes sandy loam and loam. This horizon is slightly acid or neutral. The AC horizon has value of 4 to 6 (3 to 5 moist) and chroma of 1 or 2 (dry or moist). It is slightly acid or neutral. The C horizon has hue of 10YR or 2.5Y, value of 5 to 8 (4 to 6 moist), and chroma of 1 or 2 (dry or moist). It is typically loam, but the range includes fine sandy loam above a depth of 40 inches and strata of loamy fine sand and silty clay loam below that depth. This horizon ranges from neutral to moderately alkaline.

O'Neill Series

The O'Neill series consists of well drained soils that are moderately deep over coarse sand. Permeability is moderately rapid in the solum and very rapid in the underlying material. These soils formed in loamy sediment over coarse sand on stream terraces. Slopes range from 0 to 2 percent.

These soils have a slightly thicker mollic epipedon than is definitive for the range of the series. This difference, however, does not alter the usefulness or behavior of these soils.

O'Neill soils are commonly near Blendon, Grigston, Janude, Simeon, and Thurman soils in the landscape. Blendon soils are deep and are in the same kind of landscape as the O'Neill soils. Grigston soils have more silt and clay in the 10- to 40-inch control section and are lower in the landscape than the O'Neill soils. Janude soils are moderately well drained and are lower in the landscape than the O'Neill soils. Simeon soils have coarse sand or gravelly coarse sand at a depth of 10 to 20 inches. Thurman soils are deep and are higher in the landscape than the O'Neill soils.

Typical pedon of O'Neill fine sandy loam, 0 to 2 percent slopes, 1,600 feet north and 2,000 feet east of the southwest corner of sec. 22, T. 17 N., R. 3 W.

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

A—8 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak medium granular structure; soft, very friable; slightly acid; clear smooth boundary.

Bw—12 to 22 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure; soft, very friable; neutral; clear smooth boundary.

BC—22 to 26 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; loose; neutral; abrupt smooth boundary.

2C1—26 to 41 inches; very pale brown (10YR 7/3) coarse sand, pale brown (10YR 6/3) moist; single grain; loose; neutral; clear smooth boundary.

2C2—41 to 60 inches; very pale brown (10YR 7/3) coarse sand (approximately 5 percent gravel, by volume), pale brown (10YR 6/3) moist; single grain; loose; neutral.

The thickness of the solum and the depth to coarse sand range from 20 to 40 inches. The mollic epipedon is 20 to 30 inches thick.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically fine sandy loam, but the range includes sandy loam, loam, and loamy fine sand. This horizon is medium acid or slightly acid. The B horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 to 4 (dry or moist). It is slightly acid or neutral. It is typically sandy loam and loamy sand, but the range includes fine sandy loam. The 2C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 3 or 4 (dry or moist). It is typically coarse sand, but the range includes sand and gravelly sand. This horizon is slightly acid or neutral.

Platte Series

The Platte series consists of somewhat poorly drained soils that are shallow over gravelly coarse sand and coarse sand on bottom lands. Permeability is moderate or moderately rapid in the solum and very rapid in the underlying material. These soils formed in loamy alluvium over gravelly coarse sand. Slopes range from 0 to 2 percent.

Platte soils are commonly near Alda and Gothenburg soils in the landscape. Alda soils contain more silt and clay and less sand than the Platte soils and have coarse sand or gravelly sand at a depth of 20 to 40 inches. Gothenburg soils have an A horizon that is thinner than that of the Platte soils.

Typical pedon of Platte loam, 0 to 2 percent slopes, 1,500 feet north and 1,800 feet west of the southeast corner of sec. 19, T. 16 N., R. 2 W.

A1—0 to 5 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; strong effervescence; mildly alkaline; clear smooth boundary.

A2—5 to 10 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; slightly hard, friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

2C1—10 to 16 inches; light gray (10YR 7/2) coarse sand, light brownish gray (10YR 6/2) moist; single grain; loose; neutral; clear smooth boundary.

2C2—16 to 60 inches; light gray (10YR 7/2) gravelly coarse sand, light brownish gray (10YR 6/2) moist; few fine faint brown (7.5YR 5/4 moist) mottles; single grain; loose; neutral.

The A horizon and the solum are 5 to 12 inches thick. The depth to gravelly coarse sand or coarse sand ranges from 10 to 20 inches. Reaction ranges from neutral to moderately alkaline throughout the profile.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically loam, but the range includes silt loam and fine sandy loam. Some pedons have a C horizon. The 2C horizon has value of 6 to 8 (4 to 6 moist) and chroma of 1 to 3 (dry or moist). It is coarse sand or gravelly coarse sand. The upper part of this horizon commonly contains less gravel than the lower part.

Shell Series

The Shell series consists of deep, well drained and moderately well drained soils on flood plains. These soils formed in stratified, silty alluvium. They generally are moderately permeable, but the clayey substratum phase is slowly permeable in the lower part. Slopes range from 0 to 2 percent.

Shell soils are similar to Alcester and Muir soils and are commonly near Alcester, Colo, Hobbs, Muir, and Zook soils in the landscape. Alcester soils have a B horizon, have a thicker solum than the Shell soils, and are on foot slopes above the Shell soils. Muir soils have a B horizon and are not stratified in the underlying material. Colo soils are somewhat poorly drained and are lower in the landscape than the Shell soils. Hobbs soils do not have a mollic epipedon, are stratified above a depth of 10 inches, and are lower in the landscape than the Shell soils or are in narrow upland drainageways above the Shell soils. Zook soils are poorly drained, contain more clay in the 10- to 40-inch control section, and are lower in the landscape than the Shell soils.

Typical pedon of Shell silt loam, 0 to 2 percent slopes, 200 feet south and 800 feet west of the northeast corner of sec. 13, T. 20 N., R. 4 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A1—8 to 18 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, very friable; neutral; clear smooth boundary.

A2—18 to 25 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable; neutral; clear smooth boundary.

C1—25 to 35 inches; stratified grayish brown (10YR 5/2) and brown (10YR 5/3) silt loam; very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) moist; massive; slightly hard, friable; neutral; clear smooth boundary.

C2—35 to 60 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable; neutral.

The mollic epipedon is 20 to 36 inches thick and extends into the C horizon. Free carbonates are leached to a depth of more than 48 inches. The content of organic carbon decreases irregularly with depth. Some pedons have buried soils below a depth of 30 inches. Some pedons have clayey material below a depth of 40 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 2 or 3 (dry or moist). It is typically silt loam, but the range includes loam and silty clay loam. This horizon is slightly acid or neutral. The C horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3 (dry or moist). It is typically silt loam, but the range includes silty clay, silty clay loam, and loam. This horizon is neutral or mildly alkaline. It is stratified with varying colors. Some pedons have faint mottles below a depth of 32 inches.

Simeon Series

The Simeon series consists of deep, excessively drained, rapidly permeable soils on high stream terraces and uplands. These soils formed in sandy alluvium and outwash material. Slopes range from 0 to 3 percent.

Simeon soils are similar to Valentine soils and near Thurman and Valentine soils in the landscape. Valentine soils do not have appreciable amounts of gravel in the profile and are higher in the landscape than the Simeon soils. Thurman soils are somewhat excessively drained, have a mollic epipedon 10 to 20 inches thick, and are higher in the landscape than the Simeon soils.

Typical pedon of Simeon loamy sand, 0 to 3 percent slopes, 375 feet east and 1,700 feet north of the southwest corner of sec. 7, T. 16 N., R. 2 W.

A—0 to 9 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

AC—9 to 19 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grain; loose; slightly acid; clear wavy boundary.

C—19 to 60 inches; white (10YR 8/2) coarse sand, light gray (10YR 7/2) moist; single grain; loose; about 12 percent gravel; neutral.

The solum is 7 to 20 inches thick. Reaction is slightly acid or neutral throughout the profile. The soils do not have free carbonates.

The A horizon has value of 4 or 5 (3 or 4 moist) and chroma of 1 or 2 (dry or moist). It is typically loamy sand, but the range includes fine sandy loam. The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). It is typically sand, but the range includes fine sand, coarse sand, and sand. The C horizon has value of 6 to 8 (5 to 7 moist) and chroma of 2 to 4 (dry or moist). Its range in texture includes fine sand and coarse sand. The content of gravel in this horizon is 2 to 15 percent, by volume.

Thurman Series

The Thurman series consist of deep, well drained or somewhat excessively drained, rapidly permeable soils on uplands and stream terraces. These soils formed in sandy eolian material (fig. 25). Slopes range from 0 to 11 percent.

Thurman soils are similar to Inavale and Valentine soils and are commonly near Blendon, Boelus, Simeon, and Valentine soils in the landscape. Inavale and Valentine soils do not have a mollic epipedon. Inavale soils are stratified. Blendon soils have a mollic epipedon more than 20 inches thick and are lower in the landscape than the Thurman soils. Boelus soils contain more silt and clay and less sand in the lower part of the 10- to 40-inch control section and are lower in the landscape than the Thurman soils. Simeon soils are excessively drained, contain 2 to 15 percent gravel, by volume, within a depth of 10 to 20 inches, and are in positions in the landscape similar to those of the Thurman soils.

Figure 25.—Profile of Thurman loamy fine sand, which formed in sandy eolian material and has a thick surface layer.

Typical pedon of Thurman loamy fine sand, 1 to 3 percent slopes, 700 feet north and 1,750 feet west of the southeast corner of sec. 5, T. 16 N., R. 2 W.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark brown (10YR 2/2) moist; weak medium granular structure; soft, very friable; slightly acid; abrupt smooth boundary.

A2—8 to 14 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable; slightly acid; clear smooth boundary.

AC—14 to 20 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; single grain; loose; slightly acid; clear wavy boundary.

C1—20 to 31 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral; gradual wavy boundary.

C2—31 to 60 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral.

The mollic epipedon is 10 to 20 inches thick. The solum is 14 to 30 inches thick. Reaction is slightly acid or neutral throughout the profile.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically loamy fine sand, but the range includes fine sandy loam and fine sand. The AC horizon has value of 4 to 7 (3 to 5 moist) and chroma of 2 or 3 (dry or moist). It is typically fine sand, but the range includes loamy fine sand, loamy sand, sandy loam, and fine sandy loam. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 to 4 (dry or moist). It is typically fine sand, but the range includes loamy fine sand, loamy sand, and sand. Some pedons have layers of clay loam below a depth of 40 inches.

The Thurman soils in map units MtC2 and MtD2 have a lighter colored, thinner A horizon than is defined as the range for the series. These differences, however, do not alter the usefulness of behavior of the soils.

Valentine Series

The Valentine series consists of deep, excessively drained, rapidly permeable soils on uplands and high stream terraces. These soils formed in sandy eolian material. Slopes range from 0 to 24 percent.

Valentine soils are similar to Simeon and Thurman soils and are near Boelus, Els, Ipage, Simeon, and Thurman soils in the landscape. Simeon soils have appreciable amounts of gravel in the profile. Thurman soils have a surface layer that is darker and thicker than that of the Valentine soils. They are somewhat excessively drained and are in about the same position in the landscape as the Valentine soils. Boelus soils have a mollic epipedon, contain more silt and clay in the lower part of the 10- to 40-inch control section, and are lower in the landscape than the Valentine soils. Els soils are somewhat poorly drained and are lower in the landscape than the Valentine soils. Ipage soils are moderately well drained and are lower in the landscape than the Valentine soils.

Typical pedon of Valentine fine sand, rolling, 200 feet south and 1,300 feet east of the northwest corner of sec. 9, T. 16 N., R. 2 W.

A—0 to 5 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; weak fine granular structure; loose; slightly acid; abrupt smooth boundary.

AC—5 to 11 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; slightly acid; clear smooth boundary.

C—11 to 60 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose; neutral.

The solum is 9 to 17 inches thick. The surface layer is 4 to 9 inches thick. Reaction is slightly acid or neutral throughout the profile.

The A horizon has value of 4 to 6 (3 or 4 moist). It is typically fine sand, but the range includes loamy fine sand. The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3 (dry or moist). It is typically fine sand, but the range includes loamy fine sand. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 to 4 (dry or moist). It is typically fine sand, but the range includes loamy fine sand.

Wann Series

The Wann series consists of deep, somewhat poorly drained, moderately rapidly permeable soils on bottom lands. These soils formed in stratified, loamy alluvium. Slopes are 0 to 1 percent.

Wann soils are near Alda, Boel, Grigston, Janude, and Inavale soils in the landscape. Alda soils have coarse sand or gravelly coarse sand at a depth of 20 to 40 inches. Boel soils have fine sand at a depth of 10 to 20 inches. Grigston soils are well drained. Janude soils are moderately well drained. Inavale soils are somewhat excessively drained, contain more sand and less silt in the control section, and are higher in the landscape than the Wann soils.

Typical pedon of Wann loam, 0 to 1 percent slopes, 1,200 feet west and 2,000 feet north of the southeast corner of sec. 21, T. 17 N., R. 1 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate fine and medium granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.

A—9 to 16 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; soft, friable; mildly alkaline; clear smooth boundary.

AC—16 to 23 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure; soft, friable; strong effervescence; moderately alkaline; clear smooth boundary.

C1—23 to 33 inches; very pale brown (10YR 7/3) sandy loam, pale brown (10YR 6/3) moist; few fine faint strong brown (7.5YR 4/6 moist) mottles; single grain; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2—33 to 46 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; few fine faint strong brown (7.5YR 5/6 moist) mottles; single grain; loose; moderately alkaline; clear smooth boundary.

C3—46 to 60 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; single grain; loose; mildly alkaline.

The mollic epipedon is 8 to 20 inches thick. The solum is 8 to 30 inches thick. The depth to free carbonates is 25 inches or less. Reaction ranges from neutral to moderately alkaline throughout the profile.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2 (dry or moist). It is typically loam, but the range includes fine sandy loam and silt loam. The AC horizon has value of 4 to 6 (3 to 5 moist). It is typically fine sandy loam, but the range includes loamy fine sand and loam. Some pedons do not have an AC horizon. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 1 to 3 (dry or moist). Its range includes fine sandy loam, sandy loam, loamy fine sand, and fine sand.

Zook Series

The Zook series consists of deep, poorly drained, slowly permeable soils on bottom lands of major streams and along the Loup and the Platte Rivers. These soils formed in silty and clayey alluvium. Slopes are 0 to 1 percent.

Zook soils are near Grigston, Hobbs, Lamo, and Shell soils in the landscape. Grigston soils are well drained, have less clay in the control section, and are higher in the landscape than the Zook soils. Hobbs soils are well drained, stratified, and slightly higher in the landscape than the Zook soils. Lamo soils are somewhat poorly drained and in positions in the landscape similar to those of the Zook soils. Shell soils are well drained, are stratified in the 10- to 40-inch control section, and are higher in the landscape than the Zook soils.

Typical pedon of Zook silty clay loam, 0 to 1 percent slopes, 950 feet north and 1,400 feet west of the southeast corner of sec. 5, T. 18 N., R. 2 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, firm; neutral; abrupt smooth boundary.

A1—8 to 19 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure parting to weak fine granular; hard, firm; neutral; clear smooth boundary.

A2—19 to 32 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; moderate fine subangular blocky structure; very hard, very firm; mildly alkaline; clear smooth boundary.

Bwg—32 to 43 inches; dark gray (5Y 4/1) silty clay, very dark gray (5Y 3/1) moist; moderate medium subangular blocky structure; very hard, very firm; mildly alkaline; clear smooth boundary.

Cg—43 to 60 inches; gray (5Y 5/1) silty clay, very dark gray (5Y 3/1) moist; few fine distinct dark yellowish brown (10YR 4/6) mottles; massive; very hard, very firm; mildly alkaline.

Typically, the solum is 36 to 60 inches thick. The mollic epipedon is 36 or more inches thick. Reaction is medium acid to neutral in the upper part of the profile and medium acid to mildly alkaline in the lower part. The soils are noncalcareous to a depth of 50 inches or more.

The A horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 (dry or moist). It is typically silty clay loam, but the range includes silty clay. Some pedons have overwash that has chroma of 2 (dry or moist). The B and Cg horizons range from 36 to 45 percent clay, by volume. They have hue of 10YR or 5Y, value of 3 to 5 (2 to 4 moist), and chroma of 1 (dry or moist). They are typically silty clay, but the range includes silty clay loam.

Formation of the Soils

Soil forms through the interaction of five major factors: the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief or lay of the land, and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the parent material, which has accumulated through the weathering of rocks, and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. Parent material also influences the formation of the profile and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be a long time or a short time, but some time is always required for the differentiation of soil horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are closely interrelated in their effects on the soil, and few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many processes of soil development are unknown.

Parent Material

Parent material is the disintegrated and weathered rock in which a soil forms. It affects the chemical and mineralogical composition of the soil. The soils in Platte County formed in loess, colluvium-alluvium, alluvium, and eolian sands.

Loess is silty material that was carried by wind. The upland soils in the northern two-thirds of the county formed in loess. The upper part of the loess mantle is of Peorian age. It is friable, massive, yellowish brown, gray, and very pale brown silt loam or silty clay loam. It is calcareous and has few to many lime concretions. The loess is commonly 30 to 45 feet thick, but in places it is as little as a few feet thick or as much as 100 feet thick. Belfore, Butler, Crofton, Fillmore, Moody, and Nora soils formed in Peorian loess.

Material of the Loveland Formation underlies Peoria loess. This material is presumed to be mostly of loessial origin. It is light brown silty clay loam and has slightly more sand than Peorian loess. It crops out on the upland side slopes, mainly north of Shell Creek in the eastern part of the county. Geary soils formed in this material.

Colluvium-alluvium, as a result of the combined forces of gravity and water, has accumulated on foot slopes on the loess uplands. Alcester soils formed in this material.

Alluvium is mixed sandy, silty, and clayey sediments that have been deposited by overflowing streams on bottom lands and stream terraces. The flood plains continue to receive fresh deposits from floodwater, and soil development is slight. Sedimentation has resulted in textural differences in the horizons of the soils. Alda, Boel, Colo, Gayville, Gibbon, Gothenburg, Grigston, Hobbs, Inavale, Janude, Kezan, Lamo, Lawet, Loup, Merrick, Novina, Platte, Shell, Wann, and Zook soils formed in alluvium on bottom lands. The oldest alluvium is on stream terraces above the present flood plain. Muir soils formed in alluvium on low stream terraces that are seldom flooded. Blendon and O'Neill soils formed in sandy alluvium on stream terraces.

The eolian sands, or wind-deposited sandy material, are mainly in the southwestern part of the county between the Loup and Platte Rivers. In some places, the parent material is sand, but in other places it is mixed sand and loess that thinly mantle the underlying loess. The source of the eolian sand was the alluvium on the flood plain along the Loup River. The sandy material was carried by the wind to the uplands. It is a few feet to several feet thick.

Eolian sands consist of loose, pale brown or very pale brown fine sand and loamy fine sand. Thurman and Valentine soils formed in deep deposits of this material. The upper part of Boelus soils formed in eolian sands.

Climate

The subhumid climate in Platte County is characterized by a moderate amount of moisture for soil development processes, a temperature range that nearly stops soil development for about 3 months in the winter, intense rainstorms that result in runoff on slopes and flooding in the valleys, and winds that shift the positions of the sandy soils.

Average annual precipitation is about 25 inches. This amount is sufficient moisture for the development of soils that have a dark surface layer and moderate organic matter content. In most silty soils, the surface layer and the upper part of the subsoil have been leached of lime and have an accumulation of lime in the lower part of the subsoil or in the underlying material. Sandy soils on uplands have been leached of lime throughout the profile. In a few soils, such as Belfore soils, soil development processes have resulted in the movement of some clay from the surface layer to the subsoil. Excessive rain or rapid snowmelt results in flooding and deposition of sediment on bottom lands.

The native grass vegetation and warm summers and cold winters in the county favored the development of soils that have a dark surface layer. The average depth of frost penetration is about 24 inches, and in the summer the temperature reaches or exceeds 100 degrees F a few days each year. Alternate freezing and thawing and wetting and drying aid in the formation of a granular surface layer and a prismatic or blocky subsoil. Summer heat and moisture speed chemical weathering.

Prevailing northwesterly winds in the winter help to distribute the eolian sands and the loess.

In many places in cultivated fields, runoff from hard rains has eroded the dark surface layer and reduced the fertility of the soils. Wind has eroded many of the coarse and moderately coarse soils, and in small areas all of the original dark colored surface layer has been removed. The soil material removed by water or wind erosion has for the most part been redeposited near its original site. The soil material is carried by water down a gradient to the lower slopes, foot slopes, and bottom lands. It is also carried by wind about the field or into adjacent fields.

The availability of plant nutrients depends on the decomposition of organic matter by micro-organisms and on chemical weathering of the mineral soil material.

Micro-organisms in the soil are most active in a moderate temperature and moisture range. Chemical reactions are slowed by low temperatures and speeded by high temperatures. The temperature and moisture in the soil determine the rate of weathering of parent material and the decomposition of the organic matter.

The humidity in the county generally is low, and loss of water is fairly high through evaporation and transpiration. This loss of water affects vegetative growth, decomposition of organic matter, chemical weathering, and leaching of soluble material in the soil.

Plants and Animals

Prior to settlement, prairies of mainly mid and tall grasses dominated the landscape. The fibrous root system of these grasses filled the surface layer with minute rootlets, supplied abundant organic matter, and helped to develop a granular soil structure. The deeper roots improved the permeability of the subsoil and added a small amount of organic matter. As a result, most soils are friable or very friable and dark colored at the surface.

Micro-organisms, earthworms, insects, gophers, and other small animals are important in the development of the soils in Platte County. Micro-organisms decompose organic matter, change it into humus, and make nutrients available to plants. Earthworms and burrowing animals mix organic matter with mineral material. The decayed organic matter gives the upper part of the soil a dark color and influences its physical and chemical composition. The soils that are highest in organic matter content are Lamo, Gibbon, and Muir soils. Those that have the least amount of organic matter are Valentine, Crofton, and Inavale soils.

Grassland plants extract calcium and other minerals from the soil and parent material and return them to the surface when the stems and leaves decay. This process and the fibrous root systems of grassland plants help to keep the soil porous. The decay of organic matter forms organic acids that in solution hastens the leaching process.

Human activities affect soil formation. Conservation tillage practices and terraces help to prevent excessive soil loss. Additions of fertilizer and irrigation change the soil. Cultivation accelerates soil loss. These activities immediately affect soil characteristics but have relatively little effect on soil development.

Relief

Relief affects soil formation mainly through its influence on runoff, erosion, temperature, aeration, and drainage. Runoff is more rapid on steep and very steep slopes than on gentler slopes. Consequently, plant growth generally is less vigorous, less water penetrates the soil, soil horizons are thinner and less distinct, and lime is not so deeply leached. Erosion is generally more severe on the steeper slopes.

Even in soils that formed in the same parent material, relief influences color, thickness, and horizonation of the soils. The gradient, shape, length, and direction of slope influence soil moisture. Steep and very steep soils, such as Crofton soils, are weakly developed, have a thin surface layer, and have lime at or near the surface. Moody soils are not quite so steep, have a thicker surface layer, are leached of lime to a greater depth, and have a subsoil. Belfore soils are nearly level, have a thick, dark colored surface layer and a well developed subsoil, and are leached of lime to a greater depth. Crofton, Moody, Belfore, and Nora soils formed in Peorian loess under grass vegetation; consequently, differences in these soils can largely be attributed to differences in relief.

Soils such as Alda, Boel, Colo, Gibbon, Gothenburg, Grigston, Hobbs, Inavale, Janude, Kezan, Lamo, Lawet, Loup, Merrick, Novina, Platte, Shell, Wann, and Zook soils have low relief and are on bottom lands. Soil formation is slight on bottom lands because the soils commonly have received fresh sediments from flooding. Each period of flooding provides fresh parent material and starts a new cycle of soil formation. Hobbs silt loam, channeled, for example, formed on bottom lands and is frequently flooded.

Time

Time is required to change parent material into a soil. Organic matter accumulates and darkens the surface of the soil in a short time. A darkened horizon several inches thick usually forms within a few decades. Carbonates are leached almost immediately, but slowly. The B horizon, or subsoil, develops slowly and generally does not form until carbonates have been leached and clay begins to form.

Geologic erosion, which also alters the landscape, is constantly changing the slopes. Natural hazards, such as fire, wind, erosion, climate, and living organisms, can change or destroy vegetation. Climate and living organisms generally are less subject to change than other factors. However, ice ages and extreme drought have occurred. Both of these climatic extremes have had a strong influence on the number and kind of living organisms in the soil and their rate of activity. Soil formation is faster in a warm, moist climate and slower in a cold, dry climate.

Soil formation can be rated in terms of depth of leaching, horizon development, clay movement, and other soil characteristics. The rate of soil formation cannot be expressed in inches of soil formed per year.

Soil maturity can be expressed in terms of the characteristics of the soil profile. Immature soils do not have well developed, distinct horizons and commonly will continue to change and develop. Mature soils have well developed horizons and are stable.

Belfore and Moody soils have been developing into mature soils for a long period of time. The dark surface layer of these soils indicates the accumulation of organic matter. Carbonates have been leached and fairly distinct subsoil horizons have formed. The steep Crofton soils do not have a well developed subsoil and have undergone only slight soil development. The content of organic matter has darkened the surface, carbonates have been scarcely leached from the dark colored surface layer, the subsoil is faint or nonexistent, and neither clay formation nor clay movement is evident.

Time implies age. Radiocarbon dating has been used to determine the age of carbonates in some soils and of some parent material. The dates establish a maximum age limit for soils that formed in a dated parent material but do not ensure that particular soils are the oldest possible age. Radiocarbon dates indicate that Peorian loess ranges from 15,000 to 30,000 years old. The reddish brown rocks of the Loveland Formation that occasionally crop out on hillsides in Platte County are much older. Upland sands are less than 10,000 years old. Alluvium in the valleys ranges from a few years to a few hundred years old.

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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.

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.

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 all or part of the 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 lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

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.

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.

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 its range, or geographic 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.

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.

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. Plant and animal residue in the soil in various stages of decomposition.

Organic matter content. The classes used in this survey area are very low, less than 0.5 percent organic matter in the soil; low, 0.5 to 1.0 percent; moderately low, 1.0 to 2.0 percent; moderate, 2.0 to 4.0 percent; and high, 4.0 to 8.0 percent.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

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.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

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 1 or 0 to 2
Very gently sloping	1 to 3
Gently sloping	2 to 6 or 3 to 6
Strongly sloping	6 to 11
Moderately steep	11 to 15
Steep	15 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 intake (in tables). The slow movement of water into 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.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-80 at Columbus, Nebraska]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	30.1	9.7	19.9	59	-18	0	0.50	0.17	0.76	2	4.9
February---	37.3	15.9	26.6	68	-11	11	.82	.21	1.29	2	5.3
March------	47.6	25.9	36.8	80	1	22	1.44	.54	2.18	4	5.8
April------	62.3	38.5	50.4	88	19	107	2.65	1.33	3.79	6	.8
May--------	73.4	49.8	61.6	94	28	366	3.80	2.11	5.28	7	.0
June-------	83.8	60.1	72.0	103	42	660	4.07	1.80	6.00	7	.0
July-------	88.5	65.1	76.8	103	50	831	3.03	1.50	4.35	6	.0
August-----	86.2	63.0	74.6	101	46	763	3.42	1.75	4.87	6	.0
September--	77.1	52.5	64.8	97	32	449	2.67	.86	4.14	5	.0
October----	66.1	40.5	53.3	90	22	175	1.73	.29	2.83	3	.5
November---	48.9	26.7	37.8	74	3	8	.88	.12	1.45	2	2.3
December---	36.3	16.2	26.3	64	-13	0	.71	.25	1.10	2	5.4
Yearly:											
Average--	61.5	38.7	50.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	-19	---	---	---	---	---	---
Total----	---	---	---	---	---	3,392	25.72	19.59	30.69	52	25.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-80 at Columbus, 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--	Apr. 18	Apr. 30	May 16
2 years in 10 later than--	Apr. 13	Apr. 25	May 10
5 years in 10 later than--	Apr. 4	Apr. 16	Apr. 30
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 16	Oct. 4	Sept. 24
2 years in 10 earlier than--	Oct. 21	Oct. 9	Sept. 29
5 years in 10 earlier than--	Oct. 30	Oct. 19	Oct. 7

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-80 at Columbus, 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	189	165	142
8 years in 10	196	172	148
5 years in 10	208	185	159
2 years in 10	220	198	170
1 year in 10	226	205	176

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AcC	Alcester silt loam, 2 to 6 percent slopes	16,850	3.8
Ad	Alda loam, 0 to 2 percent slopes	1,210	0.3
Be	Belfore silty clay loam, 0 to 1 percent slopes	37,360	8.6
Bn	Blendon fine sandy loam, 0 to 2 percent slopes	3,250	0.7
Bo	Boel loamy fine sand, 0 to 2 percent slopes	5,190	1.2
Bp	Boel fine sandy loam, 0 to 2 percent slopes	5,740	1.3
Br	Boel-Inavale complex, channeled	6,400	1.5
BsC	Boelus loamy fine sand, 2 to 6 percent slopes	500	0.1
Bu	Butler silt loam, 0 to 1 percent slopes	1,130	0.3
Cp	Colo silt loam, 0 to 1 percent slopes	2,360	0.5
CrE2	Crofton silt loam, 11 to 15 percent slopes, eroded	810	0.2
CrF	Crofton silt loam, 15 to 30 percent slopes	3,290	0.7
CsC2	Crofton-Nora complex, 2 to 6 percent slopes, eroded	5,140	1.2
Em	Els loamy fine sand, 0 to 3 percent slopes	950	0.2
Fm	Fillmore silt loam, 0 to 1 percent slopes	5,360	1.2
Fp	Fillmore silt loam, ponded	360	0.1
Fu	Fluvaquents, silty	160	*
GeD2	Geary silty clay loam, 6 to 11 percent slopes, eroded	1,090	0.2
GeE2	Geary silty clay loam, 11 to 15 percent slopes, eroded	340	0.1
GeF	Geary silty clay loam, 15 to 30 percent slopes	200	*
Gk	Gibbon silt loam, 0 to 2 percent slopes	5,540	1.3
Gm	Gibbon-Gayville silt loams, 0 to 2 percent slopes	7,025	1.6
Go	Gothenburg soils, 0 to 3 percent slopes	1,990	0.5
Gr	Grigston silt loam, 0 to 2 percent slopes	3,535	0.8
Gs	Grigston silt loam, wet substratum, 0 to 1 percent slopes	3,310	0.8
Hb	Hobbs silt loam, 0 to 2 percent slopes	21,600	4.9
Hf	Hobbs silt loam, channeled	4,530	1.0
ImB	Inavale loamy fine sand, 0 to 3 percent slopes	3,740	0.8
ImD	Inavale loamy fine sand, 3 to 9 percent slopes	420	0.1
InB	Inavale fine sandy loam, 0 to 3 percent slopes	1,240	0.3
Iw	Ipage-Els loamy fine sands, 0 to 3 percent slopes	1,290	0.3
Jm	Janude fine sandy loam, 0 to 1 percent slopes	3,120	0.7
Jn	Janude loam, 0 to 1 percent slopes	2,750	0.6
Kz	Kezan silt loam, 0 to 2 percent slopes	1,310	0.3
La	Lamo silty clay loam, 0 to 1 percent slopes	4,050	0.9
Lc	Lamo silty clay loam, wet, 0 to 1 percent slopes	1,940	0.4
Ld	Lawet silt loam, 0 to 1 percent slopes	1,700	0.4
Lo	Loup loam, wet, 0 to 1 percent slopes	640	0.1
Me	Merrick loam, 0 to 1 percent slopes	1,230	0.3
Mo	Moody silty clay loam, 0 to 1 percent slopes	4,680	1.1
MoB	Moody silty clay loam, 1 to 3 percent slopes	19,780	4.5
MoC	Moody silty clay loam, 3 to 6 percent slopes	20,270	4.6
MoC2	Moody silty clay loam, 3 to 6 percent slopes, eroded	19,880	4.5
MoD2	Moody silty clay loam, 6 to 11 percent slopes, eroded	1,870	0.4
Mp	Moody silty clay loam, terrace, 0 to 2 percent slopes	2,860	0.6
MtC2	Moody-Thurman complex, 2 to 6 percent slopes, eroded	510	0.1
MtD2	Moody-Thurman complex, 6 to 11 percent slopes, eroded	1,760	0.4
Mu	Muir silt loam, 0 to 1 percent slopes	9,830	2.2
Mx	Muir silt loam, sandy substratum, 0 to 1 percent slopes	1,490	0.3
NoC2	Nora silty clay loam, 2 to 6 percent slopes, eroded	7,180	1.6
NoD	Nora silty clay loam, 6 to 11 percent slopes	1,900	0.4
NpD2	Nora-Crofton complex, 6 to 11 percent slopes, eroded	96,643	22.0
NpE2	Nora-Crofton complex, 11 to 15 percent slopes, eroded	27,610	6.3
Nv	Novina fine sandy loam, 0 to 2 percent slopes	2,200	0.5
On	O'Neill fine sandy loam, 0 to 2 percent slopes	1,270	0.3
Pd	Pits and Dumps	740	0.2
Pt	Platte loam, 0 to 2 percent slopes	590	0.1
Px	Platte-Inavale complex, channeled	1,100	0.2
Rw	Riverwash	320	0.1
So	Shell silt loam, 0 to 2 percent slopes	10,250	2.3
Sp	Shell silt loam, clayey substratum, 0 to 1 percent slopes	390	0.1
Sr	Simeon loamy sand, 0 to 3 percent slopes	870	0.2
ThB	Thurman loamy fine sand, 1 to 3 percent slopes	4,520	1.0

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
ThC	Thurman loamy fine sand, 3 to 6 percent slopes	2,450	0.6
Tx	Thurman loamy fine sand, loamy substratum, 0 to 3 percent slopes	430	0.1
Us	Ustorthents, level	650	0.1
UtG	Ustorthents, steep	500	0.1
VaC	Valentine fine sand, 3 to 9 percent slopes	1,860	0.4
VaE	Valentine fine sand, rolling	5,430	1.2
VbC	Valentine-Thurman complex, 3 to 9 percent slopes	4,250	1.0
Wn	Wann loam, 0 to 1 percent slopes	2,530	0.6
Zo	Zook silty clay loam, 0 to 1 percent slopes	2,100	0.5
Zp	Zook silty clay, 0 to 1 percent slopes	950	0.2
	Water	12,736	2.9
	Total	441,049	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
AcC	Alcester silt loam, 2 to 6 percent slopes
Be	Belfore silty clay loam, 0 to 1 percent slopes
Bn	Blendon fine sandy loam, 0 to 2 percent slopes
Bu	Butler silt loam, 0 to 1 percent slopes (where drained)
Cp	Colo silt loam, 0 to 1 percent slopes (where drained)
CsC2	Crofton-Nora complex, 2 to 6 percent slopes, eroded
Gk	Gibbon silt loam, 0 to 2 percent slopes (where drained)
Gr	Grigston silt loam, 0 to 2 percent slopes
Gs	Grigston silt loam, wet substratum, 0 to 1 percent slopes
Hb	Hobbs silt loam, 0 to 2 percent slopes
Jm	Janude fine sandy loam, 0 to 1 percent slopes
Jn	Janude loam, 0 to 1 percent slopes
La	Lamo silty clay loam, 0 to 1 percent slopes (where drained)
Me	Merrick loam, 0 to 1 percent slopes
Mo	Moody silty clay loam, 0 to 1 percent slopes
MoB	Moody silty clay loam, 1 to 3 percent slopes
MoC	Moody silty clay loam, 3 to 6 percent slopes
MoC2	Moody silty clay loam, 3 to 6 percent slopes, eroded
Mp	Moody silty clay loam, terrace, 0 to 2 percent slopes
Mu	Muir silt loam, 0 to 1 percent slopes
Mx	Muir silt loam, sandy substratum, 0 to 1 percent slopes
NoC2	Nora silty clay loam, 2 to 6 percent slopes, eroded
Nv	Novina fine sandy loam, 0 to 2 percent slopes
So	Shell silt loam, 0 to 2 percent slopes
Sp	Shell silt loam, clayey substratum, 0 to 1 percent slopes
Wn	Wann loam, 0 to 1 percent slopes
Zo	Zook silty clay loam, 0 to 1 percent slopes (where drained)
Zp	Zook silty clay, 0 to 1 percent slopes (where drained)

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[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		Soybeans		Alfalfa hay		Wheat	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons	Bu	Bu
AcC--------------- Alcester	IIe	IIIe	82	135	80	125	32	40	4.2	6.5	---	---
Ad---------------- Alda	IIIw	IIIw	55	125	65	110	28	38	2.8	5.0	---	---
Be---------------- Belfore	I	I	80	135	82	120	33	40	3.9	6.0	---	---
Bn---------------- Blendon	IIs	IIs	62	130	60	115	24	34	2.5	5.0	---	---
Bo---------------- Boel	IVw	IVw	40	100	40	80	20	30	3.0	4.5	---	---
Bp---------------- Boel	IIIw	IIIw	50	110	55	100	25	35	2.5	4.0	---	---
Br---------------- Boel-Inavale	VIw	---	---	---	---	---	---	---	---	---	---	---
BsC--------------- Boelus	IIIe	IIIe	55	125	70	115	24	40	3.2	5.0	---	---
Bu---------------- Butler	IIw	IIw	70	130	75	115	31	40	3.8	5.8	---	---
Cp---------------- Colo	IIw	IIw	85	140	85	125	35	42	4.5	6.0	---	---
CrE2-------------- Crofton	IVe	---	50	---	50	---	---	---	2.0	---	---	---
CrF--------------- Crofton	VIe	---	---	---	---	---	---	---	---	---	---	---
CsC2-------------- Crofton-Nora	IIIe	IIIe	68	115	65	110	---	---	3.0	5.0	---	---
Em---------------- Els	IVw	IVw	40	105	35	75	---	---	2.3	4.2	---	---
Fm---------------- Fillmore	IIIw	IIIw	48	85	55	---	25	32	2.0	3.5	---	---
Fp---------------- Fillmore	IVw	---	22	---	30	---	15	---	1.8	---	---	---
Fu*--------------- Fluvaquents	VIIIw	---	---	---	---	---	---	---	---	---	---	---
GeD2-------------- Geary	IVe	IVe	43	95	50	---	22	---	2.6	4.2	---	---
GeE2-------------- Geary	IVe	---	40	---	45	---	---	---	2.4	4.0	---	---
GeF--------------- Geary	VIe	---	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability		Corn		Grain sorghum		Soybeans		Alfalfa hay		Wheat	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons	Bu	Bu
Gk----------------- Gibbon	IIw	IIw	84	135	85	120	34	39	4.5	6.0	---	---
Gm----------------- Gibbon-Gayville	IVs	IIIs	54	85	55	90	20	30	2.5	3.5	---	---
Go----------------- Gothenburg	VIIs	---	---	---	---	---	---	---	---	---	---	---
Gr----------------- Grigston	I	I	82	145	85	120	35	42	4.5	7.0	---	---
Gs----------------- Grigston	I	I	85	150	85	120	36	45	4.8	7.0	---	---
Hb----------------- Hobbs	IIw	IIw	80	135	82	120	33	40	4.2	6.0	---	---
Hf----------------- Hobbs	VIw	---	---	---	---	---	---	---	---	---	---	---
ImB---------------- Inavale	IVe	IIIe	---	90	---	80	20	---	1.8	4.0	---	---
ImD---------------- Inavale	VIe	IVe	---	80	---	65	---	---	---	3.8	---	---
InB---------------- Inavale	IIIe	IIIe	35	110	35	90	---	---	2.0	4.5	---	---
Iw----------------- Ipage-Els	IVw	IVw	32	100	---	85	---	---	2.5	4.5	---	---
Jm----------------- Janude	IIe	IIe	75	140	75	115	33	40	4.0	6.0	---	---
Jn----------------- Janude	I	I	80	145	80	120	35	42	4.5	6.5	---	---
Kz----------------- Kezan	IVw	---	40	---	35	---	20	---	3.0	---	---	---
La----------------- Lamo	IIw	IIw	75	125	80	120	31	37	4.2	5.5	---	---
Lc----------------- Lamo	Vw	---	---	---	---	---	---	---	---	---	---	---
Ld----------------- Lawet	IVw	---	57	---	45	---	---	---	3.0	---	---	---
Lo----------------- Loup	Vw	---	---	---	---	---	---	---	---	---	---	---
Me----------------- Merrick	I	I	85	150	85	125	40	48	3.5	4.5	6.0	---
Mo----------------- Moody	I	I	85	140	88	125	34	42	4.0	6.2	---	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability		Corn		Grain sorghum		Soybeans		Alfalfa hay		Wheat	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons	Bu	Bu
MoB---------------- Moody	IIe	IIe	82	135	80	120	33	39	3.9	6.0	---	---
MoC---------------- Moody	IIe	IIIe	80	130	79	120	31	36	3.7	5.8	---	---
MoC2--------------- Moody	IIIe	IIIe	76	125	72	115	28	33	3.3	5.4	---	---
MoD2--------------- Moody	IIIe	IVe	70	115	65	105	23	30	3.0	4.8	---	---
Mp----------------- Moody	I	I	87	140	88	125	35	42	4.2	6.3	---	---
MtC2--------------- Moody-Thurman	IIIe	IIIe	65	105	65	95	20	30	2.6	4.5	---	---
MtD2--------------- Moody-Thurman	IVe	IVe	60	100	54	90	---	---	2.5	4.3	---	---
Mu----------------- Muir	I	I	87	145	90	130	38	44	5.0	7.0	---	---
Mx----------------- Muir	I	I	75	135	80	120	33	39	4.0	6.0	---	---
NoC2--------------- Nora	IIIe	IIIe	72	115	68	110	25	32	3.2	5.3	---	---
NoD---------------- Nora	IIIe	IVe	68	110	65	110	23	30	3.1	4.8	---	---
NpD2--------------- Nora-Crofton	IIIe	IVe	65	110	60	105	22	32	2.7	4.5	---	---
NpE2--------------- Nora-Crofton	IVe	---	---	---	---	---	---	---	---	---	---	---
Nv----------------- Novina	IIw	IIw	65	135	65	115	30	38	3.0	5.5	---	---
On----------------- O'Neill	IIIe	IIIe	38	135	40	110	25	35	1.5	5.0	---	---
Pd*---------------- Pits and Dumps	VIIIs	---	---	---	---	---	---	---	---	---	---	---
Pt----------------- Platte	IVw	IVw	44	85	55	80	20	25	2.0	3.0	---	---
Px----------------- Platte-Inavale	VIw	---	---	---	---	---	---	---	---	---	---	---
Rw*---------------- Riverwash	VIIIw	---	---	---	---	---	---	---	---	---	---	---
So----------------- Shell	IIw	IIw	88	140	85	130	36	44	4.2	6.2	---	---
Sp----------------- Shell	IIw	IIw	84	130	85	120	32	40	4.0	6.0	---	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability		Corn		Grain sorghum		Soybeans		Alfalfa hay		Wheat	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons	Bu	Bu
Sr----------------- Simeon	VIe	IVe	---	95	---	90	---	---	1.4	3.5	---	---
ThB---------------- Thurman	IIIe	IIIe	50	115	52	110	22	30	1.8	4.2	---	---
ThC---------------- Thurman	IVe	IVe	45	100	47	95	18	26	1.5	3.8	---	---
Tx----------------- Thurman	IIIe	IIIe	60	120	60	110	23	32	2.0	4.5	---	---
Us*. Ustorthents, level												
UtG*--------------- Ustorthents, steep	VIIs	---	---	---	---	---	---	---	---	---	---	---
VaC---------------- Valentine	VIe	IVe	---	---	---	---	---	---	---	---	---	---
VaE---------------- Valentine	VIe	---	---	---	---	---	---	---	---	---	---	---
VbC---------------- Valentine-Thurman	IVe	IVe	42	95	45	75	18	22	1.8	4.0	---	---
Wn----------------- Wann	IIw	IIw	79	130	85	110	30	36	3.8	5.8	---	---
Zo----------------- Zook	IIw	IIw	80	115	80	110	31	37	4.2	5.0	---	---
Zp----------------- Zook	IIIw	IIIw	80	115	80	110	31	37	4.0	5.2	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I (N)	67,045	---	---	---
(I)	67,045	---	---	---
II (N)	115,420	60,020	52,150	3,250
(I)	78,300	22,900	52,150	3,250
III (N)	154,343	141,083	13,260	---
(I)	101,815	81,530	13,260	7,025
IV (N)	60,465	42,050	11,390	7,025
(I)	121,133	113,113	8,020	---
V (N)	2,580	---	2,580	---
VI (N)	24,100	12,070	12,030	---
VII (N)	2,490	---	---	2,490
VIII (N)	1,220	---	480	740

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo-sition
			Lb/acre		Pct
AcC: Alcester	Silty	Favorable	5,000	Big bluestem	35
		Normal	4,600	Little bluestem	20
		Unfavorable	4,200	Western wheatgrass	5
				Sideoats grama	5
				Sedge	5
				Porcupinegrass	5
Ad: Alda	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,300	Little bluestem	15
		Unfavorable	5,000	Indiangrass	15
				Switchgrass	10
				Prairie cordgrass	5
Be: Belfore	Clayey	Favorable	4,500	Big bluestem	30
		Normal	4,100	Little bluestem	25
		Unfavorable	3,700	Switchgrass	10
				Tall dropseed	5
				Porcupinegrass	5
				Indiangrass	5
Bn: Blendon	Sandy	Favorable	4,300	Little bluestem	25
		Normal	3,600	Big bluestem	20
		Unfavorable	2,600	Prairie sandreed	15
				Needleandthread	10
				Porcupinegrass	5
				Blue grama	5
				Sedge	5
Bo, Bp: Boel	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,300	Little bluestem	15
		Unfavorable	5,000	Indiangrass	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
Br*:					
Boel	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,300	Little bluestem	15
		Unfavorable	5,000	Indiangrass	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
Inavale	Sandy Lowland	Favorable	3,600	Little bluestem	25
		Normal	3,200	Sand bluestem	20
		Unfavorable	2,800	Prairie sandreed	15
				Needleandthread	15
				Switchgrass	15
				Blue grama	5
				Sand dropseed	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
BsC: Boelus	Sandy	Favorable	4,300	Little bluestem	25
		Normal	3,700	Sand bluestem	20
		Unfavorable	3,500	Prairie sandreed	20
				Needleandthread	15
				Blue grama	5
				Switchgrass	5
Bu: Butler	Clayey	Favorable	4,500	Big bluestem	30
		Normal	4,100	Little bluestem	20
		Unfavorable	3,700	Switchgrass	10
				Indiangrass	10
				Tall dropseed	5
				Sideoats grama	5
				Western wheatgrass	5
Cp: Colo	Subirrigated	Favorable	6,300	Big bluestem	35
		Normal	5,900	Little bluestem	15
		Unfavorable	5,500	Indiangrass	10
				Prairie cordgrass	10
				Sedge	10
				Switchgrass	5
				Kentucky bluegrass	5
CrE2, CrF: Crofton	Limy Upland	Favorable	4,000	Little bluestem	35
		Normal	3,600	Big bluestem	30
		Unfavorable	3,200	Sideoats grama	5
				Switchgrass	5
				Porcupinegrass	5
CsC2*:					
Crofton	Limy Upland	Favorable	4,000	Little bluestem	35
		Normal	3,600	Big bluestem	30
		Unfavorable	3,200	Sideoats grama	5
				Switchgrass	5
				Porcupinegrass	5
Nora	Silty	Favorable	4,800	Big bluestem	30
		Normal	4,400	Little bluestem	30
		Unfavorable	4,000	Switchgrass	10
				Needlegrass	5
				Sideoats grama	5
				Sedge	5
				Indiangrass	5
Em: Els	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,300	Little bluestem	20
		Unfavorable	5,000	Indiangrass	15
				Switchgrass	10
				Prairie cordgrass	5
				Sedge	5
Fm: Fillmore	Clayey Overflow	Favorable	3,800	Big bluestem	30
		Normal	3,300	Little bluestem	20
		Unfavorable	2,800	Switchgrass	15
				Western wheatgrass	10
				Indiangrass	5
				Sedge	5
				Kentucky bluegrass	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
GeD2, GeE2, GeF: Geary	Silty	Favorable	4,500	Big bluestem	35
		Normal	4,200	Little bluestem	20
		Unfavorable	3,900	Indiangrass	10
				Switchgrass	10
				Tall dropseed	5
				Sideoats grama	5
Gk: Gibbon	Subirrigated	Favorable	6,300	Big bluestem	35
		Normal	5,900	Little bluestem	15
		Unfavorable	5,500	Indiangrass	10
				Prairie cordgrass	10
				Sedge	10
				Switchgrass	5
				Kentucky bluegrass	5
Gm*:					
Gibbon	Subirrigated	Favorable	6,300	Big bluestem	35
		Normal	5,900	Little bluestem	15
		Unfavorable	5,500	Indiangrass	10
				Prairie cordgrass	10
				Sedge	10
				Switchgrass	5
				Kentucky bluegrass	5
Gayville	Saline Lowland	Favorable	4,900	Alkali sacaton	15
		Normal	4,500	Switchgrass	10
		Unfavorable	3,600	Western wheatgrass	10
				Blue grama	10
				Saltgrass	5
				Sedges	5
Gr: Grigston	Silty Lowland	Favorable	5,000	Big bluestem	30
		Normal	4,000	Western wheatgrass	15
		Unfavorable	3,000	Switchgrass	10
				Little bluestem	10
				Sideoats grama	10
				Indiangrass	5
				Maximilian sunflower	5
				Sedge	5
Gs: Grigston	Silty Lowland	Favorable	5,300	Big bluestem	30
		Normal	4,900	Indiangrass	15
		Unfavorable	4,500	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Slender wheatgrass	5
Hb, Hf: Hobbs	Silty Overflow	Favorable	5,500	Big bluestem	40
		Normal	5,000	Switchgrass	15
		Unfavorable	4,000	Little bluestem	10
				Western wheatgrass	10
				Indiangrass	5
				Sedge	5
ImB: Inavale	Sandy Lowland	Favorable	3,800	Sand bluestem	30
		Normal	3,500	Prairie sandreed	20
		Unfavorable	3,000	Little bluestem	15
				Needleandthread	15
				Switchgrass	5
				Porcupinegrass	5
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Compo-sition
		Kind of year	Dry weight		
			Lb/acre		Pct
ImD: Inavale	Sands	Favorable	3,600	Sand bluestem	25
		Normal	3,200	Little bluestem	20
		Unfavorable	2,800	Prairie sandreed	15
				Needleandthread	15
				Switchgrass	15
				Blue grama	5
				Sand dropseed	5
InB: Inavale	Sandy Lowland	Favorable	3,800	Sand bluestem	30
		Normal	3,500	Prairie sandreed	20
		Unfavorable	3,000	Little bluestem	15
				Needleandthread	15
				Switchgrass	5
				Porcupinegrass	5
				Sedge	5
Iw*:					
Ipage	Sandy Lowland	Favorable	4,000	Sand bluestem	15
		Normal	3,700	Prairie sandreed	15
		Unfavorable	3,200	Little bluestem	10
				Needleandthread	10
				Kentucky bluegrass	5
				Indiangrass	5
				Prairie junegrass	5
				Sedge	5
				Switchgrass	5
				Blue grama	5
				Scribner panicum	5
				Leadplant	5
Els	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,300	Little bluestem	25
		Unfavorable	5,000	Indiangrass	15
				Switchgrass	10
				Prairie cordgrass	5
				Sedge	5
Jm: Janude	Sandy Lowland	Favorable	5,300	Sand bluestem	30
		Normal	4,900	Little bluestem	20
		Unfavorable	4,500	Switchgrass	10
				Indiangrass	10
				Sedge	5
Jn: Janude	Silty Lowland	Favorable	5,300	Big bluestem	35
		Normal	4,900	Little bluestem	25
		Unfavorable	4,500	Switchgrass	10
				Indiangrass	10
				Sideoats grama	5
				Sedge	5
Kz: Kezan	Subirrigated	Favorable	5,900	Big bluestem	35
		Normal	5,500	Little bluestem	20
		Unfavorable	5,100	Switchgrass	10
				Indiangrass	10
				Prairie cordgrass	5
				Canada wildrye	5
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
La: Lamo	Subirrigated	Favorable	6,300	Big bluestem	35
		Normal	5,900	Little bluestem	15
		Unfavorable	5,500	Indiangrass	15
				Switchgrass	10
				Prairie cordgrass	5
				Sedge	5
				Canada wildrye	5
Lc: Lamo	Wetland	Favorable	6,500	Prairie cordgrass	15
		Normal	6,300	Bluejoint reedgrass	10
		Unfavorable	6,100	Switchgrass	5
				Sedge	5
				Spikesedge	5
				Northern reedgrass	5
Ld: Lawet	Subirrigated	Favorable	6,200	Big bluestem	30
		Normal	6,000	Little bluestem	15
		Unfavorable	5,800	Switchgrass	10
				Indiangrass	10
				Prairie cordgrass	10
				Slender wheatgrass	5
				Plains bluegrass	5
Lo: Loup	Wetland	Favorable	6,000	Prairie cordgrass	25
		Normal	5,800	Northern reedgrass	20
		Unfavorable	5,500	Bluejoint reedgrass	20
				Sedge	10
				Rush	5
Me: Merrick	Subirrigated	Favorable	5,900	Big bluestem	35
		Normal	5,500	Indiangrass	15
		Unfavorable	5,100	Little bluestem	15
				Switchgrass	10
				Prairie cordgrass	5
				Plains bluegrass	5
				Sedge	5
				Slender wheatgrass	5
Mo, MoB, MoC, MoC2, MoD2, Mp: Moody	Silty	Favorable	4,800	Big bluestem	30
		Normal	4,400	Little bluestem	25
		Unfavorable	4,000	Switchgrass	10
				Western wheatgrass	5
				Needlegrass	5
				Sideoats grama	5
				Sedge	5
				Indiangrass	5
MtC2*, MtD2*: Moody	Silty	Favorable	4,800	Big bluestem	30
		Normal	4,400	Little bluestem	25
		Unfavorable	4,000	Switchgrass	10
				Western wheatgrass	5
				Needlegrass	5
				Sideoats grama	5
				Sedge	5
				Indiangrass	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
MtC2*, MtD2*:					
Thurman	Sandy	Favorable	4,000	Little bluestem	25
		Normal	3,700	Sand bluestem	20
		Unfavorable	3,500	Prairie sandreed	15
				Switchgrass	10
				Blue grama	5
				Indiangrass	5
				Porcupinegrass	5
Mu Muir	Silty Lowland	Favorable	5,300	Big bluestem	30
		Normal	4,900	Indiangrass	15
		Unfavorable	4,500	Switchgrass	10
				Little bluestem	5
				Tall dropseed	5
				Eastern gamagrass	5
				Prairie cordgrass	5
				Maximilian sunflower	5
				Wholeleaf rosinweed	5
Mx Muir	Silty Lowland	Favorable	5,000	Big bluestem	35
		Normal	4,600	Little bluestem	10
		Unfavorable	4,200	Indiangrass	10
				Switchgrass	10
				Kentucky bluegrass	5
				Sideoats grama	5
				Porcupinegrass	5
				Western wheatgrass	5
				Sedge	5
NoC2, NoD Nora	Silty	Favorable	4,800	Big bluestem	30
		Normal	4,400	Little bluestem	30
		Unfavorable	4,000	Switchgrass	10
				Needlegrass	5
				Sideoats grama	5
				Sedge	5
				Indiangrass	5
NpD2*, NpE2*:					
Nora	Silty	Favorable	4,800	Big bluestem	30
		Normal	4,400	Little bluestem	30
		Unfavorable	4,000	Switchgrass	10
				Needlegrass	5
				Sideoats grama	5
				Sedge	5
				Indiangrass	5
Crofton	Limy Upland	Favorable	4,000	Little bluestem	35
		Normal	3,600	Big bluestem	30
		Unfavorable	3,200	Sideoats grama	5
				Switchgrass	5
				Porcupinegrass	5
Nv Novina	Subirrigated	Favorable	5,500	Big bluestem	35
		Normal	5,300	Little bluestem	15
		Unfavorable	5,000	Switchgrass	10
				Prairie cordgrass	10
				Indiangrass	5
				Plains bluegrass	5
				Slender wheatgrass	5
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
On: O'Neill	Sandy	Favorable	3,500	Sand bluestem	20
		Normal	3,300	Little bluestem	15
		Unfavorable	3,000	Prairie sandreed	15
				Blue grama	10
				Needleandthread	10
				Switchgrass	5
				Sand dropseed	5
				Sedge	5
Pt: Platte	Subirrigated	Favorable	5,500	Big bluestem	40
		Normal	5,100	Indiangrass	15
		Unfavorable	4,700	Little bluestem	15
				Switchgrass	5
				Prairie cordgrass	5
Px*:					
Platte	Subirrigated	Favorable	5,000	Big bluestem	30
		Normal	4,600	Little bluestem	15
		Unfavorable	4,200	Prairie cordgrass	10
				Switchgrass	10
				Indiangrass	10
				Sedge	5
				Slender wheatgrass	5
				Plains bluegrass	5
Inavale	Sandy Lowland	Favorable	3,800	Sand bluestem	30
		Normal	3,500	Prairie sandreed	20
		Unfavorable	3,000	Little bluestem	15
				Needleandthread	15
				Switchgrass	5
				Porcupinegrass	5
				Sedge	5
So: Shell	Silty Lowland	Favorable	5,300	Big bluestem	35
		Normal	4,900	Little bluestem	25
		Unfavorable	4,500	Indiangrass	5
				Switchgrass	5
				Kentucky bluegrass	5
				Porcupinegrass	5
				Sedge	5
				Tall dropseed	5
Sp: Shell	Silty Lowland	Favorable	5,300	Big bluestem	35
		Normal	4,900	Little bluestem	20
		Unfavorable	4,500	Indiangrass	5
				Switchgrass	5
				Porcupinegrass	5
				Sedge	5
				Canada wildrye	5
				Kentucky bluegrass	5
				Tall dropseed	5
Sr: Simeon	Sandy	Favorable	3,000	Little bluestem	25
		Normal	2,600	Sand bluestem	15
		Unfavorable	2,200	Prairie sandreed	10
				Needleandthread	10
				Blue grama	10
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
ThB, ThC: Thurman	Sandy	Favorable	4,000	Little bluestem	25
		Normal	3,700	Sand bluestem	20
		Unfavorable	3,500	Prairie sandreed	15
				Switchgrass	10
				Blue grama	5
				Indiangrass	5
				Porcupinegrass	5
Tx: Thurman	Sandy	Favorable	4,000	Little bluestem	25
		Normal	3,700	Sand bluestem	20
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Indiangrass	5
				Blue grama	5
				Sand dropseed	5
VaC, VaE: Valentine	Sands	Favorable	3,000	Sand bluestem	25
		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Sand lovegrass	5
				Blue grama	5
VbC*:					
Valentine	Sands	Favorable	3,000	Sand bluestem	25
		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	15
				Needleandthread	10
				Switchgrass	5
				Sand lovegrass	5
				Blue grama	5
Thurman	Sandy	Favorable	4,000	Little bluestem	25
		Normal	3,700	Sand bluestem	20
		Unfavorable	3,500	Prairie sandreed	15
				Switchgrass	10
				Blue grama	5
				Indiangrass	5
				Porcupinegrass	5
Wn: Wann	Subirrigated	Favorable	6,300	Big bluestem	35
		Normal	5,900	Little bluestem	15
		Unfavorable	5,500	Indiangrass	15
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
Zo, Zp: Zook	Clayey Overflow	Favorable	4,000	Big bluestem	35
		Normal	3,600	Switchgrass	20
		Unfavorable	3,200	Little bluestem	20
				Indiangrass	10

* 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
AcC: Alcester	---	Tatarian honeysuckle, Siberian peashrub, American plum, lilac.	Bur oak, blue spruce, hackberry, Russian-olive, eastern redcedar.	Honeylocust, ponderosa pine, green ash.	---
Ad: Alda	---	Common chokecherry, American plum, fragrant sumac.	Eastern redcedar, hackberry, Manchurian crabapple.	Austrian pine, green ash, honeylocust, golden willow, Russian mulberry.	Eastern cottonwood.
Be: Belfore	---	Siberian peashrub, Tatarian honeysuckle, lilac, American plum.	Eastern redcedar, hackberry, bur oak, Russian-olive, blue spruce.	Ponderosa pine, green ash, honeylocust.	---
Bn: Blendon	Skunkbush sumac	Tatarian honeysuckle, Siberian peashrub, lilac, American plum.	Honeylocust, green ash, hackberry, ponderosa pine, Russian-olive, eastern redcedar.	---	Siberian elm.
Bo, Bp: Boel	---	Common chokecherry, American plum, fragrant sumac.	Eastern redcedar, hackberry, Manchurian crabapple.	Austrian pine, green ash, golden willow, honey-locust, Russian mulberry.	Eastern cottonwood.
Br*:					
Boel.					
Inavale.					
BsC: Boelus	Skunkbush sumac	Lilac, Tatarian honeysuckle, American plum, Siberian peashrub.	Eastern redcedar, ponderosa pine, Russian-olive, green ash, honeylocust, hackberry.	---	Siberian elm.
Bu: Butler	Lilac	Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, ponderosa pine, hackberry, blue spruce.	Golden willow, green ash, honeylocust, silver maple.	Eastern cottonwood.
Cp: Colo	Lilac	Amur privet, Amur honeysuckle, Siberian peashrub.	Hackberry, ponderosa pine, eastern redcedar, Washington hawthorn.	Golden willow, green ash, honeylocust.	Eastern cottonwood.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
CrE2 Crofton	Silver buffaloberry, American plum.	Eastern redcedar, Siberian peashrub, Russian-olive, hackberry, Tatarian honeysuckle, bur oak.	Ponderosa pine, honeylocust, Siberian elm, green ash.	---	---
CrF. Crofton					
CsC2*:					
Crofton	Silver buffaloberry, American plum.	Eastern redcedar, Siberian peashrub, Russian-olive, hackberry, Tatarian honeysuckle, bur oak.	Ponderosa pine, honeylocust, Siberian elm, green ash.	---	---
Nora	---	Tatarian honeysuckle, Siberian peashrub, American plum, lilac.	Bur oak, hackberry, blue spruce, Russian-olive, eastern redcedar.	Honeylocust, green ash, ponderosa pine.	---
Em Els	Lilac	Tatarian honeysuckle, common chokecherry, Siberian peashrub.	Eastern redcedar, green ash, hackberry, ponderosa pine.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
Fm Fillmore	Redosier dogwood	Common chokecherry, American plum.	Eastern redcedar, hackberry.	Austrian pine, green ash, honeylocust, silver maple, northern red oak, golden willow.	Eastern cottonwood.
Fp. Fillmore					
Fu*. Fluvaquents					
GeD2, GeE2 Geary	Peking cotoneaster	Lilac, fragrant sumac, Amur honeysuckle.	Eastern redcedar, hackberry, bur oak, green ash, Russian-olive.	Scotch pine, Austrian pine, honeylocust.	---
GeF. Geary					
Gk Gibbon	American plum, redosier dogwood.	Common chokecherry	Bur oak, eastern redcedar, hackberry, Austrian pine, green ash, Russian mulberry.	Golden willow, honeylocust.	Eastern cottonwood.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Gm*:					
Gibbon	American plum, redosier dogwood.	Common chokecherry	Eastern redcedar, bur oak, hackberry, ponderosa pine, green ash, Russian mulberry.	Golden willow, honeylocust.	Eastern cottonwood.
Gayville	Lilac	Eastern redcedar, Rocky Mountain juniper, Siberian peashrub, silver buffaloberry, Tatarian honeysuckle.	Siberian elm, Russian-olive, green ash.	---	---
Go. Gothenburg					
Gr, Gs Grigston	American plum	Autumn-olive, Peking cotoneaster, Amur honeysuckle.	Eastern redcedar, hackberry, Manchurian crabapple, bur oak.	Honeylocust, Scotch pine, green ash, Austrian pine.	---
Hb Hobbs	---	American plum, Peking cotoneaster, lilac, Amur honeysuckle.	Eastern redcedar	Green ash, hackberry, Austrian pine, honeylocust, bur oak, golden willow.	Eastern cottonwood.
Hf. Hobbs					
ImB Inavale	American plum	Amur honeysuckle, lilac, fragrant sumac.	Eastern redcedar, Russian mulberry, Russian-olive.	Honeylocust, Austrian pine, hackberry, Scotch pine, green ash.	---
ImD Inavale	---	Eastern redcedar	Scotch pine, Austrian pine, ponderosa pine, jack pine.	---	---
InB Inavale	American plum	Amur honeysuckle, lilac, fragrant sumac.	Eastern redcedar, Russian mulberry, Russian-olive.	Honeylocust, Austrian pine, hackberry, Scotch pine, green ash.	---
Iw*:					
Ipage	Tatarian honeysuckle, lilac, skunkbush sumac.	Manchurian crabapple, Siberian peashrub.	Ponderosa pine, green ash, honeylocust, hackberry, eastern redcedar, Russian-olive.	Siberian elm	---
Els	Lilac	Tatarian honeysuckle, common chokecherry, Siberian peashrub.	Eastern redcedar, green ash, hackberry, ponderosa pine.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Jm, Jn Janude	Peking cotoneaster	Lilac, American plum, Siberian peashrub.	Eastern redcedar, ponderosa pine, blue spruce, Manchurian crabapple.	Golden willow, green ash, hackberry.	Eastern cottonwood.
Kz Kezan	Redosier dogwood, lilac.	Tatarian honeysuckle, Siberian peashrub.	Eastern redcedar, green ash, ponderosa pine, hackberry, bur oak.	Golden willow, honeylocust.	Eastern cottonwood.
La Lamo	---	Siberian peashrub, Tatarian honeysuckle, lilac.	Hackberry, ponderosa pine, Manchurian crabapple, eastern redcedar, bur oak.	Golden willow, green ash, honeylocust.	Eastern cottonwood.
Lc. Lamo					
Ld Lawet	Redosier dogwood	Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, hackberry, ponderosa pine.	Golden willow, honeylocust.	Eastern cottonwood.
Lo. Loup					
Me Merrick	Lilac	Siberian peashrub, Tatarian honeysuckle.	Boxelder, hackberry, ponderosa pine, eastern redcedar, bur oak.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
Mo, MoB, MoC, MoC2, MoD2, Mp Moody	---	Siberian peashrub, American plum, lilac, Tatarian honeysuckle.	Blue spruce, hackberry, eastern redcedar, bur oak, Russian-olive.	Ponderosa pine, green ash, honeylocust.	---
MtC2*: Moody	---	Siberian peashrub, American plum, lilac, Tatarian honeysuckle.	Blue spruce, hackberry, eastern redcedar, bur oak, Russian-olive.	Ponderosa pine, green ash, honeylocust.	---
Thurman	Amur honeysuckle, skunkbush sumac, lilac.	Manchurian crabapple, Siberian peashrub.	Ponderosa pine, green ash, honeylocust, hackberry, eastern redcedar, Russian-olive.	Siberian elm	---
MtD2*: Moody	---	Siberian peashrub, American plum, lilac, Tatarian honeysuckle.	Blue spruce, hackberry, eastern redcedar, bur oak, Russian-olive.	Ponderosa pine, green ash, honeylocust.	---

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
MtD2*: Thurman	---	Eastern redcedar	Austrian pine, ponderosa pine, jack pine, Scotch pine.	---	---
Mu Muir	---	Peking cotoneaster, Amur honeysuckle, American plum, lilac.	Eastern redcedar, Washington hawthorn.	Honeylocust, bur oak, ponderosa pine, green ash, hackberry.	Eastern cottonwood.
Mx Muir	Peking cotoneaster, redosier dogwood.	Autumn-olive, Amur honeysuckle.	Eastern redcedar, Russian-olive, boxelder.	Ponderosa pine, Austrian pine, honeylocust, silver maple, Siberian elm.	---
NoC2, NoD Nora	---	Tatarian honeysuckle, Siberian peashrub, American plum, lilac.	Bur oak, hackberry, blue spruce, Russian-olive, eastern redcedar.	Honeylocust, green ash, ponderosa pine.	---
NpD2*, NpE2*: Nora	---	Tatarian honeysuckle, Siberian peashrub, American plum, lilac.	Bur oak, hackberry, blue spruce, Russian-olive, eastern redcedar.	Honeylocust, green ash, ponderosa pine.	---
Crofton	Silver buffaloberry, American plum.	Eastern redcedar, Siberian peashrub, Russian-olive, hackberry, Tatarian honeysuckle, bur oak.	Ponderosa pine, honeylocust, Siberian elm, green ash.	---	---
Nv Novina	American plum, redosier dogwood.	Common chokecherry, autumn-olive.	Eastern redcedar, Scotch pine, boxelder, Austrian pine.	Green ash, honeylocust, golden willow.	Eastern cottonwood.
On O'Neill	Siberian peashrub, lilac, Peking cotoneaster.	Eastern redcedar, Manchurian crabapple, hackberry.	Siberian elm, honeylocust, green ash, Russian-olive, bur oak, ponderosa pine.	---	---
Pd*. Pits and Dumps					
Pt Platte	---	American plum, common chokecherry, fragrant sumac.	Eastern redcedar, hackberry, Manchurian crabapple.	Austrian pine, green ash, honeylocust, golden willow, Russian mulberry.	Eastern cottonwood.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Px*: Platte.					
Inavale.					
Rw*. Riverwash					
So, Sp: Shell	Peking cotoneaster	Autumn-olive, Amur honeysuckle, American plum, lilac.	Eastern redcedar, bur oak.	Green ash, Austrian pine, hackberry, honeylocust.	Eastern cottonwood.
Sr: Simeon	---	Eastern redcedar, Rocky Mountain juniper, jack pine.	Ponderosa pine, Austrian pine.	---	---
ThB, ThC, Tx: Thurman	Amur honeysuckle, skunkbush sumac, lilac.	Manchurian crabapple, Siberian peashrub.	Ponderosa pine, green ash, honeylocust, hackberry, eastern redcedar, Russian-olive.	Siberian elm	---
Us*. Ustorthents, level					
UtG*. Ustorthents, steep					
VaC, VaE: Valentine	---	Eastern redcedar	Ponderosa pine, Austrian pine, jack pine, Scotch pine.	---	---
VbC*: Valentine	---	Eastern redcedar	Ponderosa pine, Austrian pine, jack pine, Scotch pine.	---	---
Thurman	---	Eastern redcedar	Austrian pine, ponderosa pine, jack pine, Scotch pine.	---	---
Wn: Wann	---	Siberian peashrub, lilac, Tatarian honeysuckle.	Eastern redcedar, ponderosa pine, hackberry, bur oak.	Green ash, honeylocust, golden willow, Russian mulberry.	Eastern cottonwood.
Zo, Zp: Zook	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, hackberry.	Honeylocust, golden willow, green ash, northern red oak, silver maple, Austrian pine.	Eastern cottonwood.

* 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
AcC-------------------- Alcester	Slight---------------	Slight---------------	Moderate: slope.	Slight.
Ad--------------------- Alda	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight.
Be--------------------- Belfore	Slight---------------	Slight---------------	Slight---------------	Slight.
Bn--------------------- Blendon	Slight---------------	Slight---------------	Slight---------------	Slight.
Bo, Bp----------------- Boel	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Br*:				
Boel-------------------	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.
Inavale----------------	Severe: flooding.	Moderate: slope.	Severe: slope.	Slight.
BsC-------------------- Boelus	Slight---------------	Slight---------------	Moderate: slope.	Slight.
Bu--------------------- Butler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Cp--------------------- Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
CrE2------------------- Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
CrF-------------------- Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.
CsC2*:				
Crofton----------------	Slight---------------	Slight---------------	Moderate: slope.	Slight.
Nora-------------------	Slight---------------	Slight---------------	Moderate: slope.	Slight.
Em--------------------- Els	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Fm, Fp----------------- Fillmore	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
Fu*. Fluvaquents				

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
GeD2, GeE2: Geary	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
GeF: Geary	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Gk: Gibbon	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Gm*:				
Gibbon	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
Gayville	Severe: flooding, excess sodium.	Severe: excess sodium.	Severe: excess sodium.	Moderate: wetness.
Go: Gothenburg	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Gr, Gs: Grigston	Severe: flooding.	Slight	Slight	Slight.
Hb: Hobbs	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Hf: Hobbs	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
ImB: Inavale	Severe: flooding.	Slight	Slight	Slight.
ImD: Inavale	Severe: flooding.	Slight	Severe: slope.	Slight.
InB: Inavale	Severe: flooding.	Slight	Slight	Slight.
Iw*:				
Ipage	Slight	Slight	Slight	Slight.
Els	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Jm, Jn: Janude	Severe: flooding.	Slight	Slight	Slight.
Kz: Kezan	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
La: Lamo	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, flooding, percs slowly.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lc: Lamo	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ld: Lawet	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.
Lo: Loup	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Me: Merrick	Severe: flooding.	Slight	Slight	Slight.
Mo: Moody	Slight	Slight	Slight	Slight.
MoB, MoC, MoC2: Moody	Slight	Slight	Moderate: slope.	Slight.
MoD2: Moody	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Mp: Moody	Slight	Slight	Slight	Slight.
MtC2*:				
Moody	Slight	Slight	Moderate: slope.	Slight.
Thurman	Slight	Slight	Moderate: slope.	Slight.
MtD2*:				
Moody	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Thurman	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Mu, Mx: Muir	Severe: flooding.	Slight	Slight	Slight.
NoC2: Nora	Slight	Slight	Moderate: slope.	Slight.
NoD: Nora	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
NpD2*, NpE2*:				
Nora	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Crofton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Nv: Novina	Severe: flooding.	Slight	Slight	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
On: O'Neill	Slight	Slight	Slight	Slight.
Pd*. Pits and Dumps				
Pt: Platte	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Px*:				
Platte	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.
Inavale	Severe: flooding.	Slight	Slight	Slight.
Rw*. Riverwash				
So, Sp: Shell	Severe: flooding.	Slight	Moderate: flooding.	Slight.
Sr: Simeon	Slight	Slight	Slight	Slight.
ThB, ThC: Thurman	Slight	Slight	Moderate: slope.	Slight.
Tx: Thurman	Slight	Slight	Slight	Slight.
Us*. Ustorthents, level				
UtG*. Ustorthents, steep				
VaC: Valentine	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
VaE: Valentine	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
VbC*:				
Valentine	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.
Thurman	Slight	Slight	Severe: slope.	Slight.
Wn: Wann	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Zo-------------------- Zook	Severe: wetness, flooding.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
Zp-------------------- Zook	Severe: wetness, flooding, too clayey.	Severe: too clayey.	Severe: too clayey, wetness.	Severe: too clayey.

* 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
AcC----------------- Alcester	Good	Good	Good	Good	Poor	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Ad------------------ Alda	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Fair.
Be------------------ Belfore	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Bn------------------ Blendon	Fair	Fair	Good	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Bo, Bp-------------- Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Fair.
Br*:												
Boel---------------	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Poor	Good.
Inavale------------	Very poor.	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
BsC----------------- Boelus	Fair	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Bu------------------ Butler	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
Cp------------------ Colo	Good	Fair	Good	Fair	Poor	Fair	Good	Good	Fair	Fair	Good	Fair.
CrE2---------------- Crofton	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
CrF----------------- Crofton	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
CsC2*:												
Crofton------------	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Nora---------------	Fair	Good	Good	Good	Poor	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Em------------------ Els	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
Fm------------------ Fillmore	Fair	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Good	Fair.
Fp------------------ Fillmore	Poor	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Very poor.	Good	Poor.
Fu*. Fluvaquents												

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
GeD2----------------- Geary	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
GeE2, GeF---------- Geary	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Gk------------------- Gibbon	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Gm*:												
Gibbon------------	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Gayville----------	Very poor.	Very poor.	Fair	Poor	Very poor.	---	Poor	Poor	Very poor.	Very poor.	Poor	Fair.
Go------------------- Gothenburg	Very poor.	Very poor.	Fair	Poor	Fair	Fair	Fair	Good	Poor	Poor	Fair	Fair.
Gr------------------- Grigston	Good	Good	Good	---	---	Fair	Poor	Fair	Good	---	Poor	Fair.
Gs------------------- Grigston	Good	Good	Good	Good	Good	Fair	Poor	Poor	Good	---	Poor	Fair.
Hb------------------- Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Hf------------------- Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
ImB------------------ Inavale	Fair	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
ImD------------------ Inavale	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
InB------------------ Inavale	Fair	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Iw*:												
Ipage-------------	Poor	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
Els----------------	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair	Fair.
Jm, Jn-------------- Janude	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Kz------------------- Kezan	Poor	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Fair.
La------------------- Lamo	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Fair	Fair	Good.
Lc------------------- Lamo	Very poor.	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good	Fair.
Ld------------------- Lawet	Poor	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	Poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Lo: Loup	Poor	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Me: Merrick	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Mo, MoB, MoC, MoC2: Moody	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
MoD2: Moody	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Mp: Moody	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
MtC2*:												
Moody	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Thurman	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
MtD2*:												
Moody	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Thurman	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Mu: Muir	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
Mx: Muir	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
NoC2: Nora	Fair	Good	Good	Good	Poor	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
NoD: Nora	Poor	Good	Good	Good	Poor	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
NpD2*:												
Nora	Poor	Good	Good	Good	Poor	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Crofton	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
NpE2*:												
Nora	Poor	Good	Good	Good	Poor	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Crofton	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Nv: Novina	Good	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	Good.
On: O'Neill	Fair	Good	Good	Fair	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.	Good.

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
Pd*. Pits and Dumps												
Pt----------------- Platte	Fair	Good	Fair	Poor	Fair	Good	Fair	Good	Fair	Poor	Good	Fair.
Px*:												
Platte------------	Very poor.	Very poor.	Poor	Fair	Fair	Fair	Fair	Good	Very poor.	Fair	Fair	Poor.
Inavale-----------	Very poor.	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Rw*. Riverwash												
So----------------- Shell	Good	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
Sp----------------- Shell	Good	Good	Good	Good	Fair	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
Sr----------------- Simeon	Fair	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
ThB, ThC----------- Thurman	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
Tx----------------- Thurman	Fair	Good	Good	Fair	Fair	Good	Very poor.	Very poor.	Good	Fair	Very poor.	Good.
Us*. Ustorthents, level												
UtG*. Ustorthents, steep												
VaC---------------- Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VaE---------------- Valentine	Very poor.	Very poor.	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.	Good.
VbC*:												
Valentine---------	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Good.
Thurman-----------	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Wn----------------- Wann	Good	Good	Good	Good	Fair	Good	Poor	Fair	Good	Good	Fair	Good.
Zo, Zp------------- Zook	Good	Fair	Good	Fair	Poor	Fair	Good	Good	Fair	Fair	Good	Fair.

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
AcC: Alcester	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Ad: Alda	Severe: wetness, cutbanks cave.	Severe: flooding.	Severe: wetness, flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
Be: Belfore	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Bn: 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.
Br*:						
Boel	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding, slope.	Severe: flooding.	Severe: flooding.
BsC: Boelus	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Bu: Butler	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
Cp: Colo	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: shrink-swell, flooding, low strength.	Moderate: wetness, flooding.
CrE2: Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
CrF: Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CsC2*:						
Crofton	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	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
CsC2*:						
Nora	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
Em: Els	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
Fm: Fillmore	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, low strength, frost action.	Severe: ponding.
Fp: Fillmore	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
Fu*. Fluvaquents						
GeD2, GeE2: Geary	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
GeF: Geary	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Gk: Gibbon	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Gm*:						
Gibbon	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Gayville	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Severe: excess sodium.
Go: Gothenburg	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, droughty, flooding.
Gr: Grigston	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
Gs: Grigston	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
Hb: Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.

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
Hf: Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
ImB, ImD, InB: Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
Iw*:						
Ipage	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Severe: droughty.
Els	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
Jm, Jn: Janude	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Kz: Kezan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
La: Lamo	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, frost action.	Moderate: flooding, wetness.
Lc: Lamo	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Ld: Lawet	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Lo: Loup	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.
Me: Merrick	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
Mo, MoB: Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
MoC, MoC2: Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
MoD2: Moody	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Mp: Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, 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
MtC2*:						
Moody	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Thurman	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
MtD2*:						
Moody	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Thurman	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty.
Mu Muir	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
Mx Muir	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
NoC2 Nora	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
NoD Nora	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
NpD2*, NpE2*:						
Nora	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Crofton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Nv Novina	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: frost action.	Slight.
On O'Neill	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty.
Pd*. Pits and Dumps						
Pt Platte	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, droughty, flooding.
Px*:						
Platte	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.
Inavale	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.

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
Rw*. Riverwash						
So: Shell	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Sp: Shell	Moderate: too clayey, wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
Sr: Simeon	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
ThB: Thurman	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
ThC: Thurman	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Tx: Thurman	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Us*. Ustorthents, level						
UtG*. Ustorthents, steep						
VaC: Valentine	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
VaE: Valentine	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VbC*:						
Valentine	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Thurman	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Wn: Wann	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Moderate: wetness, flooding.
Zo: Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
Zp: Zook	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, low strength, frost action.	Severe: too clayey.

* 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
AcC Alcester	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ad Alda	Severe: flooding, wetness, poor filter.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Poor: too sandy, seepage.
Be Belfore	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Bn 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.
Br*:					
Boel	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Inavale	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
BsC Boelus	Slight	Moderate: slope.	Slight	Slight	Good.
Bu Butler	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Cp Colo	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: wetness, hard to pack.
CrE2 Crofton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
CrF Crofton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
CsC2*:					
Crofton	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CsC2*:					
Nora	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Em: Els	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Fm: Fillmore	Severe: percs slowly, ponding.	Severe: ponding.	Severe: too clayey, ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Fp: Fillmore	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Fu*. Fluvaquents					
GeD2, GeE2: Geary	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
GeF: Geary	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Gk: Gibbon	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Gm*:					
Gibbon	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Gayville	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, excess sodium.	Severe: flooding, wetness.	Poor: excess sodium.
Go: Gothenburg	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Gr: Grigston	Moderate: flooding.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Gs: Grigston	Moderate: flooding, wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: flooding, wetness.	Fair: too clayey.

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
Hb, Hf: Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
ImB, ImD, InB: Inavale	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Iw*:					
Ipage	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Els	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Jm: Janude	Moderate: flooding, wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Good.
Jn: Janude	Moderate: flooding, wetness, percs slowly.	Severe: seepage.	Severe: seepage, wetness.	Moderate: flooding, wetness.	Good.
Kz: Kezan	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
La: Lamo	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack.
Lc: Lamo	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ld: Lawet	Severe: flooding, wetness, percs slowly.	Severe: seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
Lo: Loup	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Me: Merrick	Moderate: flooding, wetness, percs slowly.	Moderate: seepage, wetness.	Severe: wetness.	Moderate: flooding, wetness.	Fair: too clayey.
Mo: Moody	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Poor: hard to pack.

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
MoB, MoC, MoC2------ Moody	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Poor: hard to pack.
MoD2--------------- Moody	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: hard to pack.
Mp----------------- Moody	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight-----------	Poor: hard to pack.
MtC2*:					
Moody--------------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Poor: hard to pack.
Thurman------------	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
MtD2*:					
Moody--------------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: hard to pack.
Thurman------------	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
Mu----------------- Muir	Moderate: flooding.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
Mx----------------- Muir	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Fair: thin layer.
NoC2--------------- Nora	Slight-----------	Moderate: slope, seepage.	Slight-----------	Slight-----------	Good.
NoD---------------- Nora	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
NpD2*, NpE2*:					
Nora---------------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Crofton------------	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Nv----------------- Novina	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage, wetness.	Fair: wetness.
On----------------- O'Neill	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Pd*. Pits and Dumps					

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
Pt------------------ Platte	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Px*:					
Platte-------------	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Inavale------------	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
Rw*. Riverwash					
So------------------ Shell	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Sp------------------ Shell	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Fair: wetness, thin layer.
Sr------------------ Simeon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
ThB, ThC------------ Thurman	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
Tx------------------ Thurman	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Us*. Ustorthents, level					
UtG*. Ustorthents, steep					
VaC----------------- Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VaE----------------- Valentine	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
VbC*:					
Valentine----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

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
VbC*:					
Thurman	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
Wn: Wann	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness, thin layer.
Zo, Zp: Zook	Severe: percs slowly, wetness, flooding.	Severe: flooding.	Severe: wetness, too clayey, flooding.	Severe: wetness, flooding.	Poor: too clayey, wetness, hard to pack.

* 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
AcC Alcester	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ad Alda	Fair: wetness.	Probable	Probable	Poor: area reclaim.
Be Belfore	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Bn Blendon	Good	Probable	Improbable: too sandy.	Fair: thin layer.
Bo, Bp Boel	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Br*:				
Boel	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Inavale	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
BsC Boelus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Bu Butler	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Cp Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CrE2 Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CrF Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CsC2*:				
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Em Els	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
Fm Fillmore	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Fp: Fillmore	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Fu*. Fluvaquents				
GeD2, GeE2: Geary	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
GeF: Geary	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Gk: Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gm*:				
Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gayville	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess sodium.
Go: Gothenburg	Poor: wetness.	Probable	Probable	Poor: area reclaim, small stones.
Gr, Gs: Grigston	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hb, Hf: Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
ImB, ImD: Inavale	Good	Probable	Improbable: too sandy.	Fair: too sandy.
InB: Inavale	Good	Probable	Improbable: too sandy.	Good.
Iw*:				
Ipage	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Els	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
Jm, Jn: Janude	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Kz: Kezan	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
La: Lamo	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Lc: Lamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ld: Lawet	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Lo: Loup	Poor: wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: wetness.
Me: Merrick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Mo, MoB, MoC, MoC2: Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MoD2: Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Mp: Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MtC2*:				
Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
MtD2*:				
Moody	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Mu: Muir	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Mx: Muir	Good	Probable	Improbable: too sandy.	Fair: area reclaim.
NoC2: Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
NoD: Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
NpD2*, NpE2*:				
Nora	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
Crofton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Nv: Novina	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
On: O'Neill	Good	Probable	Probable	Fair: small stones, area reclaim.
Pd*. Pits and Dumps				
Pt: Platte	Fair: wetness.	Probable	Probable	Poor: area reclaim, small stones.
Px*: Platte	Fair: wetness.	Probable	Probable	Poor: small stones.
Inavale	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Rw*. Riverwash				
So, Sp: Shell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sr: Simeon	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
ThB, ThC: Thurman	Good	Probable	Improbable: too sandy.	Poor: area reclaim.
Tx: Thurman	Fair: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: thin layer.
Us*. Ustorthents, level				
UtG*. Ustorthents, steep				
VaC: Valentine	Good	Probable	Improbable: too sandy.	Poor: too sandy.
VaE: Valentine	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
VbC*: Valentine	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Thurman	Good	Probable	Improbable: too sandy.	Fair: area reclaim.
Wn: Wann	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Zo: Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Zp: Zook	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

* 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	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AcC: Alcester	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Ad: Alda	Severe: seepage.	Severe: seepage, piping.	Flooding, frost action, cutbanks cave.	Wetness, flooding.	Wetness, too sandy.	Favorable.
Be: Belfore	Slight	Moderate: hard to pack.	Deep to water	Favorable	Favorable	Favorable.
Bn: Blendon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Too sandy, soil blowing.	Favorable.
Bo: Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy.	Droughty.
Bp: Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, too sandy.	Droughty.
Br*:						
Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Droughty.
Inavale	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
BsC: Boelus	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, fast intake, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
Bu: Butler	Moderate: seepage.	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
Cp: Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Flooding, wetness.	Wetness	Wetness.
CrE2, CrF: Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
CsC2*:						
Crofton	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	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	Drainage	Irrigation	Terraces and diversions	Grassed waterways
CsC2*:						
Nora	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Em: Els	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
Fm: Fillmore	Moderate: seepage.	Severe: hard to pack, ponding.	Percs slowly, frost action, ponding.	Percs slowly, ponding, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Fp: Fillmore	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
Fu*. Fluvaquents						
GeD2, GeE2, GeF: Geary	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Gk: Gibbon	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable.
Gm*:						
Gibbon	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable.
Gayville	Moderate: seepage.	Severe: piping, excess sodium.	Percs slowly, flooding, excess salt.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Excess sodium, erodes easily, percs slowly.
Go: Gothenburg	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, droughty, rooting depth.
Gr, Gs: Grigston	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Hb, Hf: Hobbs	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
ImB, ImD: Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
InB: Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Iw*:						
Ipage	Severe: seepage.	Severe: seepage, piping.	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	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
Iw*:						
Els	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
Jm Janude	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Jn Janude	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Kz Kezan	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
La Lamo	Slight	Moderate: piping, hard to pack, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Favorable.
Lc Lamo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
Ld Lawet	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
Lo Loup	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding, droughty.	Ponding, too sandy.	Wetness, droughty.
Me Merrick	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
Mo, MoB Moody	Moderate: seepage.	Moderate: thin layer, piping, hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
MoC, MoC2 Moody	Moderate: seepage, slope.	Moderate: thin layer, piping, hard to pack.	Deep to water	Slope	Erodes easily	Erodes easily.
MoD2 Moody	Severe: slope.	Moderate: thin layer, piping, hard to pack.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Mp Moody	Moderate: seepage.	Moderate: thin layer, piping, hard to pack.	Deep to water	Favorable	Erodes easily	Erodes easily.
MtC2*:						
Moody	Moderate: seepage, slope.	Moderate: thin layer, piping, hard to pack.	Deep to water	Slope	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	Drainage	Irrigation	Terraces and diversions	Grassed waterways
MtC2*:						
Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
MtD2*:						
Moody	Severe: slope.	Moderate: thin layer, piping, hard to pack.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Thurman	Severe: slope, seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, droughty, slope.	Slope, too sandy, soil blowing.	Droughty, slope.
Mu Muir	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
Mx Muir	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable	Favorable	Favorable.
NoC2 Nora	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
NoD Nora	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
NpD2*, NpE2*:						
Nora	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Crofton	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Nv Novina	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
On O'Neill	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, soil blowing, rooting depth.	Too sandy, soil blowing.	Droughty, rooting depth.
Pd*. Pits and Dumps						
Pt Platte	Severe: seepage.	Severe: seepage, wetness, piping.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Px*:						
Platte	Severe: seepage.	Severe: seepage, wetness.	Flooding, cutbanks cave.	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Inavale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Rw*. Riverwash						

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
So: Shell	Moderate: seepage.	Moderate: piping.	Deep to water	Flooding	Favorable	Favorable.
Sp: Shell	Moderate: seepage.	Moderate: piping, wetness.	Flooding	Wetness, percs slowly, flooding.	Wetness	Favorable.
Sr: Simeon	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
ThB, ThC: Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Tx: Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty, rooting depth.
Us*. Ustorthents, level						
UtG*. Ustorthents, steep						
VaC: Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
VaE: Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
VbC*: Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Thurman	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Wn: Wann	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness	Wetness	Slight.
Zo: Zook	Slight	Severe: hard to pack, wetness.	Flooding, percs slowly, frost action.	Wetness, percs slowly.	Not needed	Not needed.
Zp: Zook	Slight	Severe: hard to pack, wetness.	Flooding, percs slowly, frost action.	Wetness, slow intake, percs slowly.	Not needed	Not needed.

* 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	
AcC: Alcester	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	100	95-100	85-100	25-40	6-20
	8-45	Silty clay loam, silt loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
	45-60	Silty clay loam, silt loam.	ML, CL	A-6, A-7	0	100	95-100	95-100	85-100	30-50	10-20
Ad: Alda	0-16	Loam	ML, CL-ML, CL	A-4	0	90-100	85-100	85-100	50-75	20-35	3-10
	16-28	Fine sandy loam, sandy loam, very fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<26	NP-7
	28-60	Coarse sand, sand, gravelly sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	70-100	65-95	30-95	2-15	<20	NP
Be: Belfore	0-14	Silty clay loam	CL, CH	A-6, A-7	0	100	100	100	95-100	35-55	15-30
	14-45	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	100	95-100	45-60	20-30
	45-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	35-55	15-30
Bn: Blendon	0-9	Fine sandy loam	SM	A-4	0	100	90-100	60-100	35-50	20-30	NP-5
	9-23	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
	23-29	Fine sandy loam, sandy loam.	SM	A-4, A-2	0	100	85-100	60-100	20-45	20-30	NP-5
	29-41	Fine sandy loam, loamy fine sand, loamy sand.	SP-SM, SM, SM-SC	A-2, A-4	0	85-100	65-100	50-100	10-45	<30	NP-5
	41-60	Fine sand, sand	SP-SM, SM, SP	A-2, A-3	0	90-100	90-100	70-100	4-30	---	NP
Bo: Boel	0-15	Loamy fine sand	SM, SP	A-2, A-3	0	100	95-100	85-95	0-35	---	NP
	15-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	85-95	0-25	---	NP
Bp: Boel	0-12	Fine sandy loam	SM	A-4, A-2	0	100	100	85-95	20-40	<20	NP
	12-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	85-95	0-25	---	NP
Br*: Boel	0-16	Loam	ML	A-4	0	100	100	85-95	70-95	24-35	2-10
	16-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	85-95	0-25	---	NP
Inavale	0-8	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	8-12	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	12-60	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5

See footnote at end of table.

TABLE 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	
BsC-------------- Boelus	0-14	Loamy fine sand	SM, SP-SM	A-2	0	100	100	50-100	10-35	<20	NP
	14-23	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2	0	100	100	50-100	10-35	<20	NP
	23-60	Silt loam, loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-100	30-40	8-15
Bu--------------- Butler	0-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	5-15
	12-29	Clay, silty clay	CH	A-7	0	100	100	100	95-100	50-70	30-45
	29-38	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	35-60	15-35
	38-60	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0	100	100	100	95-100	30-60	10-35
Cp--------------- Colo	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	13-32	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	40-55	20-30
	32-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	40-55	15-30
CrE2------------- Crofton	0-6	Silt loam--------	ML, CL	A-6, A-7	0	100	95-100	95-100	95-100	35-50	10-25
	6-60	Silt loam--------	CL	A-6, A-7	0	100	95-100	95-100	95-100	32-50	10-25
CrF-------------- Crofton	0-4	Silt loam--------	ML, CL	A-6, A-7	0	100	95-100	95-100	95-100	35-50	10-25
	4-60	Silt loam--------	CL	A-6, A-7	0	100	95-100	95-100	95-100	32-50	10-25
CsC2*:											
Crofton---------	0-5	Silt loam--------	ML, CL	A-6, A-7	0	100	95-100	95-100	95-100	35-50	10-25
	5-60	Silt loam--------	CL	A-6, A-7	0	100	95-100	95-100	95-100	32-50	10-25
Nora------------	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	5-19	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	19-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20
Em--------------- Els	0-8	Loamy fine sand	SP-SM, SM	A-2, A-3	0	100	100	70-100	5-35	---	NP
	8-60	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SP	A-2, A-3	0	90-100	90-100	70-100	4-30	---	NP
Fm--------------- Fillmore	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	12-41	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	40-75	20-45
	41-52	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	20-40
	52-60	Silt loam, silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	100	95-100	25-75	10-45
Fp--------------- Fillmore	0-19	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-35	2-12
	19-60	Silty clay-------	CH	A-7	0	100	100	100	95-100	50-75	30-45
Fu*. Fluvaquents											

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	
GeD2, GeE2------- Geary	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	75-98	35-45	15-25
	6-34	Silty clay loam, clay loam.	CL	A-7, A-6	0	100	100	96-100	85-98	35-50	15-25
	34-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	100	100	96-100	85-98	30-45	11-22
GeF-------------- Geary	0-11	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	75-98	35-45	15-25
	11-34	Silty clay loam, clay loam.	CL	A-7, A-6	0	100	100	96-100	85-98	35-50	15-25
	34-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	100	100	96-100	85-98	30-45	11-22
Gk--------------- Gibbon	0-18	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	20-30	2-10
	18-50	Silt loam, clay loam.	CL	A-6	0	100	100	90-100	55-90	25-38	12-20
	50-60	Stratified fine sandy loam to silt loam.	SM, SC, CL, ML	A-4	0	100	100	70-95	35-90	<25	NP-8
Gm*:											
Gibbon----------	0-14	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	20-30	2-10
	14-55	Silt loam, clay loam.	CL	A-6	0	100	100	90-100	55-90	25-38	12-20
	55-60	Stratified fine sandy loam to silt loam.	SM, SC, CL, ML	A-4	0	100	100	70-95	35-90	<25	NP-8
Gayville--------	0-6	Silt loam--------	ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	3-15
	6-17	Silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	12-25
	17-60	Silty clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	95-100	85-100	30-45	8-20
Go--------------- Gothenburg	0-4	Sandy loam-------	CL-ML, ML, SM, SM-SC	A-2, A-4	0	100	100	60-100	30-90	20-35	2-10
	4-60	Sand and gravel	SP, SM, SP-SM	A-1, A-2, A-3	0	70-95	65-95	30-65	3-15	---	NP
Gr--------------- Grigston	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
	8-19	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	19-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-100	25-40	5-20
Gs--------------- Grigston	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-100	25-40	5-20
	14-22	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	22-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	70-100	25-40	5-20
Hb, Hf----------- Hobbs	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	8-60	Silt loam, silty clay loam, very fine sandy loam.	CL, CL-ML, MH	A-4, A-6, A-7	0	100	100	95-100	80-100	25-55	5-25

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	
ImB, ImD--------- Inavale	0-6	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	6-18	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	18-60	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
InB-------------- Inavale	0-8	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	95-100	65-85	35-55	<25	NP-5
	8-16	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	16-60	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
Iw*: 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
Els--------------	0-12	Loamy fine sand	SP-SM, SM	A-2, A-3	0	100	100	70-100	5-35	---	NP
	12-60	Fine sand, loamy sand, sand.	SP-SM, SM, SP	A-2, A-3	0	90-100	90-100	70-100	4-30	---	NP
Jm--------------- Janude	0-18	Fine sandy loam	SM	A-4	0	100	100	75-90	36-50	<25	NP-4
	18-42	Loam, fine sandy loam.	ML	A-4	0	100	100	85-95	60-75	20-34	NP-7
	42-60	Loamy fine sand, fine sand.	SP, SM, SP-SM	A-2, A-3	0	100	100	90-100	2-20	---	NP
Jn--------------- Janude	0-8	Loam-------------	ML	A-4	0	100	100	85-95	60-75	25-34	2-7
	8-48	Loam, fine sandy loam.	ML	A-4	0	100	100	85-95	60-75	20-34	NP-7
	48-60	Loamy fine sand, fine sand.	SP-SM, SP, SM	A-2, A-3	0	100	100	90-100	2-20	---	NP
Kz--------------- Kezan	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	70-90	20-35	2-12
	6-33	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	20-40	4-20
	33-60	Silt loam, silty clay loam.	ML, CL-ML, CL	A-4, A-6	0	100	100	95-100	80-95	20-40	2-20
La, Lc----------- Lamo	0-22	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	95-100	80-95	40-65	14-35
	22-60	Silty clay loam, silt loam.	CL, CH	A-7, A-6	0	100	100	95-100	85-95	30-55	11-35
Ld--------------- Lawet	0-7	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	85-100	50-95	20-40	5-15
	7-60	Sandy clay loam, loam, silt loam.	CL, SC	A-6, A-4	0	100	100	70-100	35-75	20-35	8-20
Lo--------------- Loup	0-13	Loam-------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	55-80	15-35	4-15
	13-60	Fine sand, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	100	100	65-100	5-20	---	NP
Me--------------- Merrick	0-29	Loam-------------	CL	A-4, A-6	0	100	100	95-100	90-100	25-40	8-15
	29-60	Loam, silt loam, clay loam.	CL	A-6, A-7	0	100	100	95-100	85-100	25-45	10-20

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	
Mo, MoB, MoC----- Moody	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	8-37	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	95-100	32-55	11-33
	37-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-46	5-25
MoC2, MoD2------- Moody	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	6-34	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	95-100	32-55	11-33
	34-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-46	5-25
Mp--------------- Moody	0-12	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	12-42	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	95-100	32-55	11-33
	42-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-46	5-25
MtC2*:											
Moody-----------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	6-31	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	95-100	32-55	11-30
	31-48	Silt loam--------	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-45	5-25
	48-60	Very fine sandy loam.	SM	A-4	0	100	100	70-100	40-60	<20	NP-5
Thurman---------	0-6	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	<20	NP
	6-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
MtD2*:											
Moody-----------	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	13-25
	6-23	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	95-100	32-55	11-30
	23-46	Silt loam--------	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	95-100	85-100	25-45	5-25
	46-60	Fine sandy loam, fine sand.	SM, SP-SM	A-2, A-4	0	100	100	70-100	15-50	<20	NP
Thurman---------	0-6	Fine sandy loam	SM	A-4	0	100	100	70-100	35-50	<20	NP
	6-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Mu--------------- Muir	0-27	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	4-15
	27-60	Silt loam, silty clay loam, loam.	CL, ML, CL-ML	A-4, A-6, A-7-6	0	100	100	95-100	85-100	20-45	4-20
Mx--------------- Muir	0-22	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-20
	22-42	Silt loam, sandy clay loam, loam.	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-20
	42-60	Fine sand, sand	SM, SP-SM, SP	A-1-b	0	100	70-90	25-40	2-25	<20	NP
NoC2------------- Nora	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	6-15	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	15-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20
NoD-------------- Nora	0-12	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	12-25	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	25-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20

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	
NpD2*, NpE2*:											
Nora	0-5	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	12-25
	5-25	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	95-100	95-100	95-100	85-100	35-50	11-20
	25-60	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	95-100	95-100	95-100	85-100	27-50	6-20
Crofton	0-5	Silt loam	ML, CL	A-6, A-7	0	100	95-100	95-100	95-100	35-50	10-25
	5-60	Silt loam	CL	A-6, A-7	0	100	95-100	95-100	95-100	32-50	10-25
Nv Novina	0-17	Fine sandy loam	SM, ML	A-4	0	100	100	70-85	40-60	<25	NP
	17-25	Sandy loam, fine sandy loam.	ML, SM	A-4	0	100	100	75-85	45-60	<25	NP
	25-52	Loam, fine sandy loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	85-95	60-80	20-35	5-15
	52-60	Loamy fine sand	SM, SP-SM	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
On O'Neill	0-12	Fine sandy loam	SM, ML, CL, SM-SC	A-4	0	95-100	95-100	70-85	35-55	<25	NP-10
	12-22	Fine sandy loam, sandy loam.	SC, SM-SC	A-2, A-4	0	95-100	95-100	60-75	30-50	<30	4-10
	22-60	Stratified loamy sand to gravelly sand.	SP, SP-SM	A-1, A-2, A-3	0	70-100	50-90	25-60	0-5	---	NP
Pd*. Pits and Dumps											
Pt Platte	0-10	Loam	CL-ML, CL	A-4, A-6	0	100	95-100	85-100	60-95	22-35	4-15
	10-60	Gravelly coarse sand, coarse sand, gravelly sand.	SP-SM, SM	A-1, A-2, A-3	0	70-95	50-95	25-65	5-15	<20	NP
Px*:											
Platte	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2	0	100	95-100	75-95	30-55	<25	NP-10
	5-12	Fine sandy loam, sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	70-90	40-65	<25	NP-10
	12-60	Stratified gravelly coarse sand to sand.	SP, SP-SM	A-1, A-2, A-3	0	70-95	50-90	25-60	2-12	<20	NP
Inavale	0-5	Loamy fine sand	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	85-95	5-35	<25	NP-5
	5-14	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	90-100	65-85	5-30	<25	NP-5
	14-60	Fine sand, loamy sand, loamy fine sand.	SP-SM, SM, SM-SC	A-2, A-3	0	100	100	70-90	5-30	<25	NP-5
Rw*. Riverwash											
So Shell	0-25	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	6-18
	25-35	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-46	10-25
	35-60	Silt loam, loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	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	
Sp------------- Shell	0-22	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-20
	22-42	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	85-100	25-46	8-20
	42-60	Silty clay, silty clay loam.	CL, CH	A-7, A-6	0	100	100	100	95-100	35-60	15-35
Sr------------- Simeon	0-9	Loamy sand-------	SM, SP-SM	A-2, A-3	0	95-100	90-100	51-80	5-35	<20	NP
	9-60	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
ThB, ThC--------- Thurman	0-14	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	<20	NP
	14-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Tx------------- Thurman	0-22	Loamy fine sand	SM	A-2	0	100	100	95-100	15-35	---	NP
	22-43	Fine sand--------	SM, SP-SM	A-2, A-3	0	100	100	90-100	5-35	---	NP
	43-60	Silt loam, clay loam.	ML, CL	A-6, A-7	0	100	100	90-100	70-100	30-45	11-25
Us*. Ustorthents, level											
UtG*. Ustorthents, steep											
VaC, VaE--------- Valentine	0-11	Fine sand--------	SM, SP-SM, SP	A-2, A-3	0	100	100	70-100	2-25	---	NP
	11-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-20	---	NP
VbC*: Valentine-------	0-13	Fine sand--------	SM, SP-SM, SP	A-2, A-3	0	100	100	70-100	2-25	---	NP
	13-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-20	---	NP
Thurman---------	0-15	Loamy fine sand	SM, SP-SM	A-2, A-3, A-4	0	100	100	90-100	5-40	<20	NP
	15-60	Loamy fine sand, fine sand, very fine sand.	SM, SP-SM	A-2, A-3	0	100	100	85-100	5-25	---	NP
Wn------------- Wann	0-9	Loam-------------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	85-100	55-75	15-30	2-15
	9-46	Sandy loam, fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	75-100	60-100	20-50	<25	NP-5
	46-60	Stratified sandy clay loam to fine sand.	SM	A-2, A-4	0	95-100	95-100	70-100	15-40	<20	NP-3
Zo------------- Zook	0-19	Silty clay loam	CH, CL	A-7	0	100	100	95-100	95-100	45-65	20-35
	19-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
Zp------------- Zook	0-15	Silty clay-------	CH	A-7	0	100	100	95-100	95-100	60-85	35-55
	15-60	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	95-100	60-85	35-55

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		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
AcC---------------	0-8	20-26	1.20-1.35	0.6-2.0	0.19-0.22	5.6-7.8	<2	Moderate	0.28	5	6	4-8
Alcester	8-45	20-32	1.20-1.35	0.6-2.0	0.19-0.22	6.1-7.8	<2	Moderate	0.28			
	45-60	20-32	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
Ad----------------	0-16	12-25	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low-------	0.28	4	6	2-4
Alda	16-28	3-10	1.70-1.90	2.0-6.0	0.15-0.17	7.4-8.4	<2	Low-------	0.20			
	28-60	0-2	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low-------	0.10			
Be----------------	0-14	27-39	1.30-1.50	0.2-0.6	0.21-0.24	5.6-6.5	<2	High------	0.32	5	7	2-4
Belfore	14-45	35-43	1.20-1.40	0.2-0.6	0.11-0.18	5.6-7.8	<2	High------	0.32			
	45-60	25-35	1.30-1.50	0.2-0.6	0.18-0.22	6.1-8.4	<2	High------	0.32			
Bn----------------	0-9	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	9-23	10-20	1.20-1.30	0.6-6.0	0.11-0.18	6.1-7.3	<2	Low-------	0.20			
	23-29	10-15	1.25-1.35	2.0-6.0	0.09-0.15	6.1-8.4	<2	Low-------	0.20			
	29-41	5-18	1.30-1.45	2.0-20	0.08-0.15	6.6-8.4	<2	Low-------	0.20			
	41-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.15			
Bo----------------	0-15	2-10	1.60-1.80	6.0-20	0.10-0.12	6.6-8.4	<2	Low-------	0.17	5	2	1-2
Boel	15-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.20			
Bp----------------	0-12	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	12-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.20			
Br*:												
Boel------------	0-16	15-25	1.30-1.40	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low-------	0.28	5	4L	1-2
	16-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.20			
Inavale---------	0-8	2-10	1.50-1.60	6.0-20	0.10-0.12	6.6-8.4	<2	Low-------	0.17	5	2	.5-1
	8-12	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low-------	0.17			
	12-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.17			
BsC---------------	0-14	2-12	1.70-1.90	6.0-20	0.10-0.12	5.6-7.3	<2	Low-------	0.17	5	2	1-2
Boelus	14-23	2-12	1.70-1.90	6.0-20	0.09-0.11	6.1-7.8	<2	Low-------	0.17			
	23-60	15-35	1.40-1.60	0.6-2.0	0.17-0.22	6.1-8.4	<2	Moderate	0.43			
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	12-29	45-55	1.10-1.20	0.06-0.2	0.11-0.13	5.6-8.4	<2	High------	0.37			
	29-38	32-45	1.10-1.30	0.2-0.6	0.14-0.20	6.6-8.4	<2	High------	0.37			
	38-60	20-35	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.37			
Cp----------------	0-13	20-26	1.25-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.28	5	6	4-5
Colo	13-32	30-35	1.25-1.35	0.2-0.6	0.18-0.20	5.6-7.3	<2	High------	0.28			
	32-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	<2	High------	0.28			
CrE2--------------	0-6	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low-------	0.43	5	4L	.5-1
Crofton	6-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-------	0.43			
CrF---------------	0-4	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low-------	0.43	5	4L	.5-2
Crofton	4-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-------	0.43			
CsC2*:												
Crofton---------	0-5	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low-------	0.43	5	4L	.5-1
	5-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low-------	0.43			

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		Wind erodi- bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
CsC2*:												
Nora------------	0-5	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	1-2
	5-19	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43			
	19-60	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
Em---------------	0-8	2-8	1.60-1.80	6.0-20	0.07-0.12	5.1-8.4	<2	Low--------	0.15	5	1	1-2
Els	8-60	0-8	1.50-1.60	6.0-20	0.05-0.08	5.6-8.4	<2	Low--------	0.15			
Fm---------------	0-12	18-27	1.30-1.40	0.6-2.0	0.21-0.24	5.6-6.5	<2	Moderate	0.37	4	6	3-4
Fillmore	12-41	40-55	1.30-1.50	<0.06	0.11-0.14	5.6-7.8	<2	High-------	0.37			
	41-52	32-40	1.20-1.40	0.2-0.6	0.18-0.20	6.6-8.4	<2	High-------	0.37			
	52-60	18-45	1.30-1.50	0.06-2.0	0.10-0.22	6.6-8.4	<2	Moderate	0.37			
Fp---------------	0-19	17-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-6.5	<2	Low--------	0.37	4	6	2-3
Fillmore	19-60	40-55	1.10-1.30	<0.06	0.10-0.14	5.6-7.3	<2	High-------	0.37			
Fu*. Fluvaquents												
GeD2, GeE2--------	0-6	27-35	1.30-1.40	0.6-2.0	0.18-0.23	5.6-6.5	<2	Moderate	0.32	5	6	1-2
Geary	6-34	27-35	1.35-1.50	0.2-2.0	0.17-0.20	5.6-7.8	<2	Moderate	0.32			
	34-60	20-32	1.30-1.40	0.6-2.0	0.15-0.19	6.1-8.4	<2	Moderate	0.32			
GeF--------------	0-11	27-35	1.30-1.40	0.6-2.0	0.18-0.23	5.6-6.5	<2	Moderate	0.32	5	6	2-4
Geary	11-34	27-35	1.35-1.50	0.2-2.0	0.17-0.20	5.6-7.8	<2	Moderate	0.32			
	34-60	20-32	1.30-1.40	0.6-2.0	0.15-0.19	6.1-8.4	<2	Moderate	0.32			
Gk---------------	0-18	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	18-50	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
	50-60	15-25	1.50-1.70	0.6-6.0	0.16-0.20	7.9-9.0	<2	Low--------	0.32			
Gm*:												
Gibbon-----------	0-14	20-25	1.40-1.60	0.6-2.0	0.21-0.23	7.4-8.4	<2	Low--------	0.32	5	4L	2-4
	14-55	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
	55-60	15-25	1.50-1.70	0.6-6.0	0.16-0.20	7.9-9.0	<2	Low--------	0.32			
Gayville---------	0-6	20-27	1.15-1.20	0.6-2.0	0.17-0.20	7.4-9.0	<2	Low--------	0.37	1	6	1-2
	6-17	35-45	1.35-1.45	<0.06	0.10-0.16	7.9-9.0	4-16	High-------	0.37			
	17-60	20-35	1.30-1.40	0.2-0.6	0.14-0.16	>7.8	4-16	High-------	0.37			
Go---------------	0-4	5-12	1.40-1.50	2.0-6.0	0.13-0.22	6.6-8.4	<2	Low--------	0.24	2	3	<1
Gothenburg	4-60	0-2	1.70-1.90	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Gr---------------	0-8	21-26	1.30-1.40	0.6-2.0	0.21-0.24	6.6-7.8	<2	Low--------	0.32	5	6	2-4
Grigston	8-19	21-30	1.35-1.45	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.32			
	19-60	21-30	1.30-1.45	0.6-2.0	0.16-0.22	7.4-8.4	<2	Low--------	0.32			
Gs---------------	0-14	18-27	1.30-1.40	0.6-2.0	0.21-0.24	6.6-7.8	<2	Low--------	0.32	5	6	2-4
Grigston	14-22	18-27	1.35-1.45	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.32			
	22-60	18-35	1.30-1.45	0.6-2.0	0.16-0.22	7.4-8.4	<2	Low--------	0.32			
Hb, Hf-----------	0-8	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
Hobbs	8-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
ImB, ImD---------	0-6	2-10	1.50-1.60	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17	5	2	.5-1
Inavale	6-18	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low--------	0.17			
	18-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.17			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
InB-------------- Inavale	0-8	7-15	1.40-1.60	2.0-6.0	0.13-0.18	6.6-8.4	<2	Low-------	0.17	5	3	.5-1
	8-16	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low-------	0.17			
	16-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low-------	0.17			
Iw*:												
Ipage-----------	0-7	3-10	1.40-1.50	6.0-20	0.10-0.12	5.1-7.8	<2	Low-------	0.20	5	2	.5-1
	7-60	1-8	1.50-1.60	6.0-20	0.04-0.10	5.1-7.8	<2	Low-------	0.15			
Els-------------	0-12	2-8	1.60-1.80	6.0-20	0.07-0.12	6.1-8.4	<2	Low-------	0.17	5	2	.5-1
	12-60	0-8	1.50-1.60	6.0-20	0.05-0.08	6.1-8.4	<2	Low-------	0.15			
Jm--------------- Janude	0-18	5-15	1.50-1.60	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low-------	0.20	5	3	2-4
	18-42	7-20	1.50-1.60	0.6-2.0	0.17-0.19	6.6-8.4	<2	Low-------	0.20			
	42-60	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low-------	0.17			
Jn--------------- Janude	0-8	10-20	1.30-1.50	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low-------	0.28	5	5	2-4
	8-48	7-20	1.50-1.60	0.6-2.0	0.17-0.19	6.6-8.4	<2	Low-------	0.20			
	48-60	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low-------	0.17			
Kz--------------- Kezan	0-6	20-27	1.20-1.40	0.6-2.0	0.22-0.24	6.6-7.8	<2	Low-------	0.32	5	6	2-4
	6-33	20-35	1.20-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Low-------	0.32			
	33-60	20-27	1.20-1.40	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low-------	0.32			
La, Lc----------- Lamo	0-22	27-35	1.40-1.60	0.2-0.6	0.21-0.23	7.4-8.4	<2	High------	0.32	5	7	2-4
	22-60	25-35	1.30-1.50	0.2-0.6	0.18-0.22	7.4-8.4	<2	High------	0.32			
Ld--------------- Lawet	0-7	15-25	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low-------	0.28	5	4L	4-6
	7-60	22-35	1.30-1.50	0.2-2.0	0.14-0.19	7.4-9.0	<2	Moderate	0.28			
Lo--------------- Loup	0-13	8-18	1.10-1.30	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low-------	0.24	5	8	4-8
	13-60	2-7	1.50-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low-------	0.17			
Me--------------- Merrick	0-29	18-25	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.3	<2	Low-------	0.28	5	6	2-4
	29-60	20-32	1.30-1.50	0.6-2.0	0.17-0.22	6.1-7.8	<2	Low-------	0.28			
Mo, MoB, MoC----- Moody	0-8	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	1-3
	8-37	27-35	1.20-1.30	0.2-0.6	0.18-0.20	6.1-7.3	<2	Moderate	0.43			
	37-60	20-32	1.20-1.30	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	0.43			
MoC2, MoD2------- Moody	0-6	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	1-2
	6-34	27-35	1.20-1.30	0.2-0.6	0.18-0.20	6.1-7.3	<2	Moderate	0.43			
	34-60	20-32	1.20-1.30	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	0.43			
Mp--------------- Moody	0-12	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	2-4
	12-42	27-35	1.20-1.30	0.2-0.6	0.18-0.20	6.1-7.3	<2	Moderate	0.43			
	42-60	20-32	1.20-1.30	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	0.43			
MtC2*:												
Moody-----------	0-6	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	1-3
	6-31	27-35	1.20-1.30	0.2-0.6	0.18-0.20	6.1-7.3	<2	Moderate	0.43			
	31-48	20-27	1.20-1.30	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	0.43			
	48-60	8-18	1.40-1.55	2.0-6.0	0.16-0.20	6.6-8.4	<2	Low-------	0.43			
Thurman---------	0-6	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low-------	0.17	5	2	.5-1
	6-60	2-10	1.60-1.80	6.0-20	0.06-0.11	6.1-7.3	<2	Low-------	0.17			

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		Wind erodi-bility group	Organic matter
									K	T		
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
MtD2*:												
Moody-----------	0-6	27-35	1.20-1.30	0.2-0.6	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	1-3
	6-23	27-35	1.20-1.30	0.2-0.6	0.18-0.20	6.1-7.3	<2	Moderate	0.43			
	23-46	20-27	1.20-1.30	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	0.43			
	46-60	4-15	1.60-1.80	2.0-6.0	0.15-0.19	6.6-8.4	<2	Low--------	0.20			
Thurman---------	0-6	8-18	1.40-1.60	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low--------	0.17	5	3	.5-1
	6-60	2-10	1.60-1.80	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17			
Mu--------------- Muir	0-27	18-27	1.30-1.45	0.6-2.0	0.20-0.23	5.6-7.8	<2	Low--------	0.32	5	6	2-4
	27-60	18-35	1.30-1.50	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
Mx--------------- Muir	0-22	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.6-7.3	<2	Low--------	0.32	5	6	2-4
	22-42	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.6-7.3	<2	Low--------	0.32			
	42-60	0-5	1.50-1.60	6.0-20	0.06-0.08	5.6-7.3	<2	Low--------	0.15			
NoC2------------- Nora	0-6	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	1-2
	6-15	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43			
	15-60	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
NoD-------------- Nora	0-12	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	2-4
	12-25	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43			
	25-60	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
NpD2*, NpE2*:												
Nora------------	0-5	27-35	1.20-1.25	0.6-2.0	0.19-0.22	6.1-7.3	<2	Moderate	0.32	5	7	1-2
	5-25	20-35	1.25-1.35	0.6-2.0	0.17-0.20	6.1-7.8	<2	Moderate	0.43			
	25-60	18-30	1.30-1.45	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.43			
Crofton---------	0-5	20-27	1.20-1.30	0.6-2.0	0.21-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	.5-1
	5-60	15-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Nv--------------- Novina	0-17	5-15	1.70-1.90	2.0-6.0	0.13-0.18	6.1-7.3	<2	Low--------	0.24	5	3	1-2
	17-25	5-15	1.70-1.90	2.0-6.0	0.12-0.14	6.1-7.3	<2	Low--------	0.24			
	25-52	7-20	1.50-1.70	0.6-2.0	0.17-0.19	6.6-8.4	<2	Low--------	0.24			
	52-60	2-10	1.50-1.70	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17			
On--------------- O'Neill	0-12	3-12	1.60-1.80	2.0-6.0	0.10-0.15	5.1-6.5	<2	Low--------	0.20	4	3	1-2
	12-22	6-18	1.60-1.80	2.0-6.0	0.10-0.15	6.6-7.3	<2	Low--------	0.20			
	22-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-7.3	<2	Low--------	0.10			
Pd*. Pits and Dumps												
Pt--------------- Platte	0-10	10-20	1.50-1.70	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	2	4L	1-2
	10-60	0-3	1.90-2.00	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.10			
Px*:												
Platte----------	0-5	3-10	1.60-1.80	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20	2	3	1-2
	5-12	3-10	1.60-1.80	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20			
	12-60	0-3	1.50-1.70	>20	0.02-0.04	6.6-8.4	<2	Low--------	0.15			
Inavale---------	0-5	2-10	1.50-1.60	6.0-20	0.10-0.12	6.6-8.4	<2	Low--------	0.17	5	2	.5-1
	5-14	3-10	1.50-1.60	6.0-20	0.06-0.11	6.6-8.4	<2	Low--------	0.17			
	14-60	3-10	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.17			
Rw*. Riverwash												
So--------------- Shell	0-25	15-27	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.32	5	6	2-4
	25-35	20-30	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	<2	Low--------	0.32			
	35-60	20-30	1.20-1.30	0.6-2.0	0.20-0.22	6.1-7.8	<2	Low--------	0.32			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Sp---------------- Shell	0-22	17-27	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	<2	Low--------	0.32	5	6	2-4
	22-42	17-27	1.25-1.40	0.6-2.0	0.20-0.22	6.1-7.8	<2	Low--------	0.32			
	42-60	27-55	1.15-1.30	0.06-0.6	0.10-0.20	6.6-8.4	<2	High-------	0.32			
Sr---------------- Simeon	0-9	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
	9-60	2-10	1.50-1.70	6.0-20	0.05-0.10	6.1-7.8	<2	Low--------	0.15			
ThB, ThC---------- Thurman	0-14	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-2
	14-60	2-10	1.60-1.80	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17			
Tx---------------- Thurman	0-22	3-10	1.35-1.55	6.0-20.0	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-3
	22-43	3-10	1.60-1.80	6.0-20.0	0.05-0.07	6.6-7.3	<2	Low--------	0.17			
	43-60	18-35	1.25-1.60	0.2-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			
Us*. Ustorthents, level												
UtG*. Ustorthents, steep												
VaC, VaE---------- Valentine	0-11	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
	11-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
VbC*:												
Valentine--------	0-13	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
	13-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
Thurman----------	0-15	5-12	1.60-1.80	6.0-20	0.10-0.12	6.1-7.3	<2	Low--------	0.17	5	2	1-2
	15-60	2-10	1.60-1.80	6.0-20	0.06-0.11	6.1-7.3	<2	Low--------	0.17			
Wn---------------- Wann	0-9	12-25	1.40-1.60	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low--------	0.28	5	5	1-3
	9-46	3-18	1.70-1.90	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low--------	0.20			
	46-60	3-22	1.40-1.60	2.0-6.0	0.09-0.12	7.4-8.4	<2	Low--------	0.15			
Zo---------------- Zook	0-19	32-38	1.30-1.35	0.2-0.6	0.21-0.23	5.6-7.3	<2	High-------	0.28	5	7	5-7
	19-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	<2	High-------	0.28			
Zp---------------- Zook	0-15	40-44	1.35-1.40	0.06-0.2	0.11-0.13	5.6-7.3	<2	High-------	0.28	5	4	5-7
	15-60	36-45	1.30-1.45	0.06-0.2	0.11-0.13	5.6-7.8	<2	High-------	0.28			

* 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					
AcC---------------- Alcester	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Low.
Ad---------------- Alda	C	Occasional	Brief-----	Mar-Jun	2.0-3.0	Apparent	Nov-May	High-----	Moderate	Low.
Be---------------- Belfore	B	None--------	---	---	>6.0	---	---	Moderate	High-----	Low.
Bn---------------- 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.
Br*:										
Boel-------------	A	Frequent----	Brief-----	Mar-Jun	1.5-3.5	Apparent	Nov-May	Moderate	High-----	Low.
Inavale----------	A	Frequent----	Very brief	Mar-Jun	>6.0	---	---	Low------	Moderate	Low.
BsC--------------- Boelus	A	None--------	---	---	>6.0	---	---	Moderate	Moderate	Low.
Bu---------------- Butler	D	None--------	---	---	1.0-3.0	Perched	Mar-Jul	High-----	High-----	Low.
Cp---------------- Colo	B/D	Occasional	Very brief to long.	Mar-Nov	2.0-3.0	Apparent	Nov-Jul	High-----	High-----	Moderate.
CrE2, CrF--------- Crofton	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
CsC2*:										
Crofton----------	B	None--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Nora-------------	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Low.
Em---------------- Els	A	Rare--------	---	---	1.5-3.0	Apparent	Nov-May	Moderate	Moderate	Low.
Fm---------------- Fillmore	D	None--------	---	---	+.5-1.0	Perched	Mar-Jul	High-----	High-----	Low.
Fp---------------- Fillmore	D	None--------	---	---	+1-1.0	Perched	Mar-Jul	High-----	High-----	Low.
Fu*. Fluvaquents										
GeD2, GeE2, GeF--- Geary	B	None--------	---	---	>6.0	---	---	High-----	Low------	Low.
Gk---------------- Gibbon	B	Occasional	Very brief	Mar-Jun	1.5-3.0	Apparent	Nov-Jun	High-----	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					
Gm*:										
Gibbon-----------	B	Occasional	Very brief	Mar-Jul	1.5-3.0	Apparent	Nov-Jun	High-----	High-----	Low.
Gayville---------	D	Occasional	Brief-----	Mar-Oct	1.5-3.0	Apparent	Nov-Jun	High-----	High-----	Moderate.
Go---------------- Gothenburg	D	Frequent----	Brief-----	Mar-Jun	0-2.0	Apparent	Nov-Jun	Moderate	Moderate	Low.
Gr---------------- Grigston	B	Rare--------	---	---	>6.0	---	---	Moderate	Low------	Low.
Gs---------------- Grigston	B	Rare--------	---	---	4.0-6.0	Apparent	Mar-Jun	Moderate	Low------	Low.
Hb---------------- Hobbs	B	Occasional	Brief-----	Mar-Nov	>6.0	---	---	Moderate	Low------	Low.
Hf---------------- Hobbs	B	Frequent----	Brief-----	Mar-Nov	>6.0	---	---	Moderate	Low------	Low.
ImB, ImD, InB----- Inavale	A	Rare--------	---	---	>6.0	---	---	Low------	Moderate	Low.
Iw*:										
Ipage------------	A	None--------	---	---	3.0-6.0	Apparent	Nov-Jun	Moderate	Low------	Moderate.
Els--------------	A	Rare--------	---	---	1.5-3.0	Apparent	Nov-Jun	Moderate	Moderate	Low.
Jm, Jn------------ Janude	B	Rare--------	---	---	4.0-6.0	Apparent	Mar-Jun	Moderate	Moderate	Low.
Kz---------------- Kezan	D	Frequent----	Brief-----	Mar-Jul	1.0-3.0	Apparent	Nov-Jun	High-----	High-----	Low.
La---------------- Lamo	C	Occasional	Brief-----	Mar-Aug	2.0-3.0	Apparent	Nov-Jun	High-----	High-----	Low.
Lc---------------- Lamo	C	Occasional	Brief-----	Mar-Aug	0.5-1.5	Apparent	Nov-Jun	High-----	High-----	Low.
Ld---------------- Lawet	B/D	Occasional	Brief-----	Mar-Jun	1.0-2.0	Apparent	Nov-Jun	High-----	High-----	Moderate.
Lo---------------- Loup	D	Rare--------	---	---	+.5-1.0	Apparent	Nov-Jun	Moderate	High-----	Low.
Me---------------- Merrick	B	Rare--------	---	---	4.0-6.0	Apparent	Nov-May	Moderate	Low------	Low.
Mo, MoB, MoC, MoC2, MoD2, Mp--- Moody	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Low.
MtC2*, MtD2*:										
Moody------------	B	None--------	---	---	>6.0	---	---	High-----	Moderate	Low.
Thurman----------	A	None--------	---	---	>6.0	---	---	Low------	Low------	Low.
Mu---------------- Muir	B	Rare--------	---	---	>6.0	---	---	Moderate	Low------	Moderate.
Mx---------------- Muir	B	Rare--------	---	---	>6.0	---	---	Moderate	Low------	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
NoC2, NoD: Nora	B	None	---	---	>6.0	---	---	High	Moderate	Low.
NpD2*, NpE2*:										
Nora	B	None	---	---	>6.0	---	---	High	Moderate	Low.
Crofton	B	None	---	---	>6.0	---	---	Moderate	Low	Low.
Nv: Novina	B	Rare	---	---	3.0-6.0	Apparent	Mar-Jun	High	Moderate	Low.
On: O'Neill	B	None	---	---	>6.0	---	---	Moderate	Moderate	Low.
Pd*. Pits and Dumps										
Pt: Platte	B	Occasional	Brief	Mar-Oct	1.0-2.0	Apparent	Feb-Jun	Moderate	High	Moderate.
Px*:										
Platte	D	Frequent	Brief	Mar-May	1.0-2.0	Apparent	Nov-Jun	Moderate	High	Moderate.
Inavale	A	Frequent	Very brief	Jan-Jul	>6.0	---	---	Low	Moderate	Low.
Rw*. Riverwash										
So: Shell	B	Occasional	Brief	Mar-Jun	>6.0	---	---	Moderate	Low	Low.
Sp: Shell	B	Occasional	Brief	Mar-Jun	2.5-4.0	Perched	Nov-Jun	Moderate	Low	Low.
Sr: Simeon	A	None	---	---	>6.0	---	---	Low	Low	Low.
ThB, ThC: Thurman	A	None	---	---	>6.0	---	---	Low	Low	Low.
Tx: Thurman	A	None	---	---	>6.0	---	---	Low	Moderate	Low.
Us*. Ustorthents, level										
UtG*. Ustorthents, steep										
VaC, VaE: Valentine	A	None	---	---	>6.0	---	---	Low	Low	Low.
VbC*:										
Valentine	A	None	---	---	>6.0	---	---	Low	Low	Low.
Thurman	A	None	---	---	>6.0	---	---	Low	Low	Low.
Wn: Wann	B	Occasional	Brief	Mar-Nov	1.5-3.5	Apparent	Mar-Jul	High	Moderate	Low.
Zo, Zp: Zook	C/D	Occasional	Brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-May	High	High	Moderate.

* 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. LL means 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--						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
Crofton silt loam: (S81NE141-146)														
Ap----- 0 to 5	A-7-6(12)	CL	---	---	100	99	99	98	42	31	26	42	20	2.67
AC----- 5 to 13	A-7-6(12)	CL	---	---	100	99	98	97	90	30	24	42	19	2.72
C2-----21 to 40	A-6(10)	CL	---	---	---	---	100	99	92	26	19	39	16	2.70
Fillmore silt loam: (S82NE141-170)														
Ap----- 0 to 8	A-4(8)	CL	---	---	---	---	100	99	88	27	21	31	9	2.58
Bt1----13 to 23	A-7-6(23)	CH	---	---	---	100	99	98	94	56	50	61	38	2.68
BC-----35 to 47	A-7-6(17)	CL	---	---	---	100	99	98	93	46	40	49	29	2.66
C------47 to 60	A-7-6(15)	CL	---	---	---	---	100	99	92	38	34	45	25	2.68
Moody silty clay loam: (S81NE141-140)														
Ap----- 0 to 8	A-7-6(12)	CL	---	---	---	---	100	98	91	37	32	42	19	2.61
Bw2----12 to 28	A-7-6(20)	CH	---	---	---	100	99	96	90	42	39	55	33	2.68
C1-----37 to 53	A-7-6(15)	CL	---	---	---	---	100	99	90	37	33	46	24	2.69
Shell silt loam: (S82NE141-177)														
Ap----- 0 to 8	A-6(10)	CL	---	---	---	---	100	97	89	34	26	39	16	2.61
A1, A2- 8 to 25	A-7-6(13)	CL	---	---	---	---	100	97	91	37	27	46	20	2.61
C2-----35 to 60	A-6(10)	CL	---	---	---	---	100	99	91	30	23	38	16	2.65

* Locations of the sampled pedons are as follows--

Crofton silt loam: 900 feet east and 2,150 feet north of the southwest corner of sec. 8, T. 18 N., R. 2 W.

Fillmore silt loam: 200 feet north and 2,500 feet east of the southwest corner of sec. 27, T. 20 N., R. 2 W.

Moody silty clay loam: 300 feet west and 2,500 feet south of the northeast corner of sec. 20, T. 19 N., R. 2 W.

Shell silt loam: 200 feet south and 800 feet west of the northeast corner of sec. 13, T. 20 N., R. 4 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
Alcester	Fine-silty, mixed, mesic Cumulic Haplustolls
Alda	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Belfore	Fine, montmorillonitic, mesic Udic Haplustolls
Blendon	Coarse-loamy, mixed, mesic Pachic Haplustolls
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
Boelus	Sandy over loamy, mixed, mesic Udic Haplustolls
Butler	Fine, montmorillonitic, mesic Abruptic Argiaquolls
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
Crofton	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Els	Mixed, mesic Aquic Ustipsamments
Fillmore	Fine, montmorillonitic, mesic Typic Argialbolls
Gayville	Fine, montmorillonitic, mesic Leptic Natrustolls
Geary	Fine-silty, mixed, mesic Udic Argiustolls
Gibbon	Fine-silty, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Gothenburg	Mixed, mesic Typic Psammaquents
Grigston	Fine-silty, mixed, mesic Fluventic Haplustolls
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
Inavale	Sandy, mixed, mesic Typic Ustifluvents
Ipage	Mixed, mesic Aquic Ustipsamments
Janude	Coarse-loamy, mixed, mesic Cumulic Haplustolls
Kezan	Fine-silty, mixed, nonacid, mesic Mollic Fluvaquents
Lamo	Fine-silty, mixed (calcareous), mesic Cumulic Haplaquolls
Lawet	Fine-loamy, mesic Typic Calciaquolls
Loup	Sandy, mixed, mesic Typic Haplaquolls
Merrick	Fine-loamy, mixed, mesic Cumulic Haplustolls
Moody	Fine-silty, mixed, mesic Udic Haplustolls
Muir	Fine-silty, mixed, mesic Cumulic Haplustolls
Nora	Fine-silty, mixed, mesic Udic Haplustolls
Novina	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
*O'Neill	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplustolls
Platte	Sandy, mixed, mesic Mollic Fluvaquents
Shell	Fine-silty, mixed, mesic Cumulic Haplustolls
Simeon	Mixed, mesic Typic Ustipsamments
Thurman	Sandy, mixed, mesic Udorthentic Haplustolls
Valentine	Mixed, mesic Typic Ustipsamments
Wann	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls
Zook	Fine, montmorillonitic, mesic Cumulic Haplaquolls

Interpretive Groups

INTERPRETIVE GROUPS

[Dashes indicate that the soil was not assigned to the interpretive group]

Soil name and map symbol	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
AcC----------- Alcester	IIe-1	IIIe-4	Yes	Silty-----------	3
Ad----------- Alda	IIIw-4	IIIw-7	---	Subirrigated---------	2S
Be----------- Belfore	I-1	I-3	Yes	Clayey-----------	3
Bn----------- Blendon	IIs-6	IIs-8	Yes	Sandy-----------	5
Bo----------- Boel	IVw-5	IVw-11	---	Subirrigated---------	2S
Bp----------- Boel	IIIw-6	IIIw-11	---	Subirrigated---------	2S
Br-----------	VIw-5	---	---		
Boel-----------				Subirrigated---------	10
Inavale-----------				Sandy Lowland--------	10
BsC----------- Boelus	IIIe-6	IIIe-10	---	Sandy-----------	5
Bu----------- Butler	IIw-2	IIw-2	Yes**	Clayey-----------	2W
Cp----------- Colo	IIw-4	IIw-4	Yes**	Subirrigated---------	2S
CrE2----------- Crofton	IVe-8	---	---	Limy Upland---------	8
CrF----------- Crofton	VIe-8	---	---	Limy Upland---------	10
CsC2-----------	IIIe-8	IIIe-6	Yes		
Crofton-----------				Limy Upland---------	8
Nora-----------				Silty-----------	3
Em----------- Els	IVw-5	IVw-11	---	Subirrigated---------	2S
Fm----------- Fillmore	IIIw-2	IIIw-2	---	Clayey Overflow------	2W
Fp----------- Fillmore	IVw-2	---	---	---	10
Fu----------- Fluvaquents	VIIIw-7	---	---	---	10
GeD2----------- Geary	IVe-8	IVe-3	---	Silty-----------	3
GeE2----------- Geary	IVe-8	---	---	Silty-----------	3
GeF----------- Geary	VIe-1	---	---	Silty-----------	10

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
Gk---------------------------- Gibbon	IIw-4	IIw-6	Yes**	Subirrigated---------	2S
Gm---------------------------- Gibbon--------------------- Gayville--------------------	IVs-1	IIIs-6	---	 Subirrigated--------- Saline Lowland-------	 2S 9S
Go---------------------------- Gothenburg	VIIs-3	---	---	---	10
Gr---------------------------- Grigston	I-1	I-6	Yes	Silty Lowland--------	1
Gs---------------------------- Grigston	I-1	I-6	Yes	Silty Lowland--------	1
Hb---------------------------- Hobbs	IIw-3	IIw-6	Yes	Silty Overflow-------	1
Hf---------------------------- Hobbs	VIw-7	---	---	Silty Overflow-------	10
ImB--------------------------- Inavale	IVe-5	IIIe-11	---	Sandy Lowland--------	5
ImD--------------------------- Inavale	VIe-5	IVe-11	---	Sands----------------	7
InB--------------------------- Inavale	IIIe-3	IIIe-11	---	Sandy Lowland--------	5
Iw---------------------------- Ipage---------------------- Els------------------------	IVw-5	IVw-11	---	 Sandy Lowland-------- Subirrigated---------	 5 2S
Jm---------------------------- Janude	IIe-3	IIe-8	Yes	Sandy Lowland--------	1
Jn---------------------------- Janude	I-1	I-6	Yes	Silty Lowland--------	1
Kz---------------------------- Kezan	IVw-4	---	---	Subirrigated---------	2W
La---------------------------- Lamo	IIw-4	IIw-3	Yes**	Subirrigated---------	2S
Lc---------------------------- Lamo	Vw-7	---	---	Wetland--------------	10
Ld---------------------------- Lawet	IVw-4	---	---	Subirrigated---------	2W
Lo---------------------------- Loup	Vw-7	---	---	Wetland--------------	10
Me---------------------------- Merrick	I-1	I-6	Yes	Subirrigated---------	1
Mo---------------------------- Moody	I-1	I-3	Yes	Silty----------------	3

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
MoB: Moody	IIe-1	IIe-3	Yes	Silty	3
MoC: Moody	IIe-1	IIIe-3	Yes	Silty	3
MoC2: Moody	IIIe-8	IIIe-3	Yes	Silty	3
MoD2: Moody	IIIe-8	IVe-3	---	Silty	3
Mp: Moody	I-1	I-3	Yes	Silty	3
MtC2:	IIIe-8	IIIe-3	---		
Moody				Silty	3
Thurman				Sandy	5
MtD2:	IVe-8	IVe-3	---		
Moody				Silty	3
Thurman				Sandy	7
Mu: Muir	I-1	I-4	Yes	Silty Lowland	1
Mx: Muir	I-1	I-4	Yes	Silty Lowland	3
NoC2: Nora	IIIe-8	IIIe-3	Yes	Silty	3
NoD: Nora	IIIe-1	IVe-3	---	Silty	3
NpD2:	IIIe-8	IVe-3	---		
Nora				Silty	3
Crofton				Limy Upland	8
NpE2:	IVe-8	---	---		
Nora				Silty	3
Crofton				Limy Upland	8
Nv: Novina	IIw-6	IIw-8	Yes	Subirrigated	2S
On: O'Neill	IIIe-3	IIIe-9	---	Sandy	6G
Pd: Pits and Dumps	VIIIs-8	---	---	---	10
Pt: Platte	IVw-4	IVw-13	---	Subirrigated	2S
Px:	VIw-7	---	---		
Platte				Subirrigated	10
Inavale				Sandy Lowland	10
Rw: Riverwash	VIIIw-8	---	---	---	10

See footnotes at end of table.

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability* N	Land capability* I	Prime farmland*	Range site	Windbreak suitability group
So------------------------- Shell	IIw-3	IIw-6	Yes	Silty Lowland--------	1
Sp------------------------- Shell	IIw-4	IIw-6	Yes	Silty Lowland--------	1
Sr------------------------- Simeon	VIe-4	IVe-14	---	Sandy----------------	7
ThB------------------------ Thurman	IIIe-5	IIIe-11	---	Sandy----------------	5
ThC------------------------ Thurman	IVe-5	IVe-11	---	Sandy----------------	5
Tx------------------------- Thurman	IIIe-5	IIIe-10	---	Sandy----------------	5
Us. Ustorthents, level					
UtG------------------------ Ustorthents, steep	VIIs-8	---	---	---	10
VaC------------------------ Valentine	VIe-5	IVe-12	---	Sands----------------	7
VaE------------------------ Valentine	VIe-5	---	---	Sands----------------	7
VbC------------------------	IVe-5	IVe-11	---		
Valentine------------------				Sands----------------	7
Thurman--------------------				Sandy----------------	7
Wn------------------------- Wann	IIw-4	IIw-8	Yes	Subirrigated---------	2S
Zo------------------------- Zook	IIw-4	IIw-1	Yes**	Clayey Overflow------	2W
Zp------------------------- Zook	IIIw-1	IIIw-1	Yes**	Clayey Overflow------	2W

* A soil complex is treated as a single management unit in the land capability and prime farmland columns. The N column is for nonirrigated soils. The I column is for irrigated soils.
** Where drained.

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