United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Missouri Department of Natural Resources, Missouri Agricultural Experiment Station, and Osage County Soil and Water Conservation District

Soil Survey of Osage County, Missouri

How to Use This Soil Survey

General Soil Map

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

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

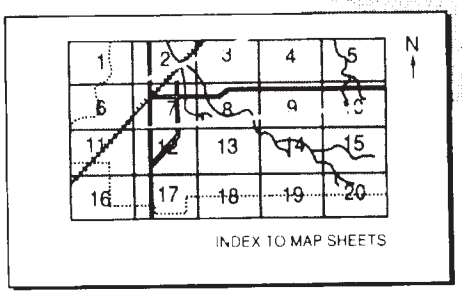
Detailed Soil Maps

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

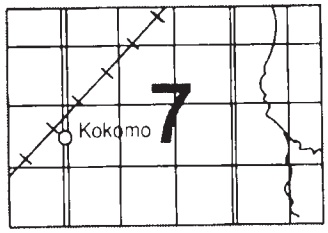
To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

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

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



INDEX TO MAP SHEETS



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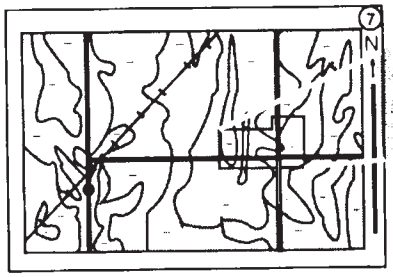

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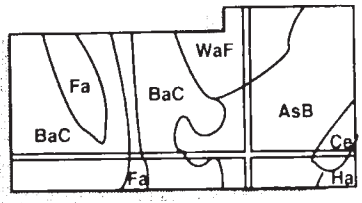

AREA OF INTEREST

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1994. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the Missouri Agricultural Experiment Station. The Missouri Department of Natural Resources provided two soil scientists to assist with the fieldwork. The survey is part of the technical assistance furnished to the Osage County Soil and Water Conservation District.

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.

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Cover: The Osage River flows adjacent to an area of the Rueter-Plato-Gravois association.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Issued 2002

Foreword

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

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

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

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

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Soil Survey of
Osage County, Missouri

By Keith O. Davis, Natural Resources Conservation Service

Fieldwork by Keith O. Davis and Melvin Simmons, Natural Resources Conservation Service; and Wyn A. Kelley and Bradley B. Berhorst, Missouri Department of Natural Resources

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Missouri Department of Natural Resources, the Missouri Agricultural Experiment Station, and the Osage County Soil and Water Conservation District

OSAGE COUNTY is in the east-central part of Missouri, on the northern edge of the Ozark region (fig. 1). It is bordered on the north by the Missouri River, on the east by Gasconade County, on the south by Maries County, and on the west by the Osage River and Cole and Miller Counties. The county has an area of 387,569 acres, or about 605 square miles.

Figure 1.—Location of Osage County in Missouri.

General Nature of the County

This section provides general information about the county. It describes the climate; water supply; physiography, relief, and drainage; and history and development.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Vienna in the period 1962 to 1990. 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 32 degrees F and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Vienna on December 23, 1989, is -27 degrees. In summer, the average temperature is 75 degrees and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred at Vienna on July 31, 1980, is 110 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 41.76 inches. Of this, about 23 inches, or 56 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 5.5 inches at Vienna on December 3, 1982. Thunderstorms occur on about 52 days each year, and most occur from May to August.

The average seasonal snowfall is 18.6 inches. The greatest snow depth at any one time during the period of record was 15 inches. On an average of 21 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year. The heaviest 1-day snowfall on record was 12.5 inches on March 6, 1989.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 66 percent of the time possible in summer and 49 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in March.

Water Supply

Many of the upland soils in Osage County are suitable for the construction of ponds and small reservoirs. Most of the livestock in the county get water from these sources, as well as from small creeks and scattered springs. Most municipalities and rural residences get water from deep wells. The quality of surface water and ground water is variable, and this survey will be an important tool in the maintenance and improvement of overall water quality. The Missouri, Osage, Gasconade, and Maries Rivers are the largest streams of consequence in the county.

Physiography, Relief, and Drainage

The landscape pattern of Osage County is highly diverse. To the north lies the Missouri River flood plain. The Osage River borders the west side, while the Gasconade and Maries Rivers dissect the southeast and southwest quadrants respectively. A winding ridge system extending from the northeast part of the county, southward through the town of Linn, and past the town of Freeburg marks the drainage divide in the county. Tributaries east of the divide flow to the Gasconade River, while drainage to the west flows toward the Osage River. Both rivers discharge into the Missouri River. The dominant landscape configuration between these rivers consists of moderately sloping to steep uplands dissected by small stream flood plains.

In the central to north-central and southeast part of the county, broad plateaus occur on crests of the major divides. The River Hills consist of loess-covered uplands in a band approximately three miles wide. They are bounded on the north by the Missouri River flood plains. The southern boundary of these hills is much less distinct due to the gradual decrease in thickness of the loess with respect to the distance from the river. Throughout the county, loess thickness is greater on north- and east-facing slopes than on other aspects.

The major flood plains in the county are along the Missouri, Osage, and Gasconade Rivers and their tributaries. Loamy, silty, and clayey alluvium was deposited along these rivers from periodic overflow. Gravelly basal deposits underlie alluvial soils along the smaller streams.

Several losing streams occur where they are underlain by the karst portions of the Gasconade geological formation. This formation, where exposed, has numerous small caves, springs, and two natural bridges.

History and Development

Little is known about the early inhabitants of Osage County other than several mound sites remaining that show evidence of Archaic and Woodland Indian cultures dating back as far as 500 B.C. In more recent history, Indians inhabited Osage County but no tribes headquartered in the county. The Osage, Shawnee, and Delaware Indians were the major tribes that passed through the county.

Osage County was part of the Louisiana Purchase of 1803 *(4)*. In 1810, the land east of Osage River was designated as the Saint Louis district. In 1812, the name was changed to Saint Louis County. In 1841, Osage County was created by an act proposed by Andrew Alexander who became the first state representative for the county.

The first settler in the Linn area was John M. Laughlin in 1835. The town of Linn, presently the largest settlement in the county, became the county seat in 1842.

Osage County has always been dependent primarily on agriculture for its economic base. Soybeans were the largest grain crop with 8,700 acres planted in 1994. In the same year, corn was grown on 7,900 acres and wheat on 2,600 acres. Turkey farming is another important agricultural enterprise in the county. Though Osage County currently has a few small industries associated with the larger towns and some tourism, most commercial strength has come from the natural resources.

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 from which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

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

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

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

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

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

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

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed

properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. In the detailed soil map units, these latter soils are called inclusions or minor components. In the general soil map units, they are called soils of minor extent.

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

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

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit 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 a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The descriptions, names, and delineations of the soils on the general soil map of this survey do not fully agree with those in the surveys of adjacent counties published at a different date. Differences may be the result of additional soil data, variations in the intensity of mapping, and correlation decisions that reflect local conditions.

Soil Descriptions

1. Wrengart-Swiss-Gatewood Association

Extent of the association:
5 percent of the survey area

Composition:
Wrengart and similar soils—38 percent
Swiss and similar soils—32 percent
Gatewood and similar soils—11 percent
Minor soils—19 percent (Gladden, Hartville, and Marion)

Landscape (fig. 2)***:***
Wrengart—narrow ridgetops and north- and east-facing side slopes
Swiss—dissected side slopes and undulating ridgetops
Gatewood—lower side slopes

Parent materials:
Loess and residuum

Slope range:
2 to 35 percent

Slope configuration:
Convex and complex

2. Wrengart-Gatewood Association

Extent of the association:
25 percent of the survey area

Composition:
Wrengart and similar soils—40 percent
Gatewood and similar soils—34 percent
Minor soils—26 percent (Freeburg, Gladden, Hartville, Jamesfin, and Moko)

Landscape (fig. 3)***:***
Wrengart—narrow ridgetops and north- and east-facing side slopes
Gatewood—south- and west-facing side slopes

Parent materials:
Loess and residuum

Slope range:
2 to 35 percent

Slope configuration:
Convex and complex

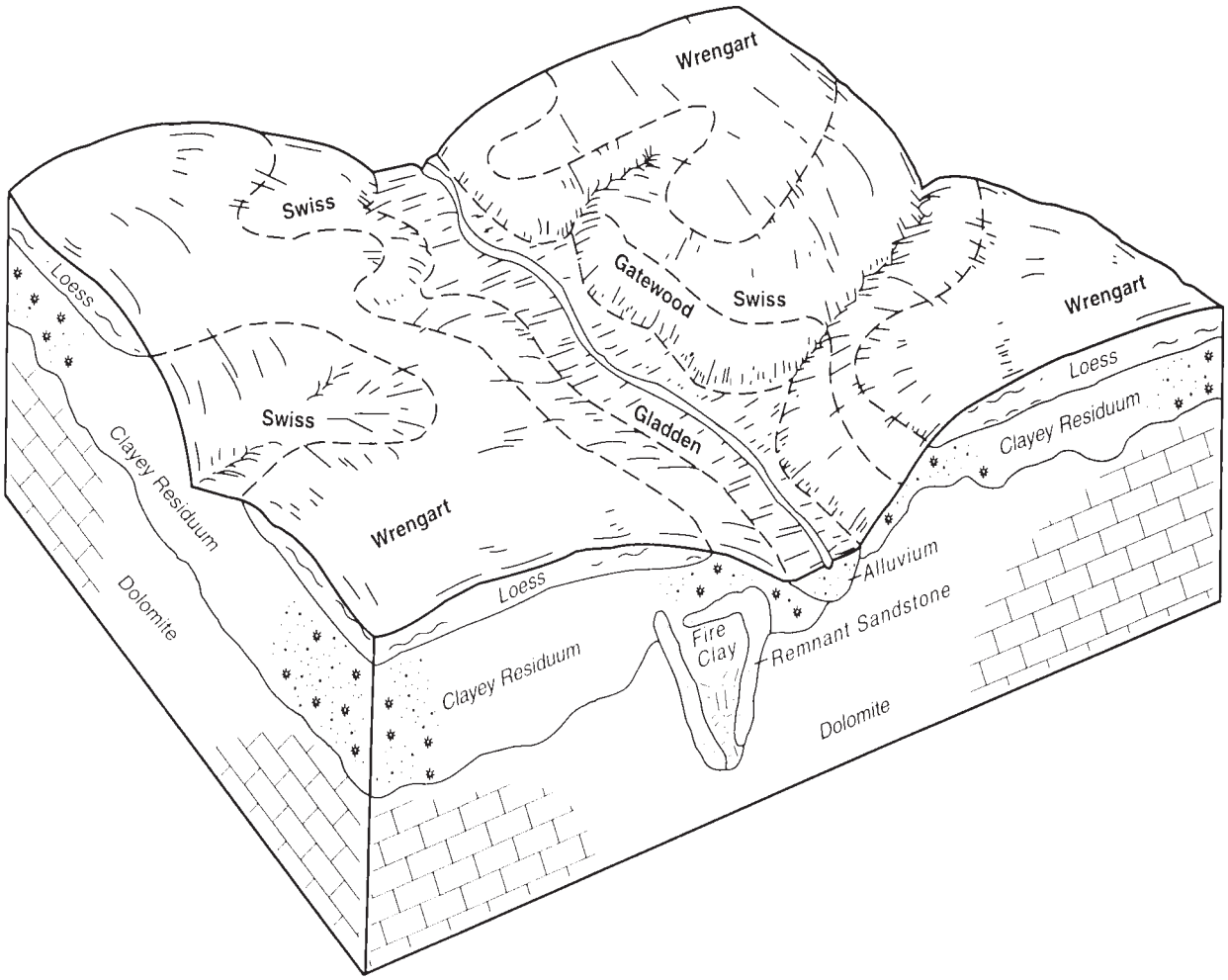

Figure 2.—Typical pattern of soils and parent material in the Wrengart-Swiss-Gatewood association.

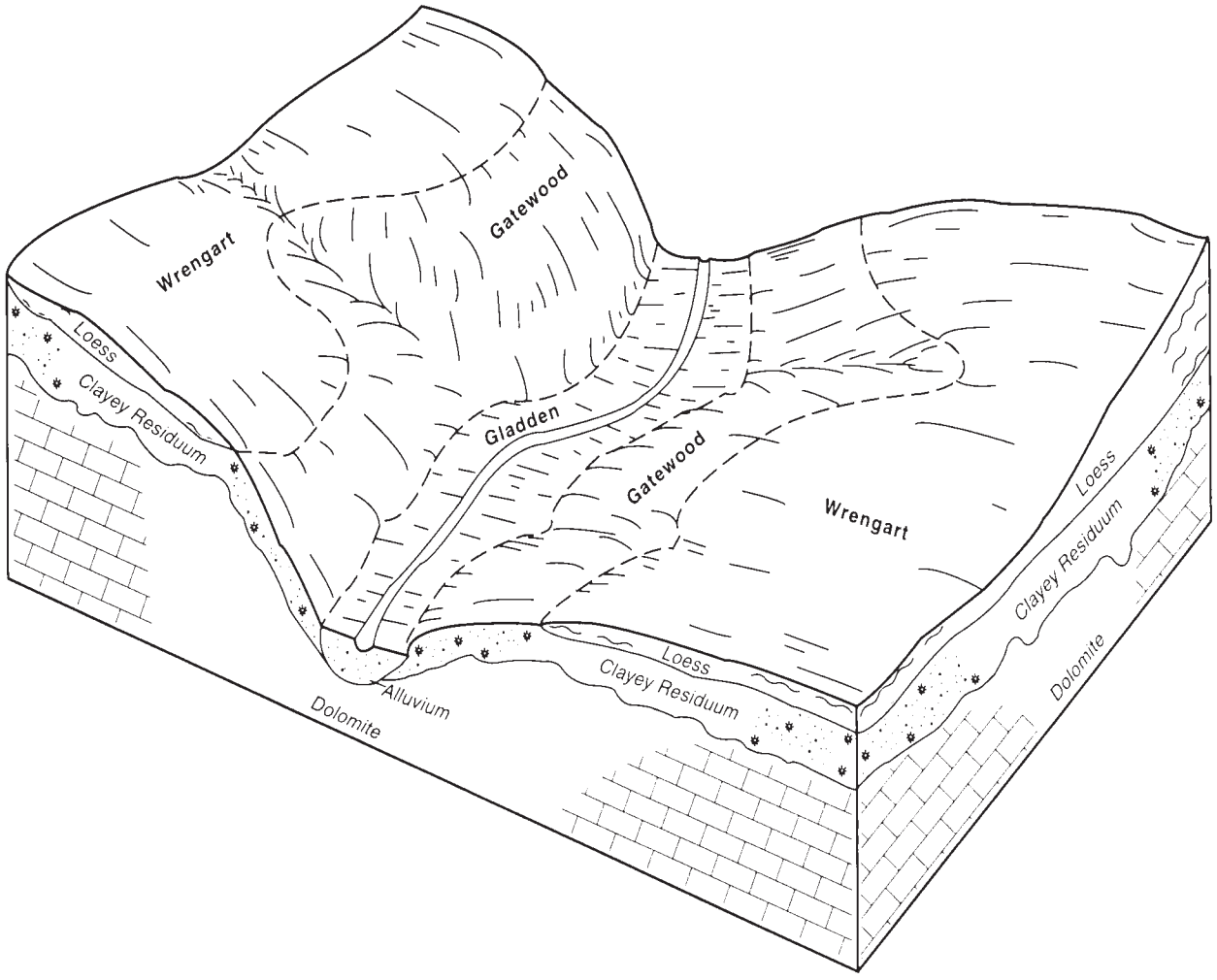

Figure 3.—Typical pattern of soils and parent material in the Wrengart-Gatewood association.

3. Rueter-Plato-Gravois Association

Extent of the association:
16 percent of the survey area

Composition:
Rueter and similar soils—44 percent
Plato and similar soils—16 percent
Gravois and similar soils—20 percent
Minor soils—20 percent (Alred, Gladden, Gatewood, and Jamesfin)

Landscape (fig. 4)***:***
Rueter—side slopes
Plato—ridgetops and side slopes
Gravois—side slopes

Parent materials:
Loess and residuum

Slope range:
1 to 35 percent

Slope configuration:
Convex and complex

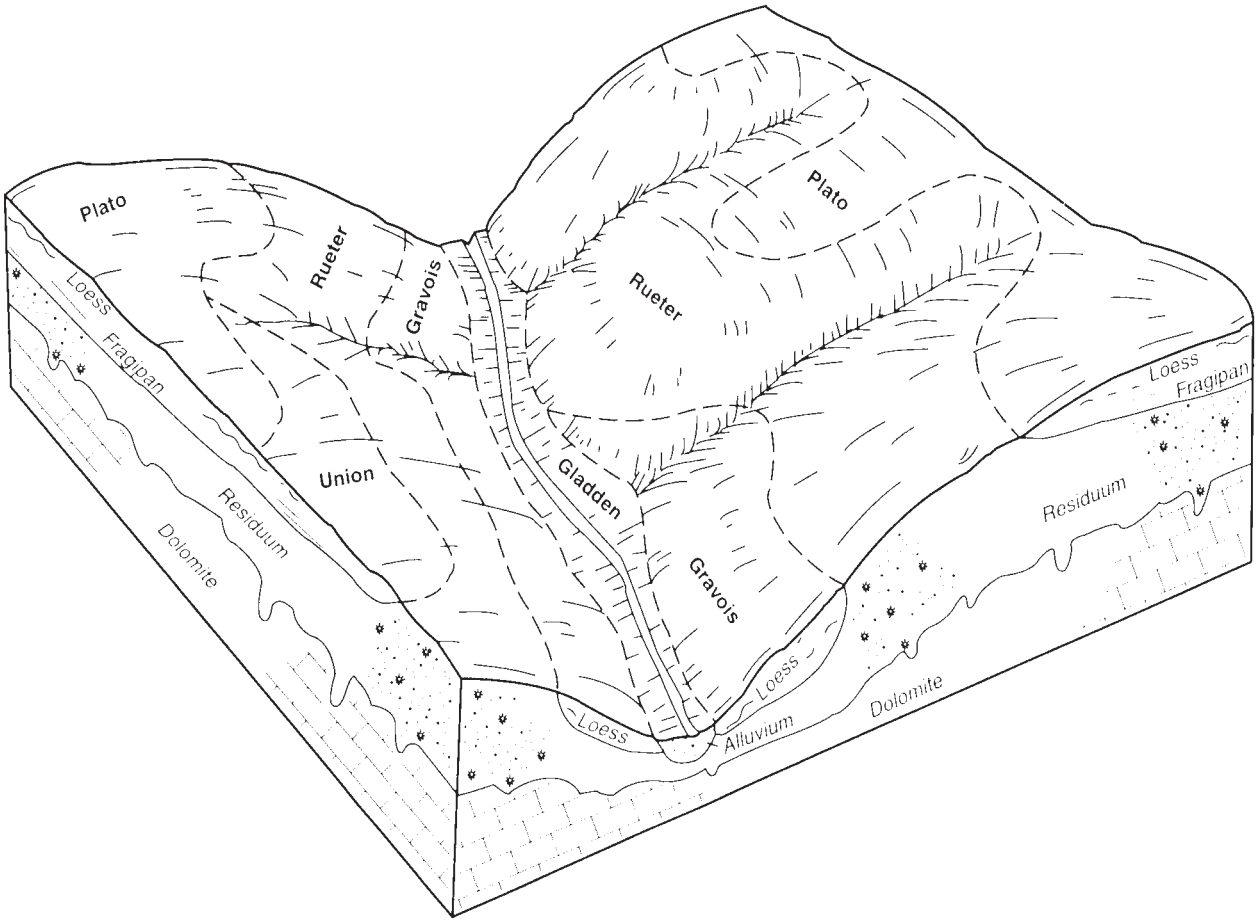

Figure 4.—Typical pattern of soils and parent material in the Rueter-Plato-Gravois association.

4. Swiss-Plato-Union Association

Extent of the association:
4 percent of the survey area

Composition:
Swiss and similar soils—40 percent
Plato and similar soils—23 percent
Union and similar soils—13 percent
Minor soils—24 percent (Gatewood, Mariosa, and Marion)

Landscape (fig. 5)***:***
Swiss—undulating ridgetops and dissected side slopes
Plato—ridgetops and side slopes
Union—ridgetops

Parent materials:
Loess and residuum

Slope range:
1 to 15 percent

Slope configuration:
Convex and complex

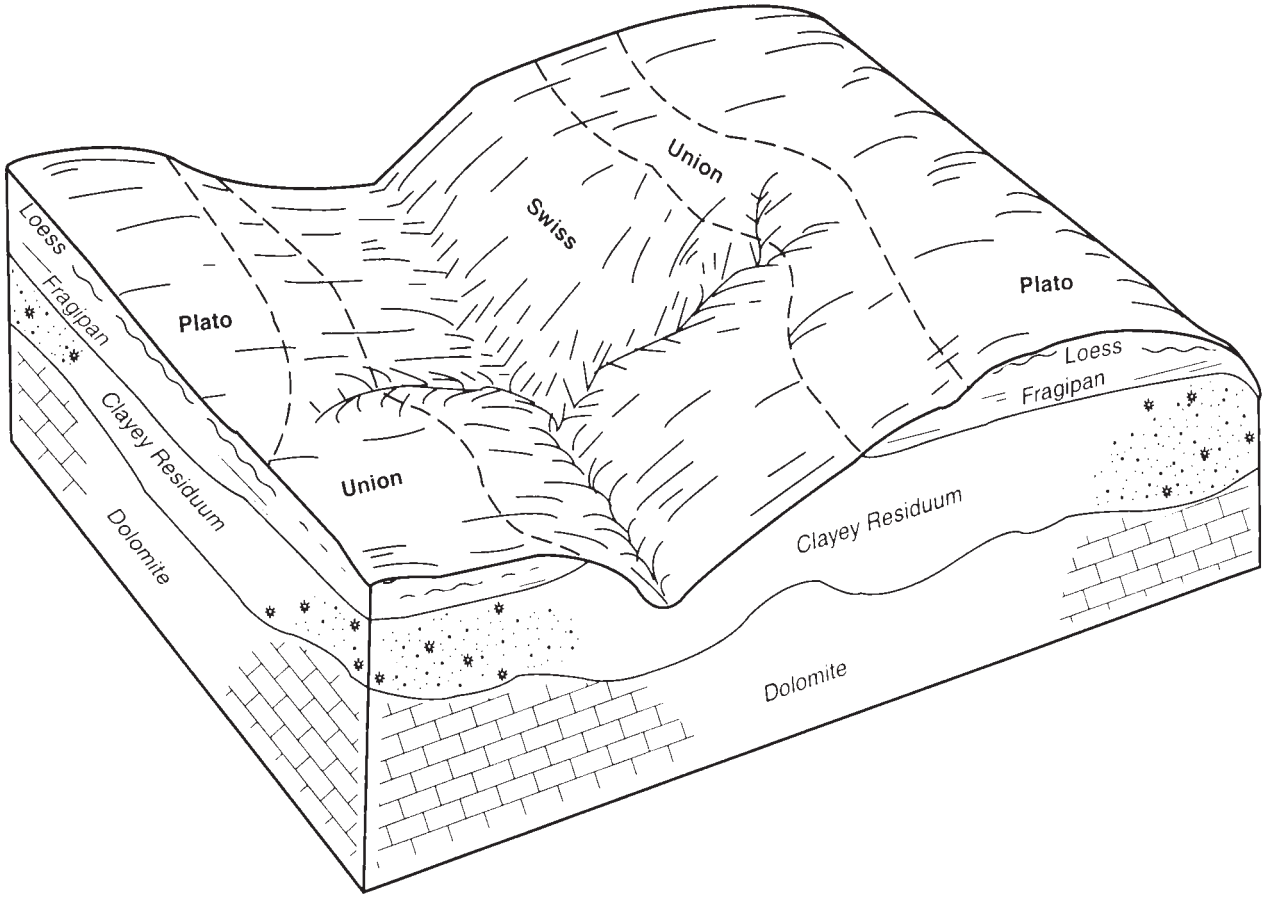

Figure 5.—Typical pattern of soils and parent material in the Swiss-Plato-Union association.

5. Jamesfin-Racoon-Kaintuck Association

Extent of the association:
6 percent of the survey area

Composition:
Jamesfin and similar soils—48 percent
Racoon and similar soils—15 percent
Kaintuck and similar soils—12 percent
Minor soils—25 percent (Freeburg and Tanglenook)

Landscape (fig. 6)***:***
Jamesfin—low stream flood plains
Racoon—high flood plains
Kaintuck—low stream flood plains

Parent materials:
Alluvium

Slope range:
0 to 3 percent

Slope configuration:
Linear and simple

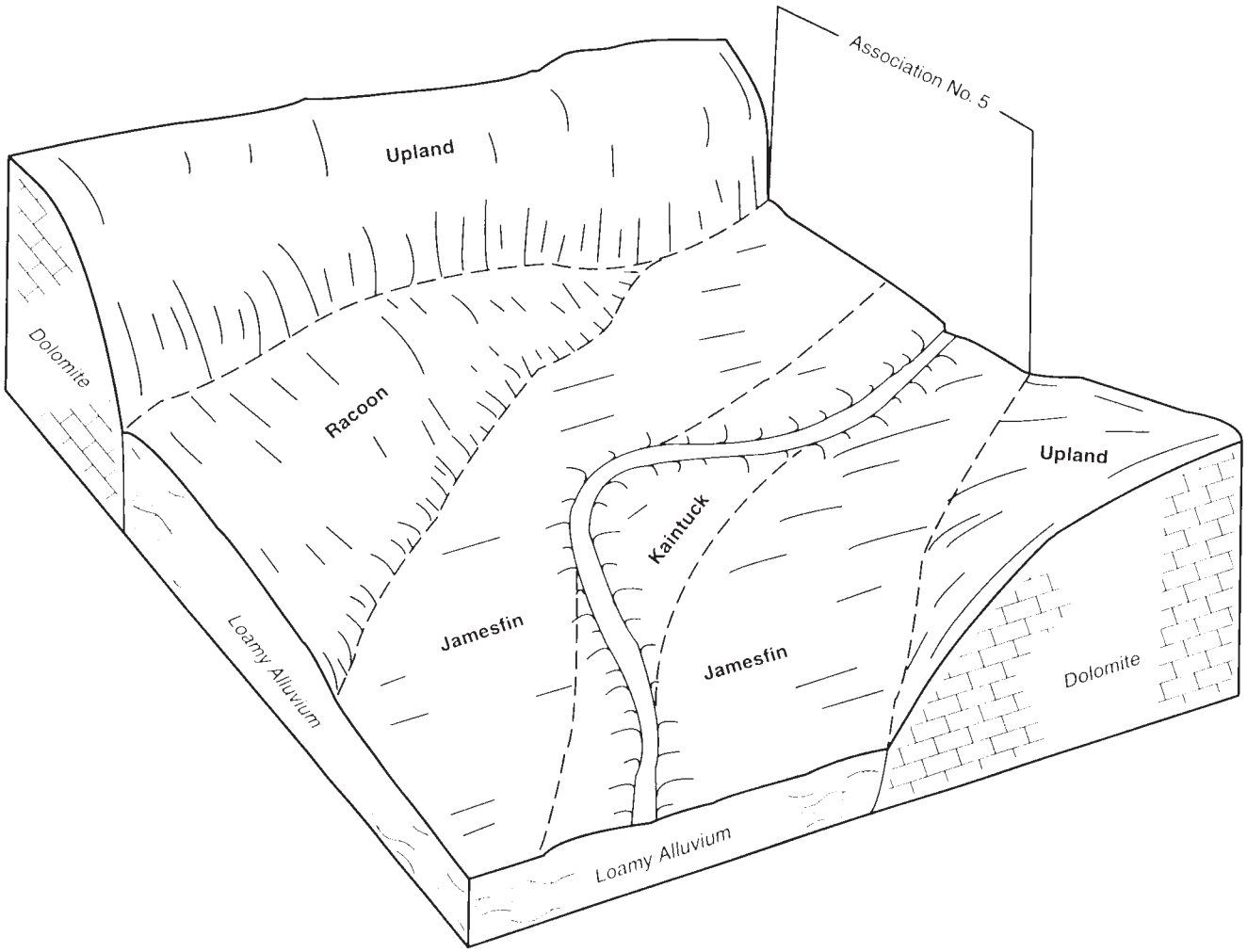

Figure 6.—Typical pattern of soils and parent material in the Jamesfin-Racoon-Kaintuck association.

6. Haynie-Leta-Blake Association

Extent of the association:
4 percent of the survey area

Composition:
Haynie and similar soils—30 percent
Leta and similar soils—22 percent
Blake and similar soils—18 percent
Minor soils—30 percent (Moville, Sarpy, and Waldron)

Landscape (fig. 7)***:***
Haynie—elevated areas of the Missouri River flood plain
Leta—depressional areas of the Missouri River flood plain
Blake—unprotected areas of the Missouri River flood plain

Parent materials:
Alluvium

Slope range:
0 to 2 percent

Slope configuration:
Linear and simple

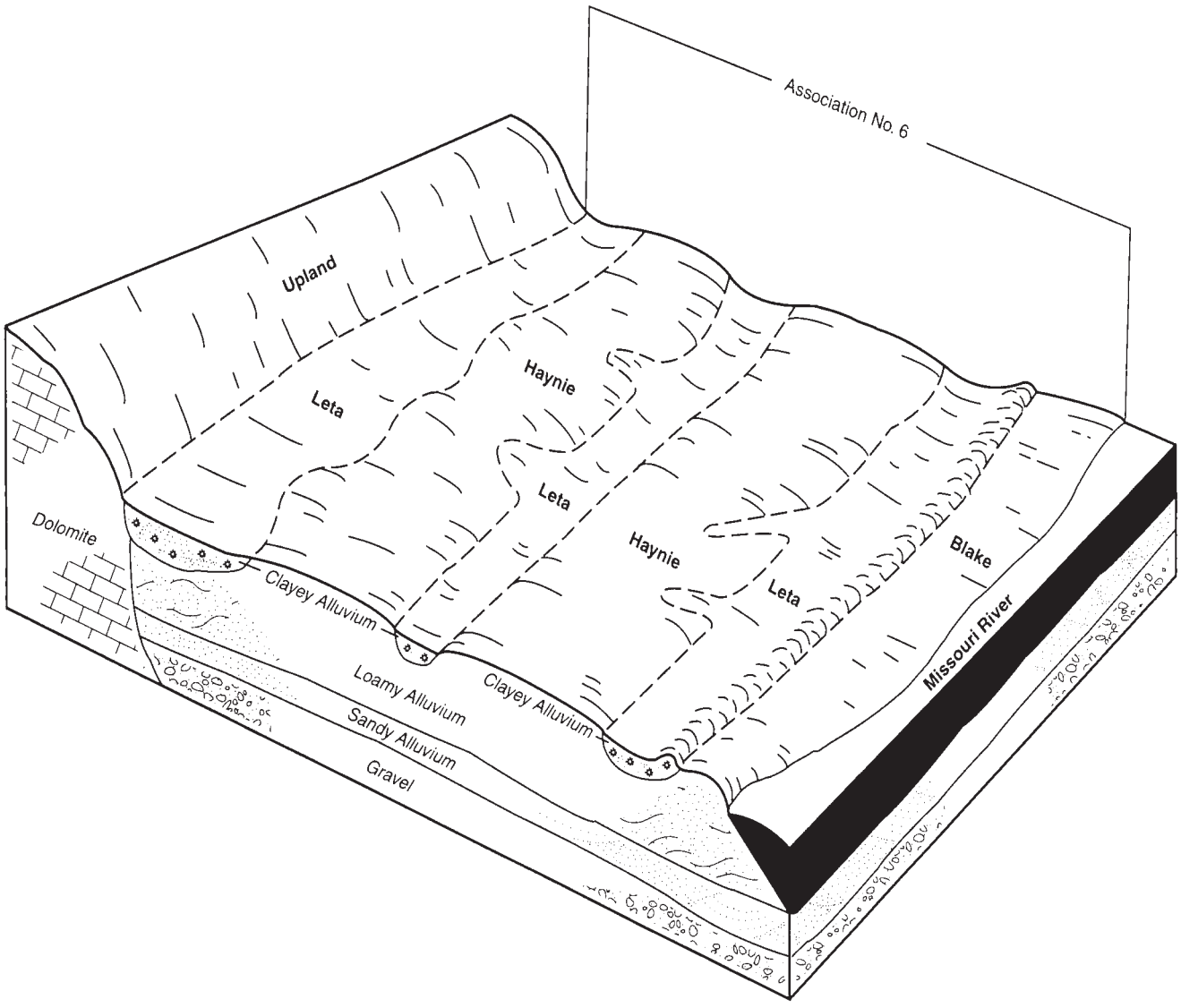

Figure 7.—Typical pattern of soils and parent material in the Haynie-Leta-Blake association.

7. Menfro-Gatewood Association

Extent of the association:
10 percent of the survey area

Composition:
Menfro and similar soils—50 percent
Gatewood and similar soils—28 percent
Minor soils—22 percent (Freeburg, Gladden, Hartville, Jamesfin, and Moko)

Landscape (fig. 8)***:***
Menfro—ridgetops and side slopes
Gatewood—south- and west-facing side slopes

Parent materials:
Loess and residuum

Slope range:
3 to 35 percent

Slope configuration:
Convex and complex

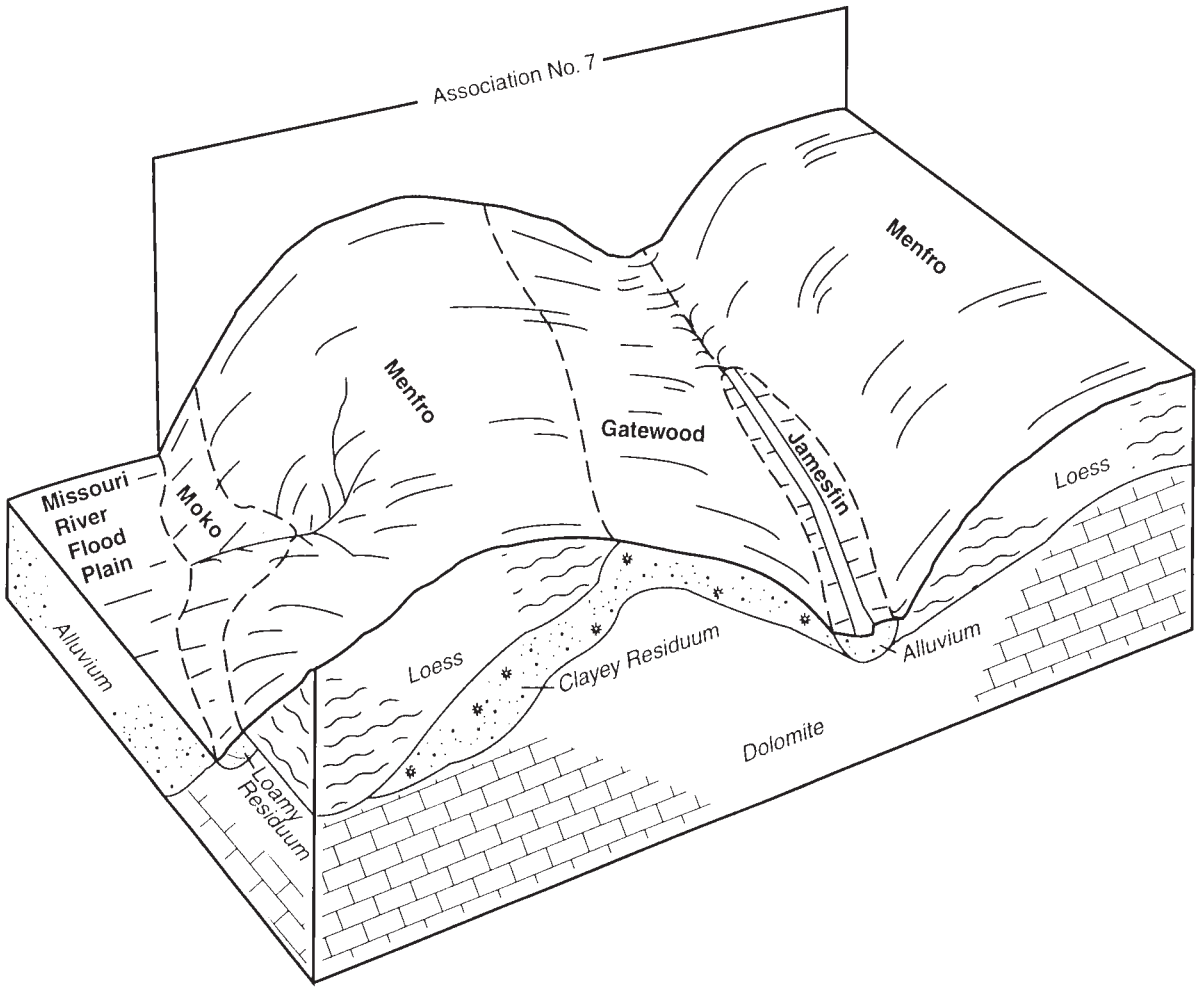

Figure 8.—Typical pattern of soils and parent material in the Menfro-Gatewood association.

8. Gatewood-Gravois Association

Extent of the association:
30 percent of the survey area

Composition:
Gatewood and similar soils—41 percent
Gravois and similar soils—27 percent
Minor soils—32 percent (Gladden, Jamesfin, Moko, and Plato)

Landscape (fig. 9)***:***
Gatewood—side slopes
Gravois—side slopes

Parent materials:
Loess and residuum

Slope range:
3 to 35 percent

Slope configuration:
Convex and complex

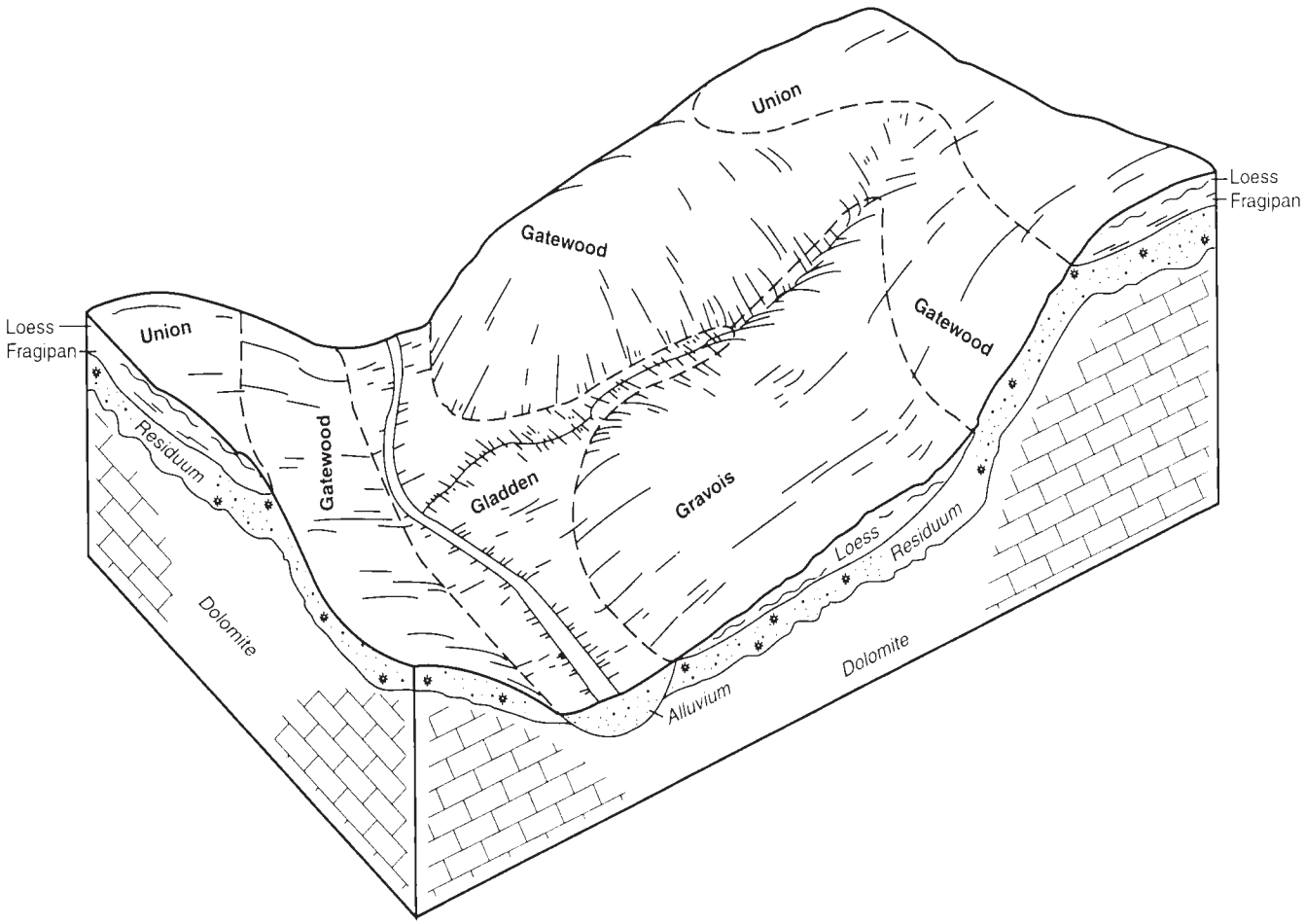

Figure 9.—Typical pattern of soils and parent material in the Gatewood-Gravois association.

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 the heading "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, Plato silt loam, 1 to 3 percent slopes, is a phase of the Plato series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Wrengart-Gatewood complex, 14 to 35 percent slopes, is an example.

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

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

The descriptions, names, and delineations of the soils identified on the detailed soil maps of this survey do not fully agree with those in the surveys of adjacent counties published at a different date. Differences are the result of additional soil data, variations in the intensity of mapping, and correlation decisions that reflect local conditions. In some areas, combining small acreages of similar soils that respond to use and management in much the same way was more practical than mapping these soils separately.

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

15002—McGirk silt loam, 1 to 3 percent slopes

Setting

Landform: Hillside
Position on the landform: Toeslope
Parent material: Colluvium over clayey alluvium

Composition

McGirk and similar soils—85 percent
Minor components—15 percent
Deible
Hartville

Typical Profile

Ap—0 to 8 inches; silt loam
Btg1—8 to 15 inches; silty clay loam
Btg2—15 to 45 inches; silty clay
Btg3—45 to 80 inches; silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 6 to 24 inches

60001—Menfro silt loam, 5 to 9 percent slopes

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Loess

Composition

Menfro and similar soils—90 percent
Minor components—10 percent
Menfro silt loam, 2 to 5 percent slopes
Menfro silt loam, 9 to 14 percent slopes
Wrengart

Typical Profile

Ap—0 to 6 inches; silt loam
Bt1—6 to 11 inches; silt loam
Bt2—11 to 34 inches; silty clay loam
Bt3—34 to 60 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: None

60002—Menfro silt loam, footslopes, 5 to 9 percent slopes

Setting

Landform: Hillside
Position on the landform: Footslope
Parent material: Loess

Composition

Menfro and similar soils—90 percent
Minor components—10 percent
Freeburg
Menfro silt loam, 2 to 5 percent slopes
Menfro silt loam, 9 to 14 percent slopes, eroded
Wrengart

Typical Profile

Ap—0 to 6 inches; silt loam
Bt1—6 to 11 inches; silt loam
Bt2—11 to 34 inches; silty clay loam
Bt3—34 to 60 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: None

60003—Menfro silt loam, 9 to 14 percent slopes, eroded

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess

Composition

Menfro and similar soils—90 percent
Minor components—10 percent
Menfro silty clay loam, severely eroded
Menfro silt loam, 5 to 9 percent slopes
Menfro silt loam, 14 to 20 percent slopes, eroded
Useful
Wrengart

Typical Profile

Ap—0 to 5 inches; silt loam
Bt1—5 to 28 inches; silty clay loam
Bt2—28 to 63 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Low (0.5 to 1 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: None

60004—Menfro silt loam, 14 to 20 percent slopes, eroded

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess

Composition

Menfro and similar soils—90 percent
Minor components—10 percent
Gatewood
Menfro silt loam, 20 to 35 percent slopes
Useful
Wrengart

Typical Profile

Ap—0 to 5 inches; silt loam
Bt1—5 to 28 inches; silty clay loam
Bt2—28 to 63 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Low (0.5 to 1 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: None

60005—Menfro silt loam, 20 to 35 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess

Composition

Menfro and similar soils—90 percent
Minor components—10 percent
Gatewood
Menfro silty clay loam, 20 to 35 percent slopes, severely eroded
Menfro silt loam, 35 to 50 percent slopes
Useful

Typical Profile

A—0 to 4 inches; silt loam
E—4 to 16 inches; silt loam
Bt1—16 to 29 inches; silty clay loam
Bt2—29 to 62 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: None

60006—Marion silt loam, 2 to 5 percent slopes

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Loess

Composition

Marion and similar soils—90 percent
Minor components—10 percent
Mariosa
Wrengart

Typical Profile

Ap—0 to 6 inches; silt loam
E—6 to 10 inches; silt loam
Bt—10 to 39 inches; silty clay and silty clay loam
2Btg—39 to 56 inches; silt loam
3Btg—56 to 65 inches; silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 12 to 24 inches

60007—Menfro-Gatewood complex, 20 to 50 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Menfro—loess; Gatewood—clayey residuum

Composition

Menfro and similar soils—55 percent
Gatewood and similar soils—40 percent
Minor components—5 percent
Gullied areas
Moko
Wrengart

Typical Profile

Menfro

A—0 to 4 inches; silt loam
E—4 to 16 inches; silt loam
Bt1—16 to 29 inches; silty clay loam
Bt2—29 to 62 inches; silt loam

Gatewood

A—0 to 2 inches; very gravelly silt loam
E—2 to 10 inches; very gravelly silt loam
2Bt—10 to 28 inches; clay
2R—28 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Menfro—very deep (more than 60 inches); Gatewood—moderately deep (20 to 40 inches)
Drainage class: Menfro—well drained, Gatewood—moderately well drained
Permeability: Menfro—moderate (0.6 inch-2.0 inches/hour); Gatewood—slow (0.06-0.2 inch/hour)
Available water capacity: Menfro—very high (more than 12 inches); Gatewood—low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Menfro—moderate (3 to 6 percent); Gatewood—high (6 to 9 percent)
Flooding: None
Water table: Menfro—none; Gatewood—18 to 36 inches

64000—Racoon silt loam, 0 to 3 percent slopes, rarely flooded

Setting

Landform: High flood plain
Position on the landform: High flood plain
Parent material: Fine-silty alluvium

Composition

Racoon and similar soils—90 percent
Minor components—10 percent
Freeburg
Racoon, long duration flooding
Tanglenook

Typical Profile

Ap—0 to 6 inches; silt loam
Eg—6 to 26 inches; silt loam
Btg—26 to 60 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: Rare (1 to 5 percent chance in any year)
Water table: At surface

64001—Freeburg silt loam, 0 to 3 percent slopes, rarely flooded

Setting

Landform: High flood plain
Position on the landform: High flood plain
Parent material: Fine-silty alluvium

Composition

Freeburg and similar soils—95 percent
Minor components—5 percent
Freeburg, long duration flooding
Jemerson
Racoon

Typical Profile

Ap—0 to 9 inches; silt loam
B/A—9 to 13 inches; silt loam
Bt—13 to 52 inches; silt loam and silty clay loam
2BCg—52 to 80 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: Rare (1 to 5 percent chance in any year)
Water table: 12 to 30 inches

64002—Freeburg silt loam, 1 to 3 percent slopes

Setting

Landform: Hillside
Position on the landform: Footslope
Parent material: Fine-silty alluvium

Composition

Freeburg and similar soils—90 percent
Minor components—10 percent
Hartville
Racoon
Wrengart

Typical Profile

Ap—0 to 7 inches; silt loam
Bt—7 to 60 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: 12 to 30 inches

64003—Freeburg silt loam, 3 to 8 percent slopes

Setting

Landform: Hillside
Position on the landform: Footslope
Parent material: Fine-silty alluvium

Composition

Freeburg and similar soils—90 percent
Minor components—10 percent
Hartville
Wrengart

Typical Profile

Ap—0 to 7 inches; silt loam
Bt—7 to 60 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: 12 to 30 inches

66003—Jemerson silt loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: High flood plain
Position on the landform: High flood plain
Parent material: Fine-silty alluvium

Composition

Jemerson and similar soils—85 percent
Minor components—15 percent
Freeburg
Jemerson, occasionally flooded

Typical Profile

Ap—0 to 9 inches; silt loam
Bt—9 to 50 inches; silt loam
2C—50 to 60 inches; gravelly loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)

Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: Rare (1 to 5 percent chance in any year)
Water table: 42 to 60 inches

66004—Dockery silt loam, 0 to 2 percent slopes, frequently flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Fine-silty alluvium

Composition

Dockery and similar soils—85 percent
Minor components—15 percent
Dockery, occasionally flooded
Dockery, ponded
Jamesfin
Kaintuck

Typical Profile

Ap—0 to 8 inches; silt loam
C—8 to 65 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: Frequent (more than a 50 percent chance in any year)
Water table: 18 to 30 inches

66005—Deible silt loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: High flood plain
Position on the landform: High flood plain
Parent material: Clayey alluvium

Composition

Deible and similar soils—95 percent
Minor components—5 percent
Deible, long duration flooding
Deible, occasionally flooded
Hartville

Typical Profile

Ap—0 to 10 inches; silt loam
E—10 to 15 inches; silt loam
Btg1—15 to 37 inches; silty clay
2Btg2—37 to 80 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Rare (1 to 5 percent chance in any year)
Water table: 0 to 12 inches

66006—Waldron silty clay loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plain
Position on the landform: Concave areas
Parent material: Clayey alluvium

Composition

Waldron and similar soils—90 percent
Minor components—10 percent
Leta
Waldron loam
Waldron silty clay
Waldron, frequently flooded
Waldron, ponded

Typical Profile

Ap—0 to 11 inches; silty clay loam
Cg—11 to 60 inches; stratified silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Occasional (5 to 50 percent chance in any year)
Water table: 12 to 36 inches

66007—Leta silty clay, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plain
Position on the landform: Concave areas
Parent material: Clayey alluvium over loamy alluvium

Composition

Leta and similar soils—90 percent
Minor components—10 percent
Haynie
Leta loam
Leta silty clay loam
Leta sandy substratum
Leta, frequently flooded
Waldron

Typical Profile

Ap—0 to 10 inches; silty clay
Bg—10 to 24 inches; silty clay loam
2C—24 to 60 inches; stratified silt loam, very fine sandy loam, and loamy very fine sand

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Occasional (5 to 50 percent chance in any year)
Water table: 12 to 36 inches

66008—Leta silt loam, 0 to 2 percent slopes, overwash, occasionally flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Clayey alluvium over loamy alluvium

Composition

Leta and similar soils—90 percent
Minor components—10 percent
Moville

Typical Profile

Ap—0 to 11 inches; silt loam
AB—11 to 22 inches; silty clay loam
Bw—22 to 34 inches; silty clay
2C—34 to 60 inches; stratified sandy loam to silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Occasional (5 to 50 percent chance in any year)
Water table: 12 to 36 inches

66009—Haynie silt loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plain
Position on the landform: Convex areas
Parent material: Coarse-silty alluvium

Composition

Haynie and similar soils—90 percent
Minor components—10 percent
Haynie silty clay loam
Haynie, frequently flooded
Sarpy

Typical Profile

Ap—0 to 16 inches; silt loam
C—16 to 64 inches; stratified very fine sandy loam to silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: Low (0 to 3 percent)
Flooding: Occasional (5 to 50 percent chance in any year)
Water table: None

66010—Sarpy fine sand, 0 to 2 percent slopes, frequently flooded

Setting

Landform: Flood plain
Position on the landform: Adjacent to the river channel
Parent material: Sandy alluvium

Composition

Sarpy and similar soils—90 percent
Minor components—10 percent
Haynie

Typical Profile

A—0 to 1 inches; fine sand
C—1 to 60 inches; stratified fine sand to loamy fine sand

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0-20 inches/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Very low (<0.5 percent)
Shrink-swell potential: Low (0 to 3 percent)
Flooding: Frequent (more than a 50 percent chance in any year)
Water table: None

66011—Moville silt loam, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Coarse-silty alluvium over clayey alluvium

Composition

Moville and similar soils—90 percent
Minor components—10 percent
Haynie
Moville very fine sandy loam
Moville sandy loam

Typical Profile

Ap—0 to 8 inches; silt loam
C—8 to 27 inches; stratified silt loam
2Ab—27 to 60 inches; silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Occasional (5 to 50 percent chance in any year)
Water table: 18 to 30 inches

66012—Blake silt loam, 0 to 2 percent slopes, frequently flooded

Setting

Landform: Flood plain
Position on the landform: Riverside of levee
Parent material: Fine-silty alluvium

Composition

Blake and similar soils—90 percent
Minor components—10 percent
Blake silty clay loam
Blake, occasionally flooded
Blake, ponded
Haynie
Waldron

Typical Profile

Ap—0 to 7 inches; silt loam
C—7 to 60 inches; stratified very fine sandy loam to silt loam to silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: Frequent (more than a 50 percent chance in any year)
Water table: 24 to 48 inches

66013—Waldron silt loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Clayey alluvium

Composition

Waldron and similar soils—100 percent
Minor components—0 percent

Typical Profile

Ap—0 to 10 inches; silt loam
Cg—10 to 60 inches; stratified silty clay loam to silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Rare (1 to 5 percent chance in any year)
Water table: 12 to 36 inches

70028—Moko-Rock outcrop complex, 3 to 15 percent slopes, very stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Moko-gravelly residuum

Composition

Moko and similar soils—80 percent
Rock outcrop—15 percent
Minor components—5 percent
Gatewood

Typical Profile

A1—0 to 3 inches; gravelly loam
A2—3 to 8 inches; very channery loam
R—8 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Moko—very shallow and shallow (4 to 20 inches); Rock outcrop—(0 inches)
Drainage class: Moko—well drained; Rock outcrop—no data
Permeability: Moko—moderate (0.6 inch-2.0 inches/hour); Rock outcrop—no data
Available water capacity: Moko—very low (0 to 3 inches); Rock outcrop—no data
Organic matter content: Moko—moderate (2 to 4 percent); Rock outcrop—no data
Shrink-swell potential: Moko—low (0 to 3 percent); Rock outcrop—no data
Flooding: None
Water table: None

70029—Moko-Rock outcrop complex, 15 to 50 percent slopes, very stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Moko—gravelly residuum

Composition

Moko and similar soils—80 percent
Rock outcrop—15 percent
Minor components—5 percent
Gatewood
Similar soils with slopes over 50 percent

Typical Profile

Moko

A1—0 to 4 inches; gravelly clay loam
A2—4 to 7 inches; very channery clay loam
R—7 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Moko—very shallow and shallow (4 to 20 inches); Rock outcrop—(0 inches)
Drainage class: Moko—well drained; Rock outcrop—no data
Permeability: Moko—moderate (0.6 inch-2.0 inches/hour); Rock outcrop—no data
Available water capacity: Moko—very low (0 to 3 inches); Rock outcrop—no data
Organic matter content: Moko—moderate (2 to 4 percent); Rock outcrop—no data
Shrink-swell potential: Moko—low (0 to 3 percent); Rock outcrop—no data
Flooding: None
Water table: None

73035—Gravois silt loam, 8 to 15 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess over residuum

Composition

Gravois and similar soils—90 percent
Minor components—10 percent
Gatewood
Useful

Typical Profile

Ap—0 to 6 inches; silt loam
Bt—6 to 25 inches; silty clay loam
2Btx—25 to 35 inches; silty clay loam
3Bt1—35 to 50 inches; very gravelly silty clay loam
4Bt2—50 to 80 inches; very cobbly clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73088—Rueter very gravelly silt loam, 8 to 15 percent slopes, very stony

Setting

Landform: Hillside
Position on the landform: Shoulders and ridgetops
Parent material: Gravelly colluvium over gravelly residuum

Composition

Rueter and similar soils—85 percent
Minor components—15 percent
Rueter silt loam
Swiss
Wilderness

Typical Profile

A—0 to 3 inches; very gravelly silt loam
E—3 to 14 inches; very gravelly silt loam
Bt—14 to 45 inches; very gravelly and extremely cobbly loam
2Bt—45 to 80 inches; clay and extremely cobbly clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: None

73089—Rueter very gravelly silt loam, 15 to 35 percent slopes, very stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Gravelly colluvium over gravelly residuum

Composition

Rueter and similar soils—85 percent
Minor components—15 percent
Alred
Rueter silt loam

Typical Profile

A—0 to 3 inches; very gravelly silt loam
E—3 to 14 inches; very gravelly silt loam
Bt—14 to 45 inches; very gravelly and extremely cobbly loam
2Bt—45 to 80 inches; clay and extremely cobbly clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: None

73090—Useful silt loam, 3 to 8 percent slopes

Setting

Landform: Hillside and ridge
Position on the landform: Side slope and summit
Parent material: Loess over gravelly colluvium over clayey residuum

Composition

Useful and similar soils—90 percent
Minor components—10 percent
Gatewood
Wrengart

Typical Profile

Ap—0 to 7 inches; silt loam
Bt—7 to 31 inches; silty clay
2Bt—31 to 45 inches; silty clay
2Bt/Cr—45 to 53 inches; very gravelly silty clay
R—53 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Deep (40 to 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 24 to 42 inches

73091—Useful silt loam, 8 to 15 percent slopes, eroded

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess over gravelly colluvium over clayey residuum

Composition

Useful and similar soils—90 percent
Minor components—10 percent
Gatewood
Hartville
Useful, uneroded
Wrengart

Typical Profile

Ap—0 to 7 inches; silt loam
Bt—7 to 31 inches; silty clay
2Bt—31 to 45 inches; silty clay
2Bt/Cr—45 to 53 inches; very gravelly silty clay
R—53 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Deep (40 to 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 24 to 42 inches

73092—Gatewood very gravelly silt loam, 3 to 8 percent slopes, stony

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Clayey residuum

Composition

Gatewood and similar soils—90 percent
Minor components—10 percent
Gatewood silt loam
Gunlock
Swiss
Useful

Typical Profile

A—0 to 2 inches; very gravelly silt loam
E—2 to 10 inches; very gravelly silt loam
2Bt—10 to 28 inches; clay
2R—28 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Moderately deep (20 to 40 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73093—Gatewood very gravelly silt loam, 8 to 15 percent slopes, stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Clayey residuum

Composition

Gatewood and similar soils—90 percent
Minor components—10 percent
- Moko
- Useful
- Wrengart

Typical Profile

A—0 to 2 inches; very gravelly silt loam
E—2 to 10 inches; very gravelly silt loam
2Bt—10 to 28 inches; clay
2R—28 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Moderately deep (20 to 40 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73094—Gatewood very gravelly silt loam, 15 to 35 percent slopes, stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Clayey residuum

Composition

Gatewood and similar soils—85 percent
Minor components—15 percent
- Gatewood silt loam
- Moko
- Useful
- Wrengart
- Similar soils with slopes over 35 percent

Typical Profile

A—0 to 2 inches; very gravelly silt loam
E—2 to 10 inches; very gravelly silt loam
2Bt—-10 to 28 inches; clay
2R—28 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Moderately deep (20 to 40 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73095—Gravois silt loam, 15 to 20 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess over residuum

Composition

Gravois and similar soils—90 percent
Minor components—10 percent
- Gatewood
- Gravois very gravelly silt loam
- Rueter
- Wrengart

Typical Profile

Ap—0 to 6 inches; silt loam
Bt—6 to 25 inches; silty clay loam
2Btx—25 to 35 inches; silty clay loam
3Bt1—35 to 50 inches; very gravelly silty clay loam
4Bt2—50 to 80 inches; very cobbly clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73096—Swiss gravelly silt loam, 8 to 15 percent slopes, stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Clayey residuum

Composition

Swiss and similar soils—85 percent
Minor components—15 percent
Gatewood
Gravois
Wrengart

Typical Profile

A—0 to 3 inches; gravelly silt loam
E—3 to 9 inches; gravelly silt loam
2Bt—9 to 40 inches; clay
2Cd—40 to 80 inches; clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 24 to 42 inches

73097—Swiss gravelly silt loam, 15 to 35 percent slopes, stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Clayey residuum

Composition

Swiss and similar soils—85 percent
Minor components—15 percent
Gatewood
Gunlock
Wrengart

Typical Profile

A—0 to 3 inches; gravelly silt loam
E—3 to 9 inches; gravelly silt loam
2Bt—9 to 40 inches; clay
2Cd—40 to 80 inches; clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 24 to 42 inches

73098—Plato silt loam, 1 to 3 percent slopes

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Loess over residuum

Composition

Plato and similar soils—90 percent
Minor components—10 percent
Marion
Union

Typical Profile

Ap—0 to 8 inches; silt loam
Bt—8 to 20 inches; silty clay
2Btx—20 to 48 inches; silt loam and extremely gravelly silt loam
3Bt—48 to 60 inches; clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 12 to 24 inches

73099—Plato silt loam, 3 to 8 percent slopes

Setting

Landform: Hillside and ridge
Position on the landform: Backslope and summit
Parent material: Loess over residuum

Composition

Plato and similar soils—95 percent
Minor components—5 percent
Plato silty clay loam, 1 to 3 percent slopes
Plato silty clay loam, 3 to 8 percent slopes, eroded
Union

Typical Profile

Ap—0 to 8 inches; silt loam
Bt—8 to 20 inches; silty clay
2Btx—20 to 48 inches; extremely gravelly silt loam and silt loam
3Bt—48 to 60 inches; clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 12 to 24 inches

73100—Wrengart silt loam, 2 to 5 percent slopes

Setting

Landform: Ridge and hillside
Position on the landform: Summit and side slope
Parent material: Loess over residuum

Composition

Wrengart and similar soils—90 percent
Minor components—10 percent
Marion
Plato
Wrengart, 5 to 9 percent slopes

Typical Profile

Ap—0 to 8 inches; silt loam
Bt2—8 to 36 inches; silty clay loam
2Btx—36 to 61 inches; silty clay loam and silt loam
3Bt—61 to 80 inches; gravelly silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: 24 to 42 inches

73101—Wrengart silt loam, 5 to 9 percent slopes

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Loess over residuum

Composition

Wrengart and similar soils—90 percent
Minor components—10 percent
Wrengart silty clay loam, eroded
Wrengart, 2 to 5 percent slopes
Wrengart, 9 to 14 percent slopes

Typical Profile

Ap—0 to 8 inches; silt loam
Bt2—8 to 36 inches; silty clay loam
2Btx—36 to 61 inches; silt loam and silty clay loam
3Bt—61 to 80 inches; gravelly silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: 24 to 42 inches

73102—Wrengart silt loam, footslopes, 5 to 9 percent slopes

Setting

Landform: Hillside
Position on the landform: Footslope
Parent material: Loess over residuum

Composition

Wrengart and similar soils—90 percent
Minor components—10 percent
Hartville
Wrengart silty clay loam, eroded
Wrengart gravelly silt loam
Wrengart, 2 to 5 percent slopes
Wrengart, 9 to 14 percent slopes

Typical Profile

Ap—0 to 8 inches; silt loam
Bt2—8 to 36 inches; silty clay loam
2Btx—36 to 61 inches; silt loam and silty clay loam
3Bt—61 to 80 inches; gravelly silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: 24 to 42 inches

73103—Wrengart silt loam, 9 to 14 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess over residuum

Composition

Wrengart and similar soils—85 percent
Minor components—15 percent
Gatewood
Hartville
Useful
Wrengart silty clay loam
Wrengart, 5 to 9 percent slopes

Typical Profile

Ap—0 to 5 inches; silt loam
Bt2—5 to 30 inches; silty clay loam
2Btx—30 to 62 inches; silt loam and silty clay loam
3Bt—62 to 80 inches; gravelly silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: 24 to 42 inches

73104—Wrengart silt loam, 14 to 20 percent slopes, eroded

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess over residuum

Composition

Wrengart and similar soils—90 percent
Minor components—10 percent
Gatewood
Gravois
Wrengart silt loam, uneroded

Typical Profile

Ap—0 to 5 inches; silt loam
Bt2—5 to 30 inches; silty clay loam
2Btx—30 to 62 inches; silt loam and silty clay loam
3Bt—62 to 80 inches; gravelly silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: None
Water table: 24 to 42 inches

73105—Wrengart-Gatewood complex, 14 to 35 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Wrengart—loess over residuum; Gatewood—clayey residuum

Composition

Wrengart and similar soils—50 percent
Gatewood and similar soils—45 percent
Minor components—5 percent
Useful

Typical Profile

Wrengart

Ap—0 to 5 inches; silt loam
Bt2—5 to 30 inches; silty clay loam
2Btx—30 to 62 inches; silt loam and silty clay loam
3Bt—62 to 80 inches; gravelly silty clay

Gatewood

A—0 to 2 inches; very gravelly silt loam
E—2 to 10 inches; very gravelly silt loam
2Bt—10 to 28 inches; clay
2R—28 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Wrengart—very deep (more than 60 inches); Gatewood—moderately deep (20 to 40 inches)
Drainage class: Moderately well drained
Permeability: Wrengart—moderately slow (0.2-0.6 inch/hour); Gatewood—slow (0.06-0.2 inch/hour)
Available water capacity: Wrengart—high (9 to 12 inches); Gatewood—low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Wrengart—moderate (3 to 6 percent); Gatewood—high (6 to 9 percent)
Flooding: None
Water table: Wrengart—24 to 42 inches; Gatewood—18 to 36 inches

73106—Mariosa silt loam, 0 to 2 percent slopes

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Loess over colluvium

Composition

Mariosa and similar soils—95 percent
Minor components—5 percent
Mariosa, 2 to 5 percent slopes
Plato

Typical Profile

Ap—0 to 7 inches; silt loam
E—7 to 11 inches; silt loam
Btg—11 to 38 inches; silty clay
Btgx—38 to 80 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow (<0.06 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 0 to 12 inches

73107—Wrengart-Swiss complex, 5 to 9 percent slopes

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Wrengart—loess over residuum; Swiss—clayey residuum

Composition

Wrengart and similar soils—60 percent
Swiss and similar soils—35 percent
Minor components—5 percent
Gravois

Typical Profile

Wrengart

Ap—0 to 8 inches; silt loam
Bt2—8 to 36 inches; silty clay loam
2Btx—36 to 61 inches; silty clay loam and silt loam
3Bt—61 to 80 inches; gravelly silty clay

Swiss

A—0 to 3 inches; gravelly silt loam
E—3 to 9 inches; gravelly silt loam
2Bt—9 to 40 inches; clay
2Cd—40 to 60 inches; clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Wrengart—moderately slow (0.2-0.6 inch/hour); Swiss—very slow (<0.06 inch/hour)
Available water capacity: Wrengart—high (9 to 12 inches); Swiss—moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Wrengart—moderate (3 to 6 percent); Swiss—high (6 to 9 percent)
Flooding: None
Water table: 24 to 42 inches

73108—Gravois-Gatewood complex, 3 to 8 percent slopes

Setting

Landform: Ridge
Position on the landform: Summit
Parent material: Gravois—loess over residuum; Gatewood—clayey residuum

Composition

Gravois and similar soils—50 percent
Gatewood and similar soils—40 percent
Minor components—10 percent
Moko
Useful

Typical Profile

Gravois

Ap—0 to 6 inches; silt loam
Bt—6 to 25 inches; silty clay loam
2Btx—25 to 35 inches; silty clay loam
3Bt1—35 to 50 inches; very gravelly silty clay loam
4Bt2—50 to 80 inches; very cobbly clay

Gatewood

A—0 to 2 inches; very gravelly silt loam
E—2 to 10 inches; very gravelly silt loam
2Bt—10 to 28 inches; clay
2R—28 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Gravois—very deep (more than 60 inches); Gatewood—moderately deep (20 to 40 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Gravois—moderate (6 to 9 inches); Gatewood—low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73109—Alred gravelly silt loam, 15 to 35 percent slopes, stony

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Gravelly colluvium over clayey residuum

Composition

Alred and similar soils—85 percent
Minor components—15 percent
Gatewood
Gunlock

Typical Profile

A—0 to 7 inches; gravelly silt loam
E—7 to 15 inches; very gravelly loam
Bt—15 to 21 inches; very gravelly loam
2Bt—21 to 80 inches; clay, cobbly clay, and gravelly clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Low (0.5 to 1 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: None

73110—Gravois-Gatewood complex, 15 to 35 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Gravois—loess over residuum; Gatewood—clayey residuum

Composition

Gravois and similar soils—50 percent
Gatewood and similar soils—40 percent
Minor components—10 percent
Moko
Swiss
Useful

Typical Profile

Gravois

Ap—0 to 6 inches; silt loam
Bt—6 to 25 inches; silty clay loam
2Btx—25 to 35 inches; silty clay loam
3Bt1—35 to 50 inches; very gravelly silty clay loam
4Bt2—50 to 80 inches; very cobbly clay

Gatewood

A—0 to 2 inches; very gravelly silt loam
E—2 to 10 inches; very gravelly silt loam
2Bt—10 to 28 inches; clay
2R—28 inches; unweathered bedrock

Soil Properties and Qualities

Depth to bedrock: Gravois—very deep (more than 60 inches); Gatewood—moderately deep (20 to 40 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Gravois—moderate (6 to 9 inches); Gatewood—low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73112—Gunlock silt loam, 3 to 8 percent slopes

Setting

Landform: Hillside
Position on the landform: Backslope
Parent material: Loess over residuum

Composition

Gunlock and similar soils—90 percent
Minor components—10 percent
Useful
Gravois

Typical Profile

Ap—0 to 5 inches; silt loam
Bt1—5 to 25 inches; silty clay loam
2Btx—25 to 43 inches; silty clay loam
3Bt1—43 to 55 inches; extremely gravelly silty clay
3Bt2—55 to 80 inches; silty clay, gravelly silty clay, and clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

73135—Union silt loam, 3 to 8 percent slopes

Setting

Landform: Ridge and hillside
Position on the landform: Summit and backslope
Parent material: Loess over residuum

Composition

Union and similar soils—90 percent
Minor components—10 percent
Plato
Gatewood
Useful

Typical Profile

Ap—0 to 9 inches; silt loam
Bt—9 to 30 inches; silty clay loam
2Btx—30 to 53 inches; extremely cobbly loam and extremely gravelly silt loam
3Bt—53 to 80 inches; clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

74633—Hartville silt loam, 1 to 3 percent slopes

Setting

Landform: Hillside
Position on the landform: Footslope
Parent material: Clayey colluvium

Composition

Hartville and similar soils—85 percent
Minor components—15 percent
Deible
Gunlock
McGirk
Tanglenook

Typical Profile

Ap—0 to 7 inches; silt loam
BE—7 to 12 inches; silt loam
Bt—12 to 48 inches; silty clay loam
2C—48 to 80 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

74634—Hartville silt loam, 3 to 8 percent slopes

Setting

Landform: Hillside
Position on the landform: Footslope
Parent material: Clayey colluvium

Composition

Hartville and similar soils—90 percent
Minor components—10 percent
- Freeburg
- Hartville, 1 to 3 percent slopes
- McGirk
- Wrengart

Typical Profile

Ap—0 to 7 inches; silt loam
BE—7 to 12 inches; silt loam
Bt—12 to 48 inches; silty clay loam
2C—48 to 80 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: None
Water table: 18 to 36 inches

74635—Tanglenook silty clay, 0 to 2 percent slopes, rarely flooded

Setting

Landform: High flood plain
Position on the landform: High flood plain
Parent material: Clayey alluvium

Composition

Tanglenook and similar soils—95 percent
Minor components—5 percent
- Deible
- Tanglenook silt loam
- Tanglenook silty clay loam
- Tanglenook, long duration flooding

Typical Profile

Ap—0 to 6 inches; silty clay
AB—6 to 17 inches; silty clay
Bt—17 to 56 inches; silty clay
Cg—56 to 60 inches; silty clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Slow (0.06-0.2 inch/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Rare (1 to 5 percent chance in any year)
Water table: 0 to 18 inches

75376—Cedargap gravelly silt loam, 0 to 3 percent slopes, frequently flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Gravelly alluvium

Composition

Cedargap and similar soils—90 percent
Minor components—10 percent
- Gladden

Typical Profile

Ap—0 to 9 inches; gravelly silt loam
A—9 to 49 inches; very gravelly sandy clay loam and very gravelly loam
2C—49 to 60 inches; clay

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: Low (3 to 6 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: High (6 to 9 percent)
Flooding: Frequent (more than a 50 percent chance in any year)
Water table: None

75391—Possumtrot fine sandy loam, 0 to 3 percent slopes, occasionally flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Loamy alluvium

Composition

Possumtrot and similar soils—85 percent
Minor components—15 percent
Cedargap
Kaintuck

Typical Profile

Ap—0 to 9 inches; fine sandy loam
Bw—9 to 40 inches; fine sandy loam
2C—40 to 80 inches; gravelly sand and gravelly loamy sand

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: Low (0 to 3 percent)
Flooding: Occasional (5 to 50 percent chance in any year)
Water table: None

75395—Jamesfin silt loam, 0 to 3 percent slopes, occasionally flooded

Setting

Landform: High flood plain
Position on the landform: High flood plain
Parent material: Fine-silty alluvium

Composition

Jamesfin and similar soils—90 percent
Minor components—10 percent
Dockery
Gladden
Jamesfin, frequently flooded
Jamesfin, long duration flooding

Typical Profile

Ap—0 to 10 inches; silt loam
Bw—10 to 60 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: Low (0 to 3 percent)
Flooding: Occasional (5 to 50 percent chance in any year)
Water table: 48 to 72 inches

75398—Kaintuck fine sandy loam, 0 to 3 percent slopes, frequently flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Coarse-loamy alluvium

Composition

Kaintuck and similar soils—85 percent
Minor components—15 percent
Cedargap
Dockery

Typical Profile

Ap—0 to 6 inches; fine sandy loam
C—6 to 80 inches; stratified fine sand to loamy fine sand to fine sandy loam to loam to silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0-6.0 inches/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Low (0.5 to 1 percent)
Shrink-swell potential: Low (0 to 3 percent)
Flooding: Frequent (more than a 50 percent chance in any year)
Water table: None

75399—Jamesfin silt loam, 0 to 3 percent slopes, frequently flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Fine-silty alluvium

Composition

Jamesfin and similar soils—90 percent
Minor components—10 percent
Dockery
Jamesfin, occasional flooding
Jamesfin, long duration flooding

Typical Profile

Ap—0 to 10 inches; silt loam
Bw—10 to 60 inches; silt loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Very high (more than 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: Low (0 to 3 percent)
Flooding: Frequent (more than a 50 percent chance in any year)
Water table: 48 to 72 inches

75400—Gladden silt loam, 0 to 3 percent slopes, frequently flooded

Setting

Landform: Flood plain
Position on the landform: Flood plain
Parent material: Coarse-loamy alluvium

Composition

Gladden and similar soils—85 percent
Minor components—15 percent
Cedargap
Gladden, occasionally flooded
Jamesfin
Kaintuck

Typical Profile

Ap—0 to 6 inches; silt loam
Bw—6 to 38 inches; silt loam
2C—38 to 60 inches; stratified extremely gravelly sand

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 inch-2.0 inches/hour)
Available water capacity: Moderate (6 to 9 inches)
Organic matter content: Moderately low (1 to 2 percent)
Shrink-swell potential: Low (0 to 3 percent)
Flooding: Frequent (more than a 50 percent chance in any year)
Water table: None

75407—Gabriel silt loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: High flood plain
Position on the landform: High flood plain
Parent material: Fine-silty alluvium

Composition

Gabriel and similar soils—90 percent
Minor components—10 percent
Gabriel silty clay loam
Gabriel, long duration flooding
Racoon
Tanglenook

Typical Profile

Ap—0 to 14 inches; silt loam
Btg1—14 to 46 inches; silty clay loam
Btg2—46 to 81 inches; silty clay loam

Soil Properties and Qualities

Depth to bedrock: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Moderately slow (0.2-0.6 inch/hour)
Available water capacity: High (9 to 12 inches)
Organic matter content: Moderate (2 to 4 percent)
Shrink-swell potential: Moderate (3 to 6 percent)
Flooding: Rare (1 to 5 percent chance in any year)
Water table: 12 to 30 inches

99000—Pits, quarries

Setting

Landform: None assigned
Position on the landform: None assigned
Parent material: No data

Composition

Pits, quarries—95 percent
Minor components—5 percent
Processed/stockpiled stone

Soil Properties and Qualities

Depth to bedrock: No data
Drainage class: No data
Permeability: No data
Available water capacity: No data
Organic matter content: No data
Shrink-swell potential: No data
Flooding: None
Water table: None

99001—Water

Setting

Landform: Lakes and ponds
Position on the landform: None assigned
Parent material: No data

Composition

Water—100 percent
Minor components—0 percent

Soil Properties and Qualities

Depth to bedrock: No data
Drainage class: No data
Permeability: No data
Available water capacity: No data
Organic matter content: No data
Shrink-swell potential: No data
Flooding: None
Water table: None

99003—Miscellaneous water

Setting

Landform: Sewage lagoons
Position on the landform: None assigned
Parent material: No data

Composition

Water—100 percent
Minor components—0 percent

Soil Properties and Qualities

Depth to bedrock: No data
Drainage class: No data
Permeability: No data
Available water capacity: No data
Organic matter content: No data
Shrink-swell potential: No data
Flooding: None
Water table: None

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 land that has the best combination of physical and chemical characteristics for producing

Figure 10.—An area of prime farmland in Osage County. Winter wheat is growing in this area of Freeburg silt loam, 0 to 3 percent slopes, rarely flooded.

food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. 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 Natural Resources Conservation Service.

About 68,182 acres in the survey area, or nearly 18 percent of the total acreage, meets the soil requirements for prime farmland. This land is mainly on the flood plains and broad uplands in associations 4, 5, and 6, which are described under the heading "General Soil Map Units." Most of the prime farmland is used for cultivated crops. The main crops grown on this land are corn, soybeans, grain sorghum, and wheat (fig. 10).

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

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. 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. The naturally wet soils in Osage County generally have been adequately drained through the application of drainage measures or the incidental drainage that results from farming or other kinds of land development.

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 to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for 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 woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

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

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

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

Crops and Pasture

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 Natural Resources 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 the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

According to Natural Resources Inventory estimates, approximately 175,600 acres in Osage County was used as pasture in 1992 *(13)*. About 150,200 acres was used as woodland, and an estimated 24,200 acres was used as cropland. Approximately 12,300 acres was used for house lots, ponds, roads, wasteland, or other uses. About 18 percent, or 68,182 acres, of the county is prime farmland. Of that, an estimated 75 percent is used as cropland.

Crops

Field crops, though not extensive, are very significant in Osage County (fig. 11). In 1994, corn was planted on about 7,900 acres, soybeans on 8,700 acres, grain sorghum on 1,800 acres, and wheat on 2,600 acres *(5)*. Small acreages of oats, barley, and rye were also grown.

Most of the corn and soybeans are grown on the flood plains in the county. Many areas of the more droughty soils, primarily in the uplands, are used for grain sorghum, wheat, grass, or grass-legume pasture and hay.

The potential for increased crop production in Osage County is good. Production can be increased by use of the latest agricultural technology on all cropland in the county. This survey can facilitate the application of such technology. About 58,108 acres in the county is made up of level to very gently sloping soils that generally are suitable for intensive cultivation. An additional 71,047 acres is made up of gently sloping and moderately sloping soils that are suitable for

Figure 11.—An area of Jamesfin silt loam, 0 to 3 percent slopes, occasionally flooded. Row crops, such as corn and soybeans, are primarily grown on very deep soils with high available water capacity.

cultivated crops if erosion is controlled. Trees have been cleared from most of this acreage.

Cropland erosion. Soil erosion is the major hazard on nearly all sloping cropland and overgrazed pastureland in Osage County. All soils with slopes greater than 2 percent are susceptible to damage from erosion.

Soil erosion results in the gradual loss of the surface layer and reduces productivity. Erosion is especially damaging on soils that have a clayey subsoil, which then becomes mixed with the plow layer. Good seedbed preparation and germination rates become increasingly difficult to achieve. Gunlock, Hartville, Marion, McGirk, Plato, and Useful soils are commonly tilled, are erodible, and have a clayey subsoil. Clayey areas resulting from erosion make tillage and seedbed preparation difficult. Erosion also reduces the productivity of soils that have rooting depths that are restricted by fragipans or bedrock, such as Gatewood, Moko, Plato, and Union soils, by effectively decreasing the volume of soil available to supply water and nutrients.

Erosion also removes valuable slow-release nutrients in the topsoil. The nutrients in one ton of topsoil are estimated to be worth about $5 or $6. At that rate, unprotected upland crop fields can lose $200 to $240 worth of nutrients each year.

Soil erosion on farmland results in sediment entering

streams, lakes, ponds, and road ditches. Controlling erosion minimizes the pollution of streams by sediment and collateral pesticides, thereby improving the quality of water for municipal and recreational uses and for fish and wildlife. It also prolongs the useful life of ponds, lakes, and roadside ditches by preventing sediment from filling them.

Erosion-control practices. Erosion-control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover or residue on the soil surface can hold erosion losses to amounts that will not reduce the productive capacity of the soil. Growing grasses and legumes for pasture and hay is very effective in controlling erosion (fig. 12). Including grasses and legumes in the crop rotation improve soil tilth, and the legumes provide nitrogen for the following crop.

Significant reductions in soil loss can be accomplished by basic management techniques. Farming on the contour reduces soil loss by as much as 50 percent. Conservation tillage is a management practice in which the amount of tillage is reduced or changed so that at least 30 percent of the soil surface is covered with residue after the crop is planted. The residue controls erosion by reducing the impact of raindrops, which can dislodge unprotected topsoil. Also, runoff is reduced, and soil particles are not as likely to be removed from the field. This system becomes more effective with increasing amounts of residue on the soil surface. All of the upland soils that are commonly used for row crops are well suited to conservation tillage. No-till farming is a practice that eliminates tillage operations entirely and leaves nearly all of the crop residue on the soil surface. Some farmers in the county are finding this to be a cornerstone of their conservation efforts. Other benefits of no-till farming include less expenditure for equipment, less soil compaction, time savings at planting, conservation of soil moisture, and fuel savings.

The large amounts of residue left as a result of no-till farming also shield the soil from sunshine, which slows evaporation. This is an asset in the summer during droughty periods, but tends to delay warming and drying of the soil in the spring. Therefore, no-till farming is best suited to deep or very deep, moderately well drained or well drained soils that are not frequently flooded, which include Gravois, Gunlock, Haynie, Jemerson, Menfro, Possumtrot, Useful, and Wrengart soils.

Contour stripcropping reduces erosion by maintaining strips of permanent vegetation on the contour. Such grass or legume strips are usually used for hay. The areas between the strips are cultivated, and row crops are planted on the contour. The grass or legume strips minimize erosion and help filter the sediment from runoff that would otherwise leave the field.

Figure 12.—An area of Wrengart silt loam, 5 to 9 percent slopes, used as hayland.

Terraces reduce runoff and erosion and reduce the length of slopes. Broad-base terraces are most practical on uneroded upland soils that have smooth slopes less than 8 percent. Soil loss on strongly sloping to steep cultivated areas of Menfro soils and strongly sloping or moderately steep Wrengart soils can be very severe. Special management techniques are needed to maintain the productivity of these soils. Construction of grassed backslope or narrow-base terraces reduces the steepness of the slope because construction cuts are made from the downslope side. Construction of broad-base terraces actually increases the slope and makes additional erosion-control practices crucial. On many soils, such as Hartville and Marion soils, topsoiling may be required in areas where

terracing exposes the clayey subsoil. Gravois, Gunlock, Plato, and Union soils have similar intensive management needs because of a dense layer in the subsoil.

Grade stabilization structures create small water bodies that cover up gullied areas and prevent further uphill encroachment. These structures provide a stable place into which tile terrace outlets or grassed waterways can empty runoff from terraced fields.

Soil wetness. Wetness and/or flooding are management concerns on about 66,844 acres in the county. Deible, Gabriel, Leta, Mariosa, Racoon, Tanglenook, and Waldron soils are naturally so wet that planting or harvesting is delayed or crop production is reduced in most years (fig.13). Land grading or surface drainage may be needed to some extent on these soils.

In the past, drainage of wetland areas was unregulated and, therefore, occurred at the discretion of individual landowners. In recent years, however,

Figure 13.—Seasonal ponding occurs on the lower portion of some areas of Waldron silty clay loam, 0 to 2 percent slopes, occasionally flooded.

legislation has been enacted recognizing the importance of wetlands to the total environment. The effect of these laws is to protect most existing wetlands from further degradation and to encourage redevelopment of areas that were formerly wetlands. Before altering any area that might be considered a wetland, the Natural Resources Conservation Service should be contacted in order to ensure compliance with existing laws.

Flooding is a hazard on the Blake, Cedargap, Deible, Dockery, Gabriel, Gladden, Haynie, Jamesfin, Jemerson, Kaintuck, Leta, Moville, Possumtrot, Racoon, Sarpy, Tanglenook, and Waldron soils. If flooding occurs, it is commonly during the period from November to May. The 1993 flood was a notable exception, occurring primarily during the month of July. Such major floods on the Missouri River bottom can drastically alter the landscape and soil patterns. Many areas on the Missouri River bottom are protected by a privately maintained levee system, but breeches can occur when the river reaches critical levels. Areas on the riverside of the levee flood frequently, and areas away from the river flood occasionally. The lower portion of the Osage and Maries Rivers is affected by backwater from the Missouri River when it floods.

Soil fertility. Soil fertility is naturally low in most of the eroded and shallow soils in the survey area. However, all of the soils need additional plant nutrients for maximum production. Except for the Missouri River bottom soils, most of the soils are naturally acid in the upper part of the rooting zone and require applications of lime to raise the pH and calcium levels sufficiently for optimum growth of legumes. On all of the soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the production level desired. The Cooperative Extension Service can help in determining these values. Soil samples can be organized using the soil survey to identify contrasting soil types.

Soil tilth. Soil tilth affects seedbed preparation, seed germination, and water infiltration. Soils that have good tilth are granular and porous. Regular additions of organic matter help to maintain good tilth.

Most of the cultivated soils in the county have a surface layer of silt loam or loam that has a low to moderate content of organic matter. If these soils are frequently cultivated, soil structure becomes weak and intense rainfall can cause the formation of a crust on the surface. The crust is hard when dry, thereby reducing water infiltration and increasing runoff. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

The bearing weight of machinery as it travels over the soil surface tends to compact the soil if it is moist or wet. This compaction reduces infiltration of water into the soil and makes the resulting seedbed less favorable for root penetration. Operation of machinery when soil moisture is optimum will reduce the effects of compaction. Periodic deep tillage can improve existing compacted areas.

The nearly level Leta and Tanglenook soils, which have a clayey surface layer, are commonly cultivated in the fall so that tilth is improved for spring planting. These soils can be cultivated in the fall without a significant risk of erosion. In contrast, fall cultivation of the more sloping soils in the uplands results in serious soil losses. Such losses can be catastrophic when intense spring rains follow partial thawing of the bare, frozen surface layer.

Pasture and Hayland

A combination of different kinds of grasses and legumes is necessary to obtain maximum forage production for the climate in Osage County. Cool temperatures in the spring and fall are favorable for the production of cool-season grasses. The hot summer months are more favorable for production of warm-season grasses. Many of the soils in the survey area are suited to both kinds of grasses, and some of the soils are suited to legumes. A management system that includes cool-season grasses, warm-season grasses, and legumes takes advantage of the entire growing season for forage production.

Cool-season grasses. The cool-season grass most commonly grown in Osage County is tall fescue. Orchardgrass, timothy, smooth bromegrass, reed canarygrass, and Kentucky bluegrass are also grown on limited acreages. All of these grasses are commonly grown on upland soils, except for reed canarygrass, which is planted primarily on wetter bottomland sites. These cool-season grasses can provide top production only when properly managed. Rotational grazing systems help to keep forages at an optimum height for highest production. Supplemental fertilization and timely weed control are also essential for top production.

Cool-season grasses grow vigorously when temperatures are cool (between 50 and 85 degrees F). These grasses generally start growing in late March and can be grazed by late April. Timothy and bromegrass will not produce tillers unless a seedhead is allowed to develop. Therefore, overgrazing or haying too early in the growing season will reduce total production of these forages. Orchardgrass will regrow vigorously with or without development of a seedhead, so the timing of grazing or haying is less critical. Bluegrass is generally less productive than the other

cool-season grasses, but it can better withstand overgrazing and poor management. Fescue can also withstand abuse and severe site conditions, but endophyte-infested stands are widespread and produce less than optimum weight gains, especially during summer months. Reestablishment of existing stands with endophyte-free seed is an option some managers are selecting. Careful grazing management and interseeding of legumes can minimize the effects and reduce the spread of the infestation. Poor palatability can also be a problem with fescue stands. Reed canarygrass is moderately palatable and is highly productive in areas that would be too wet for other grasses or row crops.

Because of increasing temperatures and day length, cool-season grass production decreases significantly by mid-June. As fall brings cooler temperatures and shorter days, growth increases accordingly. Production continues until the first killing frost occurs, usually in late October. One exception to this growth pattern is tall fescue, which continues to grow until sometime in December.

Warm-season grasses. Warm-season grasses that are commonly grown in Osage County include big bluestem, indiangrass, switchgrass, and little bluestem. Gammagrass is grown on some small acreages and requires high or very high available water capacity. This soil survey is a useful tool for locating sites that have such specific requirements.

Warm-season grasses were native to small areas of the county before the arrival of early pioneers. These grasses were native because of their adaptation to the soils and climate of the county. Their suitability for the climate is vividly demonstrated during the hot summer months of June, July, and August. As their name implies, these grasses peak in production when the temperature reaches 90 degrees F. Growth slows when temperatures fall below 70 degrees F. An important advantage for summer forage production is that warm-season grasses need only 40 percent as much water as cool-season grasses to produce the same amount of forage.

Strict management techniques are necessary for optimum warm-season grass production and longevity. Rotation grazing patterns must be used so that these grasses can be utilized when growing vigorously and to eliminate overgrazing during dormant periods. Minimum grazing height guidelines and prescribed burning plans must be followed (fig. 14). Supplemental fertilizer needs for warm-season grasses are small compared to cool-season grasses. Usually nitrogen is the only supplement necessary for top production.

Legumes. Legumes are included in many forage systems in Osage County. They improve overall forage quality and quantity. When included with grasses in a seeding mixture, legumes stimulate growth of the grasses because of nitrogen fixation by bacteria on the roots of the legumes.

Pure legume stands provide sources of high protein forage. Some legumes, such as alfalfa and ladino clover, can cause bloating if unrestricted grazing is allowed; therefore, most pure legume stands are used for hay. Alfalfa is the legume most commonly used for hay production. Other legumes, such as red clover, birdsfoot trefoil, and ladino clover, are used in pasture mixes. Crownvetch is used to stabilize steep banks and critically eroding areas.

Use and management of legumes involves selecting soils that are compatible with the growth characteristics of the various plants. Most legumes require well drained or moderately well drained, very deep soils with high or very high available water capacity for healthy productive stands. Haynie, Jamesfin, Jemerson, Menfro, and Wrengart soils have such characteristics. Some legumes, such as alsike clover, will tolerate wetter soils. This soil survey can help in fitting the most productive forages to appropriate soils.

Legumes do not need supplemental nitrogen because of the natural fixation that occurs in the root system. When used for hay, legumes often require large amounts of phosphorus and potassium. Heavy applications of limestone are also needed for optimum production on most soils.

Balanced management. Cool-season grasses, warm-season grasses, and legumes have different periods of the growing season when their production peaks. Management plans that include all three kinds of forage will make optimum use of the entire season. Such a system with rotation grazing or haying of these different crops can help to increase production and profit while protecting the topsoil with permanent cover.

Certain management practices are needed on all soils in the survey area. Timely mowing or chemical weed control reduces competition from undesirable plants and encourages uniform grazing. Overgrazing reduces production of grasses and legumes and increases weed growth. Grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

Specialty crops. Specialty crops are grown on a limited basis in Osage County. Some small areas are used for Christmas tree farms. These crops require special equipment, management, and propagation techniques. This soil survey can help to identify areas

Figure 14.—Warm season grass management includes controlled burning in areas of Gunlock silt loam, 3 to 8 percent slopes.

that are suitable for these and other crops if specific soil-related requirements are known.

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 tables because of variations in rainfall and other climatic factors.

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.

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 the table 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 Natural Resources 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 woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of the map units in this survey area is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Douglas Wallace, state forester, Natural Resources Conservation Service, helped prepare this section.

A forest is more than a group of trees. The trees, soil, and associated plants and animals form a forest ecosystem that has many valuable properties. Wood fiber, sustained water quality and quantity, wildlife habitat, and recreational activities are all useful products from a productive forest ecosystem *(10).*

According to woodland survey estimates by the Missouri Department of Conservation, 47 percent, or 184,351 acres, of Osage County was forested in 1986 *(3).* Forested uplands in Osage County are covered by oak-hickory and eastern redcedar communities. White oak, red oak, bitternut hickory, and black oak grow on the better sites. Post oak, blackjack oak, eastern redcedar, and hickories prevail on the shallower and more droughty soils. Rock outcrop areas and areas that are very shallow or shallow to bedrock are dominated by eastern redcedar, blackjack oak, and prairie grasses. These areas are commonly referred to as glades or cedar breaks. Common associates on flood plain sites include black walnut, American elm, sycamore, bur oak, hackberry, green ash, and black willow. The variations in tree species and growth on both upland and bottomland positions are dependent on

the interaction of site characteristics, soil properties, and management activities.

Site characteristics that affect tree growth include aspect (the direction the slope is facing) and slope position. These site characteristics influence the amount of available sunlight, air drainage, soil temperature, soil moisture, and relative humidity. Generally, north and east aspects and lower slope positions, which are cooler and have better moisture conditions, are more productive than the south and west aspects and upper slope positions of the same or similar soil types. Swiss and Gatewood soils exhibit particularly strong productivity and species responses to aspect and slope position.

Soil properties are fundamentally important for woodland production and management considerations. A quarter or more of a tree's mass is located in the soil, which serves as a reservoir for moisture, provides an anchor for roots, and supplies essential plant nutrients. In Osage County, important soil properties include soil wetness, soil slope, soil clay content, and soil depth.

Soil wetness is the result of a high water table, flooding, or ponding. It causes seedling mortality, limits the use of equipment, and increases the windthrow hazard by restricting the rooting depth of some trees. Somewhat poorly drained and poorly drained upland soils that have a perched water table include Freeburg, Hartville, Marion, Mariosa, McGirk, and Plato soils. Ruts form easily if wheeled skidders are used when these soils are wet. Deep ruts tend to restrict lateral drainage, result in damage to tree roots, and alter soil structure. Flooding and/or surface wetness is a problem on about 66,932 acres. Included are areas of Blake, Cedargap, Deible, Dockery, Gabriel, Gladden, Haynie, Jamesfin, Jemerson, Kaintuck, Leta, Moville, Possumtrot, Racoon, Sarpy, Tanglenook, and Waldron soils. On all of these soils, equipment should be used only during dry periods or when the ground is frozen.

Soil slope can limit the use of forestry equipment. A slope of 15 percent or more limits the use of equipment in logging areas, on skid roads, in yarding areas, and on logging roads. Soil erosion is a hazard in these disturbed areas. The use of equipment is limited on about 184,915 acres in the survey area due to slope. This acreage is also highly susceptible to erosion. This acreage includes many areas of Gatewood, Gravois, Menfro, Moko, Rueter, Swiss, and Wrengart soils. Using special erosion-control measures, such as water bars or dips, and designing logging roads and trails to minimize the steepness and length of slope and concentration of water reduce erosion. Moderately steep to very steep slopes indicate a safety hazard and limitation for equipment. In these areas, equipment should be operated on the contour when possible. Severe sites require moving logs uphill to skid trails and yarding areas.

The content of clay in the topsoil or subsoil can affect equipment use and seedling mortality. Clayey soils have reduced traction, moderate or high seedling mortality, and compact easily when wet. Unsurfaced roads and skid trails rut easily and may be impassable during rainy periods. Soils that have a high content of clay in the subsoil include Deible, Gatewood, Gunlock, Hartville, Leta, Marion, Mariosa, McGirk, Plato, Swiss, Tanglenook, Useful, and Waldron soils. Activities on these soils should be restricted to dry periods or to surfaced areas. Seedling establishment can be increased with mechanical or chemical weed control, mulching, or supplemental water.

Soil depth favorable to rooting is usually one of the most significant soil properties affecting woodland productivity. Soil horizons that are favorable for root development allow a tree to anchor its roots and provide volume for available water and nutrients. Very shallow and shallow Moko soils have a limited rooting depth and rooting volume. Trees in areas of these soils are prone to water stress during dry years or dry seasons and are susceptible to windthrow during high winds (fig.15). Effective rooting depths are restricted on the Deible, Gatewood, Hartville, Leta, Marion, Mariosa, McGirk, Swiss, Tanglenook, Useful, and Waldron soils because of a high clay content in the subsoil. Other soils, such as Gravois and Plato soils, have root restrictions due to subsoil layers that are too dense for root penetration. Very shallow soils, areas that are shallow at depth to bedrock, and areas of rock outcrop also restrict the use of equipment and hinder the construction of logging roads. Careful planning of proposed logging roads to avoid these areas can minimize most of these limitations.

Management activities can influence woodland productivity and should be aimed at eliminating factors causing tree stress. Generally, this involves controlling erosion; thinning overstocked young stands; planting trees where natural regeneration is insufficient or undesirable; harvesting old, mature trees; and eliminating destructive fire and grazing.

Concentrating management activities on sites that have productive soils and in areas that support high-value timber species helps to maximize woodland productivity. The more productive soils in Osage County include Hartville, Menfro, Useful, and Wrengart soils on the uplands and Blake, Dockery, Freeburg, Gabriel, Gladden, Haynie, Jamesfin, Jemerson, Kaintuck, Leta, Possumtrot, Tanglenook, and Waldron soils on the bottomlands. High-value timber species

Figure 15.— Windthrow occurs when the rooting depth is insufficient to anchor individual trees. Windthrow is likely to occur in areas of the Moko-Rock outcrop complex, 3 to 15 percent slopes, very stony.

include white oak, red oak, black walnut, and black oak.

Fire and grazing have very negative impacts on forest growth and quality. About 32 percent of the woodland is still subject to moderate to heavy grazing. Grazing destroys the leaf layer on the surface, compacts the soil, and eliminates or damages tree seedlings. Forest damage caused by fires is a major concern throughout the Ozarks. Fire not only results in damage to trees, causing reduced wood quality and growth, but also affects soil and water quality and wildlife habitat *(6)*. Woodland sites that have not been grazed or burned have the highest potential for optimum timber production, for wildlife habitat, and for recreational uses.

Table 7 can be used by woodland owners or forest

managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; *L*, low strength; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, L, and N.

In the table, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or

common trees on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Douglas Wallace, state forester, Natural Resources Conservation Service, helped prepare this section.

Living plants play an important role in supporting our life and improving its condition. When properly used and maintained, plants help to provide positive solutions to many problems existing in our contemporary environment. In Osage County, windbreaks and environmental plantings can be utilized throughout the landscape for a variety of engineering, climatological, and aesthetic needs.

Windbreaks can be grown successively in most areas of Osage County. Some important considerations for managing farmstead and feedlot windbreaks are design and layout; species selection; site preparation; seedling handling; weed management; irrigation; and protection from diseases, insects, and livestock.

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

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

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

Table 8 shows windbreak suitability groups. The table can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Windbreak Suitability Groups

Soil map units in Osage County are placed in 1 of 10 windbreak suitability groups of similar soils. Groups 1 and 4 may be further divided into subgroups.

Group 1. The soils in this group are deep and are well drained to somewhat poorly drained. They receive beneficial moisture from favorable landscape positions, flooding, runoff from adjacent land, or they have beneficial seasonal high water table during the spring. This group has a subgroup of K for calcareous soils.

Group 2. The soils in this group are deep and are poorly drained or very poorly drained. They are excessively wet or ponded during the spring or during overflow periods. Wetness limits the selection of species suitable for planting on the soils in this group and may reduce the growth rate.

Group 3. The soils in this group are deep, well drained, loamy, and moderately permeable or moderately slowly permeable.

Group 4. The soils in this group are moderately deep or deep, have a loamy surface layer and a clayey subsoil, and are slowly permeable or very slowly permeable. They are on uplands. This group has a subgroup of C for moderately deep or deep soils that have a clayey texture throughout the profile.

Group 6D. The soils in this group are moderately well drained or well drained, generally are loamy, and are moderately deep to bedrock or other layers that can severely restrict root growth. They have a low or moderate available water capacity.

Group 10. The soils in this group have one or more characteristics, such as soil depth, texture, drainage, channeled phases, available water capacity, slope, or salt toxicity, that severely limit the planting, survival, or growth of trees and shrubs.

Recreation

Reggie Bennett, area wildlife services biologist, Missouri Department of Conservation, helped prepare this section.

Osage County affords abundant opportunities for people to interact with the rich diversity of plant and animal communities. The Missouri River forms the northeast boundary of the county. Other major rivers include the Osage, Maries, and Gasconade, all of which offer recreational opportunities.

Ben Branch Lake Conservation Area, Smokey Water's Conservation Area, and Painted Rock Conservation Area are public lands open to hunting and fishing *(7)*. Painted Rock Conservation Area offers beautiful Osage River scenery from several observation decks. The Osage Bluff Scenic Trail runs along high river bluffs and through an oak-hickory-sugar maple forest offering spectacular fall colors and viewing opportunities *(8)*.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In the table, 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 a combination of these measures.

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

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

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

Wildlife Habitat

Reggie Bennett, area wildlife services biologist, Missouri Department of Conservation, helped prepare this section.

Osage County is one of 13 counties in Missouri that make up the Northern and Eastern Ozark Border zoogeographic region *(9)*. Prior to European settlement, the primary vegetation was oak-hickory forest, glades, and savannahs (also called barrens), small patches of treeless prairie, and both wooded and herbaceous wetlands.

The diversity and abundance of wildlife species depend on the type of vegetative cover and its

diversity and interspersion (the mixing of different types of cover, which also creates an "edge" or transition zone between vegetation types). Many areas of grassland and woodland in Osage County are mosaic and intermixed, thus creating a tremendous amount of "edge." An important wildlife management opportunity exists in all soil associations through "edge" development for wildlife (creating a better transition between a different cover as opposed to a clear, defined break.) Wildlife managers try to create an "edge" with different vegetative heights and types, the goal being to create a transition zone rich in plant diversity. The habitat quality of most of the "edge" in Osage County is poor, mainly because of the vegetation found in it. Most of the "edge" habitat is currently a single species of grass (in most cases fescue), or the "edge" is an abrupt change between grassland, woodland, and/or cropland, without a transition zone.

Soil types, and thus soil productivity, generally dictate land use and, therefore, the value of vegetation and cover for wildlife. The Wrengart-Swiss-Gatewood association, Wrengart-Gatewood association, Rueter-Plato-Gravois association, and Gatewood-Gravois association, which are described under the heading "General Soil Map Units," have more than 50 percent woodland cover type. Grass is the second most prevalent cover type. In the woodland portions of these associations, the Menfro and Wrengart soils support the best overall oak-hickory forest in the county. A good mixture of red oak and white oak in the timber stands is important to wildlife. This is due to the different times the tree's fruit (acorns) mature. Red oak acorns take two years to mature, while white oak acorns grow and drop in the same year. When white oak acorns aren't available, the prior year's red oak acorn crop will be available for wildlife. This cycle helps to ensure a consistent acorn crop through the years.

Timber management is an important tool for enhancing wildlife habitat. Consultation with a professional forester is recommended. The very deep Deible, Freeburg, Menfro, and Wrengart soils are highly productive for timber and are usually the best sites to begin timber management if existing woods are found on these sites. Most of these sites have been cleared, however, and are presently in other land uses. If tree planting is to be done, these soils offer some of the best return on the dollar for wood fiber production. Gatewood and Rueter soils are still predominantly wooded today and are examples of soils with better timber production. On alluvial soils along small and medium-sized river bottoms, walnut is a tree species that offers good management potential.

Woodland wildlife species include white-tailed deer, eastern wild turkey, fox squirrel, and gray squirrel. Other woodland species are barred owl, marbled salamander, northern cardinal, bluejay, and broad-winged hawk. Two key woodland wildlife management priorities include the prohibition of woodland grazing and the preservation of old second growth tree communities.

When grassland and cropland are abandoned in the previously mentioned associations, woody species begin to invade, ultimately increasing the total woodland acreage. The most prevalent woody species invading these sites are eastern redcedar, sassafras, persimmon, and post oak.

Prior to settlement, many areas probably were referred to as "barrens," which was a term used to describe a landscape with a variety of grass-brush-timber mixtures. These areas were also called savannahs. The soils that may be managed or restored as barrens or savannahs include Gatewood soils (particularly south and west slopes) and the somewhat drier Moko soils. Sites dominated by Moko soils usually have numerous rock outcrops and are commonly referred to as dolomite glades (fig.16). Small areas of these glades currently support xeric, prairie-like flora that is not found in other habitats in the county.

Glades in the Meta vicinity provide habitat for small populations of the state-listed collard lizard. Other wildlife species found in restored "barrens" are similar to that found in "edge" habitat. To restore the grassland component on Moko sites, management generally includes the use of prescribed fire and a reduction in the amount of tree cover. Moko sites also offer the potential to grow marketable eastern redcedar.

Grassland cover makes up the most prevalent habitat type in the county. The Mariosa soil series originally had treeless prairie cover as the predominant vegetative type. These prairies occurred on broad upland summits. The Tanglenook soil also supported prairie vegetation prior to European settlement. Two areas of native prairie are described in the Pre-settlement Prairie of Missouri as originally occurring in Osage County northeast of Belle (Mariosa soil) and due east of Rich Fountain (Tanglenook soil). In both cases these are very small and represent a minor acreage in the county *(11).*

A very important wildlife habitat consideration for openland wildlife is the type of grass in which pastures and hay fields are established. Because of its vigor under almost any grazing situation, fescue is the most common forage species in the county. Unfortunately, it generally provides poor wildlife habitat. Intensive management of grazing systems, including introduction of legumes and the use of different species of grass, is

Figure 16.—Dolomite glades occur in areas of the Moko-Rock outcrop complex, 3 to 15 percent slopes, very stony, where the shallow rooting depths preclude growth of all but the most hardy tree species.

needed if habitat improvement is an objective in these areas.

Where remnants of native warm-season grasses and native forbs exist, restoration of these natural communities is preferable to reintroduction. Restoration will benefit wildlife as much, if not more, than reintroduction and is generally easier and cheaper to accomplish. Restoration may include the use of prescribed fire and removal of some trees, especially eastern redcedar. Grassland wildlife in Osage County includes western chorus frog, dickcissel, red-tailed hawk, American kestrel, and bobwhite quail. "Edge" development and management are also important wildlife habitat enhancement considerations.

The Jamesfin-Racoon-Kaintuck association in areas of the flood plains along the Gasconade, Osage, and Maries Rivers and the Haynie-Leta-Blake association in areas of bottomland along the Missouri River provide additional openland wildlife habitat. Instead of grass as a cover type, these associations are heavily cropped. Many soil conservation measures can enhance habitat in cropland settings, including leaving some crops

standing as food plots and using a system of conservation tillage. Species to look for in a cropland setting include the mourning dove, red-tailed hawk, killdeer, northern bobwhite, coyote, and white-tailed deer.

The Jamesfin-Racoon-Kaintuck and Haynie-Leta-Blake associations also contain most of the remaining wetlands in Osage County, but small wetlands may be found in the bottomlands of the other associations as well. Wetlands and marshes provide an important cover type for many species of wildlife. These wetlands, where not drained, are found in old oxbows and river channels in these bottoms. Gabriel, Tanglenook, and Waldron soils are likely sites for the occurrence or development of marshy, herbaceous wetlands. The Racoon series is a wetland soil series that was originally wooded.

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

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

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

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

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

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, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, 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 flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are 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, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

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.

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

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

shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

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

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, sage 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. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil

properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and 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, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and 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.

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

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

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

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

The ratings in the table are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or 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 wind erosion.

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 the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the

engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a 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 have a water table at a depth of 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. They are used in many kinds of construction. Specifications for each use vary widely. In the table, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

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

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land

against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to 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 the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and 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.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

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

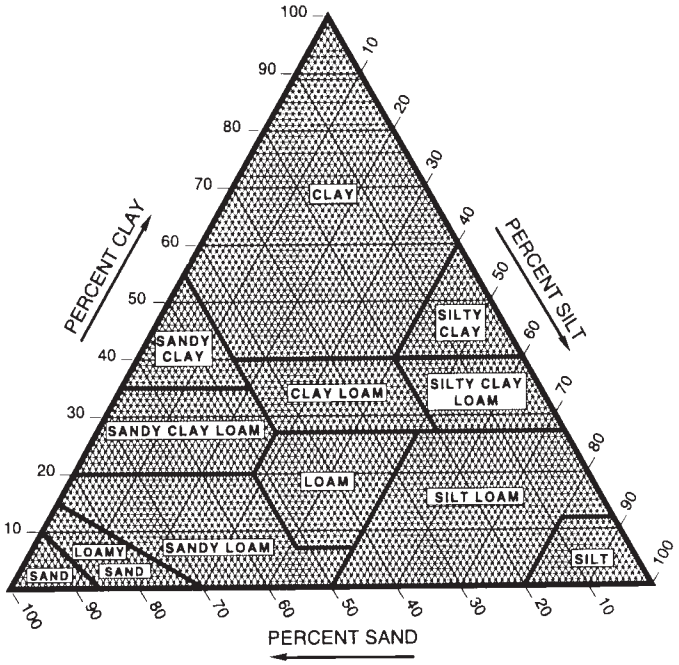

Figure 17.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "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. 17). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting

engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 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 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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 the heading "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 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.

Saturated hydraulic conductivity (Ksat) refers to the amount of water that would move vertically through a unit time under unit hydraulic gradient. The estimates are in micrometers per second and 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. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

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.

Cation-exchange capacity is 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

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.

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 the basis of 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 classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor Kw (formerly K factor) indicates the susceptibility of a soil to sheet and rill erosion by water. Factor Kw is one of six factors used in the Universal Soil Loss Equation (USLE), and may be used in the Revised Universal Soil Loss Equation (RUSLE), 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. Factor Kw is adjusted for the effect of rock fragments. Values of Kw range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size. Factor Kf is one of the factors that may be used in the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion.

Soil Features

Table 17 gives estimates of several important soil features. The estimates are used in land use planning that involves engineering considerations.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

A *cemented pan* is a nearly continuous layer of indurated or strongly cemented material that is hard and brittle. The particles are held together by cementing substances, such as calcium carbonate and oxides of silicon, iron, or aluminum. Pans are identified when they are within a depth of 60 inches. They are classified as thin or thick. A thin pan can be excavated by trenching machines, backhoes, small rippers, and other equipment commonly used to dig excavations for pipelines, sewer lines, and graves. A thick pan is so thick or massive that blasting or special equipment is needed when excavations are made.

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.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to the formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to the formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

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 results in a severe hazard of corrosion. 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.

Water Features

Table 18 gives estimates of several important water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, 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 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 the table, 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, and water standing in swamps and marshes is considered ponding rather than flooding.

The table 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 (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

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 little or no horizon development.

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 estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are the depth to the seasonal high water table; the kind of water table—that is, perched, apparent, or artesian; 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 the table.

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. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(12)*. 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 on laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

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 Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

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; type of saturation; 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 Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup 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 taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, superactive, mesic Typic Hapludalfs.

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. There can be some variation in the texture of the surface layer or of the substratum 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" *(14)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(12)* and in "Keys to Soil Taxonomy" *(15)*. Unless otherwise stated, colors in the descriptions are for moist 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."

Alred Series

The Alred series consists of very deep, well drained, slowly permeable soils on uplands. These soils formed in gravelly colluvium over clayey residuum. Slopes range from 15 to 35 percent.

Soils of the Alred series are loamy-skeletal over clayey, siliceous, semiactive, mesic Typic Paleudalfs.

Typical pedon of Alred gravelly silt loam, 15 to 35 percent slopes, stony; USGS Summerfield topographic quadrangle; latitude 38 degrees 18 minutes 18 seconds N.; longitude 91 degrees 52 minutes 6 seconds W.; 200 feet north and 200 feet east of the southwest corner of sec. 7, T. 41 N., R. 8 W.

A—0 to 7 inches; brown (10YR 5/3) gravelly silt loam; moderate fine subangular blocky structure; friable; many very fine, fine, medium, and coarse roots; 18 percent chert gravel; very strongly acid; clear wavy boundary.

E—7 to 15 inches; brown (7.5YR 5/4) very gravelly loam; moderate fine angular blocky structure; friable; common very fine, fine, and medium roots; 40 percent chert gravel and 5 percent chert cobbles; very strongly acid; gradual wavy boundary.

Bt1—15 to 21 inches; strong brown (7.5YR 5/6) very gravelly loam; few fine distinct yellowish red (5YR 4/6) mottles; moderate fine angular blocky structure; firm; few fine and common medium roots; few faint clay films on faces of peds; 40 percent chert gravel and 5 percent chert cobbles; very strongly acid; clear wavy boundary.

2Bt2—21 to 28 inches; strong brown (7.5YR 5/6) gravelly clay; moderate fine angular blocky structure; firm; few fine and medium roots; common distinct clay films on faces of peds; 25 percent angular chert gravel; very strongly acid; gradual wavy boundary.

2Bt3—28 to 36 inches; strong brown (7.5YR 5/6) gravelly clay; common medium prominent red (2.5YR 4/6) mottles; moderate very fine subangular blocky structure; firm; few fine and medium roots; common distinct clay films on faces of peds; 15 percent chert gravel; very strongly acid; gradual wavy boundary.

2Bt4—36 to 47 inches; yellowish brown (10YR 5/6) cobbly clay; few fine prominent red (2.5YR 4/6) mottles; weak fine subangular blocky structure; firm; few fine and medium roots; common distinct clay films on faces of peds; 10 percent chert cobbles and 5 percent chert gravel; very strongly acid; clear wavy boundary.

2Bt5—47 to 66 inches; red (2.5YR 4/6) cobbly clay; few fine prominent yellowish brown (10YR 5/6) mottles; moderate fine and medium angular blocky structure; firm; few fine and medium roots; many prominent clay films on faces of peds; 10 percent chert cobbles and 10 percent chert gravel; very strongly acid; clear wavy boundary.

2Bt6—66 to 80 inches; red (2.5YR 4/6) clay; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium angular blocky; firm; few fine roots; many prominent clay films on faces of peds with redoximorphic concentrations on faces of 20 percent of peds; 10 percent chert gravel; neutral.

The Bt horizon is very gravelly or extremely gravelly silt loam or loam.

The 2Bt horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 3, 4, or 6.

Blake Series

The Blake series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Blake series are fine-silty, mixed, superactive, calcareous, mesic Aquic Udifluvents.

Typical pedon of Blake silt loam, 0 to 2 percent slopes, frequently flooded; USGS Mokane East topographic quadrangle; latitude 38 degrees 40 minutes 50 seconds N.; longitude 91 degrees 47 minutes 47 seconds W.; 5,000 feet north and 2,300 feet west of the southeast corner of sec. 10, T. 45 N., R. 8 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam with 30 percent dark grayish brown (10YR 4/2) mixings; weak fine subangular blocky structure; friable; slight effervescence; moderately alkaline; clear smooth boundary.

C1—7 to 41 inches; stratified dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure parting to weak fine subangular blocky; firm; slight effervescence; few fine prominent brown (7.5YR 4/4) irregularly shaped masses of iron accumulation below 20 inches; moderately alkaline; gradual smooth boundary.

C2—41 to 60 inches; stratified dark grayish brown (10YR 4/2), grayish brown (10YR 5/2), and very dark grayish brown (10YR 3/2) silt loam; weak coarse platy structure parting to weak medium subangular blocky; firm; strong effervescence; moderately alkaline.

The C horizon is highly stratified with values of 3 to 6 and chroma of 1 to 3. Texture of individual strata ranges from loamy fine sand to silty clay.

Cedargap Series

The Cedargap series consists of very deep, well drained, moderately slowly permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 3 percent.

Soils of the Cedargap series are loamy-skeletal, mixed, superactive, mesic Cumulic Hapludolls.

Typical pedon of Cedargap gravelly silt loam, 0 to 3 percent slopes, frequently flooded; USGS Westphalia East topographic quadrangle; latitude 38 degrees 28 minutes 15 seconds N.; longitude 91 degrees 55 minutes 41 seconds W.; 2,450 feet west and 1,900 feet south of the northeast corner of sec. 16, T. 43 N., R. 9 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) gravelly silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common very fine and fine roots; 10 percent chert gravel and 5 percent chert cobbles; neutral; clear smooth boundary.

A—9 to 18 inches; dark brown (10YR 3/3) very gravelly loam, brown (10YR 4/3) dry; weak very fine subangular blocky structure; firm; common very fine and fine roots; 45 percent chert gravel; neutral; clear smooth boundary.

Bw1—18 to 31 inches; very dark grayish brown (10YR 3/2) very gravelly sandy clay loam, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; firm; common very fine and fine roots; 45 percent chert gravel; neutral; gradual smooth boundary.

Bw2—31 to 49 inches; very dark grayish brown (10YR 3/2) very gravelly sandy clay loam, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; firm; few very fine roots; 40 percent chert gravel and 10 percent chert cobbles; neutral.

2C—49 to 60 inches; yellowish brown (10YR 5/6) clay; massive; firm; common distinct iron-manganese concentrations on faces of peds; common fine distinct dark yellowish brown (10YR 4/4) and common medium distinct brownish yellow (10YR 6/8) irregularly shaped masses of iron accumulation; many medium prominent white (10YR 8/1) iron depletions; 10 percent shale-like channers; neutral.

The 2C horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2, 3, or 6. It ranges from sandy clay loam to clay or the gravelly to very cobbly analogues of these textures.

Deible Series

The Deible series consists of very deep, poorly drained, very slowly permeable soils on high flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Deible series are fine, mixed, active, mesic Typic Albaqualfs.

Typical pedon of Deible silt loam, 0 to 2 percent slopes, rarely flooded; USGS Linn topographic quadrangle; latitude 38 degrees 24 minutes 47 seconds N.; longitude 91 degrees 47 minutes 41 seconds W.; 300 feet north and 400 feet west of the southeast corner of sec. 3, T. 42 N., R. 8 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak very thin platy structure; friable; common very fine roots; neutral; abrupt smooth boundary.

E—7 to 11 inches; light brownish gray (10YR 6/2) silt loam; weak thin platy structure parting to weak very fine subangular blocky; friable; common very fine roots; common faint discontinuous organic coats and common distinct discontinuous clay depletions on faces of peds; few fine iron-manganese concretions; slightly acid; clear smooth boundary.

Btg1—11 to 16 inches; grayish brown (10YR 5/2) silty clay loam; moderate very fine subangular blocky structure; firm; common very fine roots; common distinct discontinuous clay films on faces of peds; few fine iron-manganese concretions; few fine yellowish brown (10YR 5/6) masses of iron accumulation; moderately acid; gradual smooth boundary.

Btg2—16 to 24 inches; grayish brown (10YR 5/2) silty clay; common fine faint gray (10YR 5/1) mottles; moderate fine subangular blocky structure; firm; common very fine roots; many prominent continuous clay films on faces of peds; few fine iron-manganese concretions; common fine yellowish brown (10YR 5/4) masses of iron accumulation; neutral; gradual smooth boundary.

Btg3—24 to 34 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium prismatic structure; firm; common very fine roots; many prominent continuous clay films on faces of peds; common fine iron-manganese concretions; common fine yellowish brown (10YR 5/6) masses of iron accumulation; moderately alkaline; gradual smooth boundary.

Btg4—34 to 41 inches; grayish brown (2.5Y 5/2) silty clay; moderate medium subangular blocky structure; firm; common prominent discontinuous

clay films on faces of peds; common fine iron-manganese concretions; common fine yellowish brown (10YR 5/6) masses of iron accumulation; moderately alkaline; clear smooth boundary.

Btg5—41 to 52 inches; grayish brown (2.5Y 5/2) silty clay loam; moderate medium subangular blocky structure; firm; common prominent discontinuous clay films on faces of peds; common fine iron-manganese concretions; common fine yellowish brown (10YR 5/6) and few fine brownish yellow (10YR 6/8) masses of iron accumulation; moderately alkaline; clear smooth boundary.

Btg6—52 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; moderate medium subangular blocky structure; firm; common distinct discontinuous clay films on faces of peds; few fine iron-manganese concretions; few fine brownish yellow (10YR 6/6) masses of iron accumulation; moderately alkaline.

The Ap horizon has value of 4 or 5.

The Btg horizon and the 2Btg horizon, where present, have hue of 10YR or 2.5Y and value of 4 to 6. Texture is silty clay loam or silty clay.

Dockery Series

The Dockery series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Dockery series are fine-silty, mixed, superactive, nonacid, mesic Aquic Udifluvents.

Typical pedon of Dockery silt loam, 0 to 2 percent slopes, frequently flooded; USGS Cooper Hill topographic quadrangle; latitude 38 degrees 26 minutes 10 seconds N.; longitude 91 degrees 41 minutes 35 seconds W.; 2,500 feet east and 1,075 feet south of the northwest corner of sec. 34, T. 43 N., R. 7 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many very fine and few fine roots; neutral; abrupt smooth boundary.

C1—8 to 28 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3 and 10YR 5/3) silt loam; weak coarse bedding planes with thin discontinuous brown (10YR 5/3) strata; weak very fine subangular blocky structure within strata; friable; few very fine roots; common fine faint dark grayish brown (10YR 4/2) and common fine faint grayish brown (10YR 5/2) iron depletions; slightly acid; gradual smooth boundary.

C2—28 to 65 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3 and 5/3) silt loam; weak coarse bedding planes with thin discontinuous brown (10YR 5/3) strata; friable; common fine faint dark grayish brown (10YR 4/2) and common fine faint grayish brown (10YR 5/2) iron depletions; slightly acid.

The C horizon has value of 3 to 5 and chroma of 2 or 3.

Freeburg Series

The Freeburg series consists of very deep, somewhat poorly drained, moderately slowly permeable soils on high flood plains and footslopes. These soils formed in alluvium. Slopes range from 0 to 8 percent.

Soils of the Freeburg series are fine-silty, mixed, superactive, mesic Aquic Hapludalfs.

Typical pedon of Freeburg silt loam, 0 to 3 percent slopes, rarely flooded; USGS Westphalia West topographic quadrangle; latitude 38 degrees 27 minutes 48 seconds N.; longitude 92 degrees 4 minutes 12 seconds W.; 3,400 feet west and 4,550 feet north of the southeast corner of sec. 19, T. 43 N., R. 10 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common very fine roots; strongly acid; clear smooth boundary.

B/A—9 to 13 inches; brown (10YR 4/3) silt loam with common splotches of dark brown (10YR 3/3) mixed from the Ap; weak very fine subangular blocky structure; friable; few very fine roots; moderately acid; clear smooth boundary.

Bt1—13 to 19 inches; brown (10YR 4/3) silty clay loam; moderate very fine subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; few fine faint dark grayish brown (10YR 4/2) iron depletions; moderately acid; clear smooth boundary.

Bt2—19 to 30 inches; brown (10YR 4/3) silt loam; moderate very fine subangular blocky structure; firm; common distinct clay films on faces of peds; common fine faint dark grayish brown (10YR 4/2) iron depletions; neutral; clear smooth boundary.

Bt3—30 to 45 inches; brown (10YR 4/3) and dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; firm; common distinct clay films on faces of peds; moderately acid; clear smooth boundary.

Btg—45 to 52 inches; dark grayish brown (10YR 4/2) silt loam; moderate very fine subangular blocky structure; firm; common distinct clay films on faces of peds; few fine distinct dark yellowish brown (10YR 4/4) irregularly shaped masses of iron

accumulation; moderately acid; gradual smooth boundary.

2BCg—52 to 80 inches; dark gray (10YR 4/1) silty clay loam; moderate very fine subangular blocky structure; firm; few fine prominent dark yellowish brown (10YR 4/6) irregularly shaped masses of iron accumulation; moderately acid.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3 with dry value greater than 5.

The Bt horizon has value of 4 or 5 and chroma of 1 to 3. It is silt loam or silty clay loam.

Gabriel Series

The Gabriel series consists of very deep, poorly drained, moderately slowly permeable soils on high flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Gabriel series are fine-silty, mixed, superactive, mesic Typic Argiaquolls.

Typical pedon of Gabriel silt loam, 0 to 2 percent slopes, rarely flooded; USGS Linn topographic quadrangle; latitude 38 degrees 25 minutes 11 seconds N.; longitude 91 degrees 52 minutes 15 seconds W.; 1,600 feet west and 2,850 feet south of the northeast corner of sec. 1, T. 42 N., R. 9 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; common very fine roots; neutral; clear smooth boundary.

Btg1—10 to 17 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; friable; few very fine roots; common distinct clay films on faces of peds; common fine distinct dark yellowish brown (10YR 4/4) irregularly shaped masses of iron accumulation; slightly acid; clear smooth boundary.

Btg2—17 to 26 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak very fine subangular blocky structure; friable; few very fine roots; common distinct and few prominent clay films on faces of peds; common fine prominent light olive brown (2.5Y 5/4) irregularly shaped masses of iron accumulation; slightly acid; clear smooth boundary.

Btg3—26 to 36 inches; dark gray (10YR 4/1) silt loam; weak very fine subangular blocky structure; friable; common faint clay films on faces of peds; many fine prominent light olive brown (2.5Y 5/4) and few fine prominent light olive brown (2.5Y 5/6) irregularly shaped masses of iron accumulation; slightly acid; gradual smooth boundary.

Btg4—36 to 51 inches; dark gray (10YR 4/1) silt loam; weak very fine subangular blocky structure; friable; common faint clay films on faces of peds; common fine prominent light olive brown (2.5Y 5/4) and few fine prominent light olive brown (2.5Y 5/6) irregularly shaped masses of iron accumulation; slightly acid; clear smooth boundary.

Btg5—51 to 60 inches; grayish brown (2.5Y 5/2) silt loam; weak very fine subangular blocky structure; friable; common prominent dark gray (10YR 4/1) clay films on faces of peds; few fine prominent yellowish brown (10YR 5/6) and common fine prominent light olive brown (2.5Y 5/6) irregularly shaped masses of iron accumulation; slightly acid.

The Btg horizon has hue of 10YR and 2.5Y, value or 3 to 5, and chroma of 1 or 2. It is silt loam or silty clay loam.

Gatewood Series

The Gatewood series consists of moderately deep, moderately well drained, slowly permeable soils on uplands. These soils formed in clayey residuum from dolomite. Slopes range from 3 to 50 percent.

Soils of the Gatewood series are very fine, mixed, active, mesic Oxyaquic Hapludalfs.

Typical pedon of Gatewood very gravelly silt loam, 15 to 35 percent slopes, stony; USGS Fredericksburg topographic quadrangle; latitude 38 degrees 39 minutes 10 seconds N.; longitude 91 degrees 36 minutes 23 seconds W.; 2,000 feet south and 600 feet west of the northeast corner of sec. 36, T. 45 N., R. 7 W.

A—0 to 2 inches; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) very gravelly silt loam, gray (10YR 5/1) dry; weak fine granular structure; very friable; many very fine and common fine roots; 40 percent chert gravel; neutral; clear smooth boundary.

E—2 to 10 inches; brown (10YR 5/3) very gravelly silt loam; weak very fine granular structure; very friable; few very fine and common fine roots; 45 percent chert gravel and 5 percent chert cobbles; neutral; clear smooth boundary.

2Bt1—10 to 19 inches; red (2.5YR 4/6) clay; moderate fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; common fine prominent brown (7.5YR 5/4) irregularly shaped masses of iron accumulation; 5 percent chert gravel; moderately acid; clear smooth boundary.

2Bt2—19 to 28 inches; dark yellowish brown (10YR 4/4) clay; moderate fine subangular blocky structure; firm; few fine and medium roots;

common fine soft iron-manganese nodules; common distinct clay films and common fine iron-manganese concentrations on faces of peds; common fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; neutral; gradual smooth boundary.

2R—28 inches; dolomite.

The depth to bedrock ranges from 20 to 38 inches.

The A horizon has value of 3 to 5 and chroma of 1 or 2. It is gravelly silt loam or very gravelly silt loam.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is silt loam, loam, sandy loam, or the gravelly to extremely cobbly analogues of these texture.

The 2Bt horizon has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 3, 4, 6, or 8, but chroma may be 2 just above bedrock. It is clay, gravelly clay, or very gravelly clay.

Gladden Series

The Gladden series consists of very deep, well drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 3 percent.

Soils of the Gladden series are coarse-loamy, siliceous, superactive, mesic Dystric Fluventic Eutrudepts.

Typical pedon of Gladden loam, 0 to 3 percent slopes, frequently flooded; USGS Luystown topographic quadrangle; latitude 38 degrees 31 minutes 57 seconds N.; longitude 91 degrees 51 minutes 54 seconds W.; 200 feet west and 100 feet south of the northeast corner of sec. 36, T. 44 N., R. 9 W.

Ap—0 to 6 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many very fine roots; slightly acid; clear smooth boundary.

Bw1—6 to 21 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; common very fine roots; neutral; gradual smooth boundary.

Bw2—21 to 30 inches; yellowish brown (10YR 5/4) silt loam; common fine faint dark brown (10YR 3/3) mixings; weak very fine subangular blocky structure; friable; few very fine roots; neutral; gradual smooth boundary.

Bw3—30 to 38 inches; brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; friable; few very fine roots; neutral; clear wavy boundary.

2C—38 to 60 inches; dark yellowish brown (10YR 3/4) extremely gravelly sand; single grained; loose; 75 percent chert gravel; neutral.

The A horizon has value of 3 or 4 and chroma of 2 or 3.

The Bw horizon has value of 3 to 5 and chroma of 3 or 4.

The 2C horizon has value of 3 to 5 and chroma of 3 or 4. Texture ranges from silt loam to extremely gravelly sand.

Gravois Series

The Gravois series consists of very deep, moderately well drained, slowly permeable soils on uplands. These soils formed in loess and residuum from dolomite. Slopes range from 3 to 35 percent.

Soils of the Gravois series are fine-silty, mixed, active, mesic Aquic Paleualfs.

Typical pedon of Gravois silt loam, 8 to 15 percent slopes; USGS Freeburg topographic quadrangle; latitude 38 degrees 15 minutes 28 seconds N.; longitude 91 degrees 57 minutes 9 seconds W.; 1,050 feet south and 1,650 feet east of the northwest corner of sec. 32, T. 41 N., R. 9 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam: weak fine granular structure; friable; many very fine and fine and common medium roots; common very fine vesicular pores with low continuity; moderately acid; clear smooth boundary.

BE—5 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; firm; common very fine and fine roots; common very fine and fine vesicular pores with low continuity; moderately acid; clear smooth boundary.

Bt—10 to 19 inches; dark yellowish brown (10YR 4/6) silty clay loam; few fine distinct brown (10YR 5/3) irregular mottles; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; common very fine and fine roots; few fine vesicular pores with low continuity; common distinct discontinuous clay films on faces of peds; 2 percent angular chert gravel; strongly acid; gradual smooth boundary.

2Btx1—19 to 26 inches; light yellowish brown (10YR 6/4) silty clay loam; moderate fine prismatic structure parting to moderate angular blocky structure; firm; 30 percent brittle; common very fine and fine roots; many very fine vesicular pores with moderate continuity; common distinct continuous clay films and common prominent discontinuous iron-manganese stains on faces of peds; many medium prominent yellowish red (5YR 4/6) iron accumulations; 2 percent angular chert gravel; strongly acid; gradual smooth boundary.

2Btx2—26 to 34 inches; light brownish gray (10YR 6/2) silty clay loam; moderate medium prismatic structure parting to moderate fine angular blocky; firm; 30 percent brittle; common very fine and few fine roots; many very fine vesicular pores with moderate continuity; common prominent continuous clay films and common prominent discontinuous very dusky red (2.5YR 2/2) iron-manganese stains on ped faces; many medium prominent strong brown (7.5YR 5/6) and common fine prominent yellowish red (5YR 4/6) irregular iron accumulations; 10 percent angular chert gravel; strongly acid; clear wavy boundary.

3Bt1—34 to 42 inches; 50 percent brown (10YR 5/3) and 40 percent strong brown (7.5YR 4/6) very gravelly clay; moderate medium prismatic structure parting to moderate fine angular; firm; few very fine roots; few very fine and fine vesicular pores with low continuity; common distinct discontinuous clay films and common prominent discontinuous very dusky red (2.5YR 2/2) iron-manganese stains on faces of peds; common fine distinct light brownish gray (10YR 6/2) iron depletions; 50 percent angular and 5 percent subangular chert gravel; strongly acid; clear wavy boundary.

3Bt2—42 to 51 inches; 60 percent yellowish brown (10YR 5/4) and 40 percent reddish brown (5YR 5/4) very gravelly clay; weak fine angular blocky structure; firm; few very fine vesicular pores with low continuity; common distinct discontinuous clay films and common prominent discontinuous very dusky red (2.5YR 2/2) iron-manganese stains on faces of peds; 50 percent angular gravel; neutral; clear wavy boundary.

3Bt3—51 to 60 inches; yellowish brown (10YR 5/6) clay; moderate fine prismatic structure parting to weak fine angular blocky; firm; few fine vesicular pores with low continuity; common distinct continuous clay films and common distinct prominent discontinuous very dusky red (2.5YR 2/2) iron-manganese stains on faces of peds; common fine faint strong brown (7.5YR 5/6) irregular iron accumulations; 5 percent angular chert gravel; slightly acid; clear wavy boundary.

3Bt4—60 to 73 inches; brownish yellow (10YR 6/8) extremely gravelly clay; common medium prominent light yellowish brown (10YR 6/4) irregular mottles; weak fine angular blocky structure; firm; few very fine vesicular pores with low continuity; common distinct discontinuous clay films and common prominent discontinuous very dusky red (2.5YR 2/2) iron-manganese stains on faces of peds; 50 percent angular gravel and 25 percent angular cobbles; slightly alkaline; abrupt irregular boundary.

The Ap horizon has value or 4 or 5 and chroma of 2 or 3.

The BE horizon has chroma of 3 or 4.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3, 4, 6, or 8. It is silt loam or silty clay loam.

The 2Btx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2, 3, 4, or 6. It is silt loam, loam, silty clay loam, or the very gravelly or extremely gravelly analogues of these textures.

The 3Bt horizon has hue of 10YR to 2.5YR, value of 3 to 6, and chroma of 2, 3, 4, 6, or 8. It is silty clay loam, silty clay, clay, or the gravelly to extremely gravelly analogues of these textures.

The 4Bt horizon, where present, is very cobbly clay.

Gunlock Series

The Gunlock series consists of very deep, moderately well drained, slowly permeable soils on uplands. These soils formed in loess and residuum from dolomite. Slopes range from 3 to 8 percent.

Soils of the Gunlock series are fine, mixed, active, mesic Fragic Oxyaquic Hapludalfs.

Typical pedon of Gunlock silt loam, 3 to 8 percent slopes; USGS Summerfield topographic quadrangle; latitude 38 degrees 18 minutes 14 seconds N.; longitude 91 degrees 46 minutes 31 seconds W.; 100 feet north and 300 feet east of the southwest corner of sec. 12, T. 41 N., R. 8 W.

Ap1—0 to 6 inches; brown (10YR 4/3) silt loam; weak thin platy structure parting to moderate fine granular; friable; many very fine and fine roots; many fine vesicular pores with moderate continuity; slightly acid; clear smooth boundary.

Ap2—6 to 11 inches; brown (brown 4/3) silt loam; weak medium subangular blocky structure parting to weak fine granular; friable; many very fine and common fine roots; many very fine vesicular pores with moderate continuity; neutral; clear smooth boundary.

Bt1—11 to 18 inches; dark yellowish brown (10YR 4/6) silty clay loam; common fine distinct yellowish brown (10YR 4/4) irregular mottles; moderate medium angular blocky structure; firm; common very fine and fine roots; common very fine vesicular pores with moderate continuity; few distinct discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—18 to 24 inches; 85 percent strong brown (7.5YR 4/6) and 15 percent yellowish brown (10YR 5/4) silty clay loam; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; common very fine and fine roots; common very fine vesicular pores with moderate continuity; few prominent continuous yellowish brown (10YR 5/4) clay films on faces of peds; slightly acid; clear smooth boundary.

2Btx1—24 to 36 inches; strong brown (7.5YR 4/6) silty clay loam; common fine prominent pale brown (10YR 6/3) irregular mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; firm; 30 percent brittle; common very fine and fine roots in gray seams; common fine vesicular pores with moderate continuity; common prominent continuous light brownish gray (10YR 6/2) clay films and common prominent discontinuous dark brown (7.5YR 3/2) iron-manganese stains on faces of peds; light brownish gray (10YR 6/2) iron depletions; very strongly acid; clear smooth boundary.

2Btx2—36 to 45 inches; 50 percent grayish brown (10YR 5/2) and 50 percent strong brown (7.5YR 5/6) silt loam; weak medium prismatic structure; very firm; 40 percent brittle; few very fine roots in gray seams; common fine vesicular pores with moderate continuity; few prominent discontinuous light brownish gray (10YR 6/2) clay films and dark reddish brown (5YR 3/2) iron-manganese stains on faces of peds; very strongly acid; gradual smooth boundary.

2Btx3—45 to 52 inches; 80 percent strong brown (7.5YR 4/6) and 20 percent brown (10YR 5/3) silt loam; weak medium prismatic structure; very firm; 50 percent brittle; common fine vesicular pores with moderate continuity; few prominent discontinuous dark brown (10YR 3/3) clay films and very dark grayish brown (10YR 3/2) iron-manganese stains on faces of peds; 5 percent subrounded chert gravel; few medium old root channels filled with dark grayish brown (10YR 4/2) organic coats; slightly acid; clear smooth boundary.

3Bt1—52 to 57 inches; 75 percent strong brown (7.5YR 5/6) and 25 percent yellowish brown (10YR 5/4) extremely gravelly silty clay; moderate fine angular blocky structure; very firm; few fine vesicular pores with low continuity; few distinct discontinuous yellowish brown (10YR 5/4) clay films and few prominent discontinuous very dark grayish brown (10YR 3/2) iron-manganese stains on faces of peds; 45 percent subrounded chert gravel and 20 percent subangular chert cobbles; slightly alkaline; clear smooth boundary.

3Bt2—57 to 65 inches; 80 percent yellowish red (5YR 4/6) and 20 percent yellowish brown (10YR 5/6) silty clay; moderate fine prismatic structure parting to moderate fine angular blocky; firm; few fine vesicular pores with low continuity; few prominent discontinuous yellowish brown (10YR 5/4) clay films and dark reddish brown (5YR 3/2) iron-manganese stains on faces of peds; few medium old root channels filled with dark grayish brown (10YR 3/2) organic coats; moderately alkaline.

The Ap horizon has value of 3 to 6 and chroma of 2 to 4.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3, 4, or 6. It is silt loam or silty clay loam.

The 2Btx horizon has hue of 10YR or 7.5YR, value of 2 to 6, and chroma of 2, 3, 4, or 6. It is silt loam or silty clay loam.

The 3Bt horizon has hue of 10YR to 2.5YR, value of 3 to 6, and chroma of 3, 4, 6, or 8. It is silty clay loam, silty clay, clay, or the gravelly to extremely gravelly analogues of these textures.

Hartville Series

The Hartville series consists of very deep, somewhat poorly drained, slowly permeable soils on uplands. These soils formed in colluvium. Slopes range from 1 to 8 percent.

Soils of the Hartville series are fine, mixed, active, mesic Aquic Hapludalfs.

Typical pedon of Hartville silt loam, 3 to 8 percent slopes; USGS Fredericksburg topographic quadrangle; latitude 38 degrees 31 minutes 37 seconds N.; longitude 91 degrees 39 minutes 42 seconds W.; 400 feet south and 100 feet west of the northeast corner of sec. 35, T. 44 N., R. 7 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak very fine granular structure; common very fine and few fine roots; very friable; neutral; clear smooth boundary.

BE—7 to 12 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silt loam; weak very fine subangular blocky structure; friable; common very fine and few fine roots; slightly acid; clear smooth boundary.

Bt1—12 to 21 inches; brown (10YR 5/3) silty clay loam; moderate fine angular blocky structure; firm; common very fine and few fine roots; common distinct clay films and depletions on faces of peds; strongly acid; clear smooth boundary.

Bt2—21 to 31 inches; light brownish gray (10YR 6/2)

silty clay loam; firm; common very fine roots; common distinct dark yellowish brown (10YR 4/4) clay films and common iron-manganese concentrations on faces of peds; many fine distinct dark yellowish brown (10YR 4/4) irregularly shaped masses of iron accumulation; strongly acid; gradual smooth boundary.

Bt3—31 to 40 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium prismatic structure; firm; common distinct clay films and common iron-manganese concentrations on faces of peds; many fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; strongly acid; gradual smooth boundary.

Bt4—40 to 48 inches; yellowish brown (10YR 5/6) silty clay loam; weak fine prismatic structure; firm; few iron-manganese concentrations on faces of peds; common fine prominent grayish brown (10YR 5/2) iron depletions; common distinct dark yellowish brown (10YR 4/4) irregularly shaped masses of iron accumulation; few chert pebbles; slightly acid; gradual smooth boundary.

2C—48 to 80 inches; strong brown (7.5YR 5/6) silty clay loam; massive; firm; common medium prominent brown (7.5YR 5/2) iron depletions; 5 percent chert gravel; few iron-manganese concentrations with diffuse boundaries; slightly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The Bt horizon has value of 4 to 7 and chroma of 2, 3, 4, or 6.

The 2C horizon has value of 4 or 5 and chroma of 2, 3, 4, or 6.

Haynie Series

The Haynie series consists of very deep, well drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Haynie series are coarse-silty, mixed, superactive, calcareous, mesic Mollic Udifluvents.

Typical pedon of Haynie silt loam, 0 to 2 percent slopes, occasionally flooded; USGS Morrison topographic quadrangle; latitude 38 degrees 41 minutes 34 seconds N.; longitude 91 degrees 39 minutes 1 second W.; 1,450 feet north and 2,900 feet west of the southeast corner of sec. 36, T. 46 N., R. 7 W.

Ap—0 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; few very fine and fine roots; slight effervescence; moderately alkaline; clear smooth boundary.

C1—16 to 35 inches; weakly stratified pale brown (10YR 6/3) very fine sandy loam; single grained; loose; few very fine and fine roots; strong effervescence; moderately alkaline; clear smooth boundary.

C2—35 to 64 inches; weakly stratified brown (10YR 5/3) very fine sandy loam; massive; very friable; few very fine and fine roots; violent effervescence; moderately alkaline.

The C horizon has hue of 10YR or 2.5YR and value of 5 or 6.

Jamesfin Series

The Jamesfin series consists of very deep, well drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 3 percent.

Soils of the Jamesfin series are fine-silty, mixed, active, mesic Dystric Fluventic Eutrudepts.

Typical pedon of Jamesfin silt loam, 0 to 3 percent slopes, occasionally flooded; USGS Fredericksburg topographic quadrangle; latitude 38 degrees 30 minutes 52 seconds N.; longitude 91 degrees 37 minutes 50 seconds W.; 400 feet north and 2,450 feet east of the southwest corner of sec. 35, T. 44 N., R. 7 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common very fine and few fine roots; moderately acid; abrupt smooth boundary.

Bw1—10 to 23 inches; dark brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; very friable; few very fine roots; slightly acid; clear smooth boundary.

Bw2—23 to 33 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; very friable; few very fine roots; slightly acid; gradual smooth boundary.

Bw3—33 to 47 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; few very fine roots; slightly acid; gradual smooth boundary.

Bw4—47 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; few fine faint yellowish brown (10YR 5/4) irregularly shaped masses of iron accumulation; slightly acid.

The Ap horizon has chroma of 2 or 3.

The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3, 4, or 6. It is silt loam or silty clay loam.

Jemerson Series

The Jemerson series consists of very deep, well drained, moderately permeable soils on high flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Jemerson series are fine-silty, mixed, superactive, mesic Typic Hapludalfs.

Typical pedon of Jemerson silt loam, 0 to 2 percent slopes, rarely flooded; USGS Westphalia East topographic quadrangle; latitude 38 degrees 28 minutes 3 seconds N.; longitude 91 degrees 55 minutes 43 seconds W.; 750 feet north and 2,400 feet west of the southeast corner of sec. 16, T. 43 N., R. 9 W.

A—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common very fine and fine roots; strongly acid; clear smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak very fine subangular blocky structure; friable; few very fine roots; common distinct clay films on faces of peds; moderately acid; clear smooth boundary.

Bt2—15 to 27 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; firm; few very fine roots; moderately acid; gradual smooth boundary.

Bt3—27 to 41 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine prismatic structure; firm; common distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt4—41 to 50 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine prismatic structure; firm; common distinct clay films on faces of peds; strongly acid; clear smooth boundary.

2C—50 to 60 inches; yellowish brown (10YR 5/4) gravelly loam; massive; firm; few distinct iron-manganese concentrations with diffuse boundaries; 25 percent chert gravel; strongly acid.

The A horizon has chroma of 2 or 3.

The Bt horizon has value of 4 or 5 and chroma of 3 or 4. It is silt loam or silty clay loam.

The 2C horizon has hue of 4 or 5 and chroma of 3 or 4.

Kaintuck Series

The Kaintuck series consists of very deep, well drained, moderately rapidly permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 3 percent.

Soils of the Kaintuck series are coarse-loamy, siliceous, superactive, nonacid, mesic Typic Udifluvents.

Typical pedon of Kaintuck fine sandy loam, 0 to 3 percent slopes, frequently flooded; USGS Linn topographic quadrangle; latitude 38 degrees 22 minutes 37 seconds N.; longitude 91 degrees 46 minutes 49 seconds W.; 1,400 feet west and 2,200 feet south of the northeast corner of sec. 23, T. 42 N., R. 8 W.

Ap—0 to 10 inches; dark brown (10YR 3/3) fine sandy loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; very friable; many very fine and few fine roots; moderately acid; abrupt smooth boundary.

C—10 to 61 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3 and 5/3) silt loam, loam, fine sandy loam, and fine sand; massive; friable; common very fine (10 to 18 inches) and few very fine (18 to 35 inches) roots; slightly acid.

The Ap horizon has value or 3 or 4.

Leta Series

The Leta series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in alluvium. Permeability is slow in the upper part and moderate in the lower part. Slopes range from 0 to 2 percent.

Soils of the Leta series are clayey over loamy, smectitic, mesic Fluvaquentic Hapludolls.

Typical pedon of Leta silty clay, 0 to 2 percent slopes, occasionally flooded; USGS Morrison topographic quadrangle; latitude 38 degrees 41 minutes 9 seconds N.; longitude 91 degrees 39 minutes 37 seconds W.; 1,350 feet south and 455 feet west of the northeast corner of sec. 2, T. 45 N., R. 7 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; weak fine granular structure; firm; common very fine and fine roots; neutral; clear smooth boundary.

Bg1—10 to 20 inches; dark grayish brown (2.5Y 4/2) silty clay loam; weak very fine subangular blocky structure; firm; few very fine roots; few fine prominent dark yellowish brown (10YR 3/4) irregularly shaped masses of iron accumulation; few fine prominent grayish brown (10YR 5/2) iron depletions; slightly acid; clear smooth boundary.

Bg2—20 to 24 inches; dark grayish brown (2.5Y 4/2) silt loam; weak very fine subangular blocky structure; friable; few very fine roots; few fine prominent dark yellowish brown (10YR 3/4) irregularly shaped masses of iron accumulation;

few fine prominent grayish brown (10YR 5/2) iron depletions; neutral; clear smooth boundary.

2C1—24 to 31 inches; stratified light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) very fine sandy loam; few very fine roots; very friable; few fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; slightly alkaline; clear smooth boundary.

2C2—31 to 52 inches; stratified grayish brown (10YR 5/2) and gray (10YR 6/1) silt loam; weak very fine platy structure; very friable; strong effervescence; common medium prominent dark yellowish brown (10YR 4/6) irregularly shaped masses of iron accumulation; moderately alkaline; abrupt smooth boundary.

2C3—52 to 60 inches; stratified light brownish gray (10YR 6/2) loamy very fine sand; single grained; loose; strong effervescence; moderately alkaline.

The Ap horizon has chroma of 1 or 2. It is silt loam or silty clay.

The Bg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It is silt loam, silty clay loam, or silty clay.

The 2C horizon has value of 4 to 6 and chroma of 2. It is very fine sandy loam, silt loam, or loamy very fine sand.

Marion Series

The Marion series consists of very deep, somewhat poorly drained, very slowly permeable soils on uplands. These soils formed in loess. Slopes range from 2 to 5 percent.

Soils of the Marion series are fine, smectitic, mesic Aquertic Chromic Hapludalfs.

Typical pedon of Marion silt loam, 2 to 5 percent slopes; USGS Luystown topographic quadrangle; latitude 38 degrees 35 minutes 49 seconds N.; longitude 91 degrees 45 minutes 57 seconds W.; 2,000 feet north and 1,600 feet east of the southwest corner of sec. 1, T. 44 N., R. 8 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; many very fine and common fine roots; common fine iron-manganese concentrations on faces of peds; very strongly acid; abrupt smooth boundary.

E—6 to 10 inches; light gray (10YR 7/2) silt loam; moderate fine granular structure; very friable; few very fine roots; few fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; very strongly acid; clear smooth boundary.

Bt1—10 to 17 inches; yellowish brown (10YR 5/4) silty clay; moderate fine subangular blocky structure; firm; few very fine roots; common distinct clay films and few fine iron-manganese concentrations on faces of peds; many fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; common fine distinct gray (10YR 5/1) iron depletions; very strongly acid; clear smooth boundary.

Bt2—17 to 25 inches; yellowish brown (10YR 5/4) silty clay; moderate fine subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; common fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; very strongly acid; clear smooth boundary.

Btg1—25 to 32 inches; grayish brown (10YR 5/2) silty clay loam; moderate fine subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; common fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; very strongly acid; gradual smooth boundary.

Btg2—32 to 39 inches; grayish brown (10YR 5/2) silty clay loam; weak fine subangular blocky structure; friable; few very fine roots; common faint clay films and common fine iron-manganese concentrations on faces of peds; few fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; very strongly acid; gradual smooth boundary.

2Btg3—39 to 49 inches; grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; few very fine roots; common faint clay films and common fine iron-manganese concentrations on faces of peds; few fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; strongly acid; clear smooth boundary.

2Btg4—49 to 56 inches; light brownish gray (10YR 6/2) silt loam; weak fine platy structure parting to weak fine subangular blocky; very firm; 20 percent brittle; few faint clay films and common fine iron-manganese concentrations on faces of peds; many medium light yellowish brown (10YR 6/4) and few fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; slightly acid; abrupt smooth boundary.

3Btg5—56 to 65 inches; dark grayish brown (10YR 4/2) silty clay; moderate fine subangular blocky structure; very firm; common distinct clay films and few fine iron-manganese concentrations on faces of peds; slightly acid.

The Ap horizon has chroma of 2 or 3.

The Bt horizon has value of 4 to 6 and chroma of 3 or 4.

The Btg horizon has value of 5 or 6 and chroma of 1 or 2. It is silty clay loam or silty clay.

The 2Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam or silty clay loam.

The 3Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or silty clay.

Mariosa Series

The Mariosa series consists of very deep, poorly drained, very slowly permeable soils on uplands. These soils formed in loess and colluvium. Slopes range from 0 to 2 percent.

Soils of the Mariosa series are fine, smectitic, mesic Chromic Vertic Albaqualfs.

Typical pedon of Mariosa silt loam, 0 to 2 percent slopes; USGS Highgate topographic quadrangle; latitude 38 degrees 10 minutes 34 seconds N.; longitude 91 degrees 41 minutes 41 seconds W.; 2,400 feet south and 1,500 feet east of the northwest corner of sec. 27, T. 40 N., R. 7 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many very fine and fine and few medium roots; common very fine and fine vesicular pores with moderate continuity; slightly alkaline; abrupt smooth boundary.

E—7 to 11 inches; grayish brown (10YR 5/2) silt loam; weak very fine subangular blocky structure; friable; many very fine and common fine roots; common very fine and fine vesicular pores with moderate continuity; common fine prominent yellowish brown (10YR 5/6) and common fine faint brown (10YR 5/3) irregularly shaped masses of iron accumulation; neutral; abrupt wavy boundary.

Btg1—11 to 20 inches; grayish brown (10YR 5/2) silty clay; moderate fine subangular blocky structure; firm; common very fine and fine roots; few very fine vesicular pores with low continuity; common distinct continuous clay films on faces of peds; common medium prominent reddish brown (2.5YR 4/4) irregularly shaped masses of iron accumulation; very strongly acid; clear wavy boundary.

Btg2—20 to 28 inches; grayish brown (10YR 5/2) silty clay; moderate fine subangular blocky structure; firm; common very fine and few fine roots; few very fine vesicular pores with low continuity; common distinct continuous clay films on faces of peds; many medium prominent strong brown (7.5YR 4/6) irregularly shaped masses of iron accumulation; very strongly acid; clear smooth boundary.

Btg3—28 to 38 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium angular blocky structure; firm; common very fine roots; few very fine vesicular pores with low continuity; few distinct discontinuous clay films on faces of peds; common medium prominent strong brown (7.5YR 4/6) irregularly shaped masses of iron accumulation; strongly acid; clear smooth boundary.

2Btgx1—38 to 50 inches; light brownish gray (10YR 6/2) silt loam; moderate medium prismatic structure parting to moderate fine subangular blocky; very firm; 60 percent brittle; common very fine roots between peds; many very fine vesicular pores with low continuity; few faint discontinuous clay films on faces of peds; common medium prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; few chert gravel; moderately acid; gradual smooth boundary.

2Btgx2—50 to 80 inches; light brownish gray (10YR 6/2) silt loam; weak medium prismatic structure parting to weak fine subangular blocky; very firm; 60 percent brittle; few very fine roots between peds; many very fine pores with moderate continuity; few faint discontinuous clay films on faces of peds; many medium prominent yellowish brown (10YR 5/6) irregular redoximorphic concentrations; 5 percent subrounded chert gravel; slightly acid; gradual smooth boundary.

The Ap horizon has value of 4 or 5.

The E horizon has value of 5 or 6.

The Btg horizon has value of 5 or 6.

The 2Btgx horizon has value of 5 or 6 and chroma of 1 or 2. It is silt loam or silty clay loam.

McGirk Series

The McGirk series consists of very deep, poorly drained, slowly permeable soils on uplands. These soils formed in colluvium and alluvium. Slopes range from 1 to 3 percent.

Soils of the McGirk series are fine, smectitic, mesic Chromic Vertic Endoaqualfs.

Typical pedon of McGirk silt loam, 1 to 3 percent slopes; USGS Wardsville topographic quadrangle; latitude 38 degrees 28 minutes 8 seconds N.; longitude 92 degrees 9 minutes 26 seconds W.; 950 feet north and 1,380 feet west of the southeast corner of sec. 17, T. 43 N., R. 11 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; common very fine and fine roots; neutral; clear smooth boundary.

Btg1—8 to 15 inches; dark gray (10YR 4/1) silty clay loam; weak very fine subangular blocky structure; firm; common very fine and fine roots; common distinct clay films on faces of peds; few fine distinct dark yellowish brown (10YR 4/4) irregularly shaped masses of iron accumulation; moderately acid; clear smooth boundary.

Btg2—15 to 24 inches; dark gray (10YR 4/1) silty clay; moderate very fine subangular blocky structure; firm; common very fine roots; common distinct clay films on faces of ped; common medium faint gray (10YR 5/1) and common fine prominent dark yellowish brown (10YR 3/6) irregularly shaped masses of iron accumulation; strongly acid; gradual smooth boundary.

Btg3—24 to 45 inches; dark gray (10YR 4/1) silty clay; weak very fine subangular blocky structure; firm; common very fine roots; common fine prominent dark yellowish brown (10YR 3/6) irregularly shaped masses of iron accumulation; strongly acid; gradual smooth boundary.

Btg4—45 to 80 inches; dark gray (10YR 4/1) silty clay; weak fine subangular blocky structure; firm; few very fine roots; common distinct clay films on faces of peds; few fine prominent dark yellowish brown (10YR 3/6) irregularly shaped masses of iron accumulation; strongly acid.

The Btg horizon has value of 4 or 5 and chroma of 1 or 2.

Menfro Series

The Menfro series consists of very deep, well drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 5 to 50 percent.

Soils of the Menfro series are fine-silty, mixed, superactive, mesic Typic Hapludalfs.

Typical pedon of Menfro silt loam, 5 to 9 percent slopes; USGS Morrison topographic quadrangle; latitude 38 degrees 40 minutes 26 seconds N.; longitude 91 degrees 41 minutes 2 seconds W.; 1,600 feet south and 1,950 feet west of the northeast corner of sec. 10, T. 45 N., R. 7 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable; many very fine and common fine roots; neutral; abrupt smooth boundary.

Bt1—6 to 11 inches; brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; friable; common very fine roots; few faint clay films on faces of peds; neutral; clear smooth boundary.

Bt2—11 to 19 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; common very fine roots; few faint clay films on faces of peds; common fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; neutral; gradual smooth boundary.

Bt3—19 to 34 inches; yellowish brown (10YR 5/4) silty clay loam; strong fine prismatic structure parting to strong medium angular blocky; firm; common very fine roots; common distinct clay films and few organic stains on faces of peds; common medium faint brown (7.5YR 5/4) irregularly shaped masses of iron accumulation; slightly acid; diffuse smooth boundary.

Bt4—34 to 43 inches; yellowish brown (10YR 5/6) silt loam; moderate medium prismatic structure; firm; few very fine roots; common distinct clay films and few organic stains on faces of peds; common medium prominent brown (7.5YR 5/4) irregularly shaped masses of iron accumulation; strongly acid; gradual smooth boundary.

Bt5—43 to 53 inches; yellowish brown (10YR 5/4) silt loam; moderate medium prismatic structure; firm; few very fine roots; common faint clay films and common organic stains on faces of peds; common fine distinct yellowish brown (10YR 5/6) and common fine faint brown (10YR 5/3) irregularly shaped masses of iron accumulation; strongly acid; diffuse smooth boundary.

Bt6—53 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium prismatic structure; firm; few very fine roots; common faint clay films and common organic stains on faces of peds; common fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; strongly acid.

The A or Ap horizon has value of 3 or 4 and chroma of 2 or 3.

The E or BE horizon, where present, has value of 4 or 5 and chroma of 3 or 4.

The Bt horizon has value of 4 or 5, and chroma of 3, 4, or 6.

Moko Series

The Moko series consists of very shallow and shallow, well drained, moderately permeable soils on uplands. These soils formed in loamy residuum over dolomite. Slopes range from 3 to 50 percent.

Soils of the Moko series are loamy-skeletal, mixed, superactive, mesic Lithic Hapludolls.

Typical pedon of Moko gravelly clay loam, in an area of Moko-Rock outcrop complex, 15 to 50 percent slopes, very stony; USGS Fredericksburg topographic quadrangle; latitude 38 degrees 36 minutes 53 seconds N.; longitude 91 degrees 38 minutes 43 seconds W.; 600 feet south and 1,200 feet west of the northeast corner of sec. 36, T. 45 N., R. 7 W.

A1—0 to 1 inches; black (10YR 2/1) gravelly clay loam; weak fine granular structure; friable; many very fine and fine roots; 16 percent chert gravel; neutral; abrupt smooth boundary.

A2—1 to 4 inches; black (10YR 2/1) gravelly clay loam; weak fine granular structure; friable; many very fine and fine roots; 30 percent chert gravel; slightly alkaline; clear smooth boundary.

A3—4 to 7 inches; black (10YR 2/1) very channery clay loam; weak fine granular structure; friable; common very fine and fine and few medium roots; 50 percent dolomite channers; slightly alkaline; abrupt wavy boundary.

R—7 inches; dolomite.

The depth to bedrock ranges from 6 to 20 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is loam, clay loam, or the gravelly or channery analogues of these textures.

Moville Series

The Moville series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in alluvium. Permeability is moderate in the upper part and very slow in the lower part. Slopes range from 0 to 2 percent.

Soils of the Moville series are coarse-silty over clayey, mixed, superactive, calcareous, mesic Aquic Udifluvents.

Typical pedon of Moville silt loam, 0 to 2 percent slopes, occasionally flooded; USGS Morrison topographic quadrangle; latitude 38 degrees 41 minutes 37 seconds N.; longitude 91 degrees 42 minutes 47 seconds W.; 700 feet north and 550 feet east of the southwest corner of sec. 33, T. 46 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many very fine, fine, and medium roots; slightly alkaline; clear smooth boundary.

C—8 to 27 inches; stratified grayish brown (10YR 5/2) and grayish brown (2.5Y 5/2) silt loam; weak fine and weak medium platy structure; very friable; common very fine, fine, and medium roots; slight effervescence; common fine faint brown (10YR 5/3) irregularly shaped masses of iron accumulation; slightly alkaline; clear smooth boundary.

2Ab—27 to 60 inches; very dark grayish brown (2.5Y 3/2) silty clay; common medium pockets of grayish brown (2.5Y 5/2) silt loam (from overlying C horizon disturbed by occasional very deep tillage) in upper few inches; moderate fine angular blocky structure; firm; few very fine roots; strong effervescence; slightly alkaline.

The C horizon has hue of 10YR or 2.5Y and value of 4 or 5.

The 2Ab horizon has hue of 2.5Y and value of 2 or 3.

Plato Series

The Plato series consists of very deep, somewhat poorly drained soils that have a fragipan in the subsoil. These soils are on uplands. These soils formed in a thin layer of loess and residuum. Permeability is moderately slow above the fragipan and very slow within the fragipan. Slopes range from 1 to 8 percent.

Soils of the Plato series are fine, mixed, active, mesic Aquic Fragiudalfs.

Typical pedon of Plato silt loam, 3 to 8 percent slopes; USGS Cooper Hill topographic quadrangle; latitude 38 degrees 25 minutes 19 seconds N.; longitude 91 degrees 39 minutes 19 seconds W.; 500 feet south and 1,300 feet east of the northwest corner of sec. 1, T. 42 N., R. 7 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam; moderate fine granular structure; friable; many very fine and common fine roots; strongly acid; abrupt smooth boundary.

Bt—8 to 20 inches; yellowish brown (10YR 5/4) silty clay; moderate fine subangular blocky structure; firm; common very fine roots; common distinct clay films on faces of peds; common fine light gray (10YR 7/1) clay depletions; common fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; very strongly acid; clear smooth boundary.

2Btx1—20 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine platy structure parting to moderate very fine subangular blocky; very firm; 65 percent brittle; few very fine roots; common fine iron-manganese concentrations on faces of peds; common faint clay films in vertical streaks 3 to 8 inches apart on faces of peds; common fine distinct gray (10YR 5/1) iron depletions; very strongly acid; gradual smooth boundary.

2Btx2—36 to 48 inches; yellowish brown (10YR 5/4) extremely gravelly silt loam; weak very fine subangular blocky structure; very firm; 65 percent brittle; few faint clay films and few fine iron-manganese concentrations on faces of peds; 70 percent chert gravel; moderately acid; clear smooth boundary.

3Bt—48 to 60 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; firm; common prominent clay films on faces of peds; common fine prominent strong brown (7.5YR 5/6) irregularly shaped masses of iron accumulation; 5 percent chert gravel; moderately acid.

The depth to the fragipan ranges from 20 to 36 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4.

The E horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 3 or 4.

The Bt horizon has value of 4 to 6 and chroma of 2, 3, 4, or 6. It is silty clay loam or silty clay.

The 2Btx horizon has value of 4 to 6 and chroma of 1 to 4. It is silt loam, extremely gravelly silt loam, or silty clay loam.

The 3Bt horizon has hue of 10YR, 7.5YR, or 2.5YR, value of 3 to 6, and chroma of 4 or 6.

Possumtrot Series

The Possumtrot series consists of very deep, well drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 3 percent.

Soils of the Possumtrot series are coarse-loamy, siliceous, superactive, mesic Fluventic Dystrudepts.

Typical pedon of Possumtrot fine sandy loam, 0 to 3 percent slopes, occasionally flooded; USGS Cooper Hill topographic quadrangle; latitude 38 degrees 29 minutes 2 seconds N.; longitude 91 degrees 38 minutes 41 seconds W.; 500 feet south and 450 feet west of the northeast corner of sec. 13, T. 43 N., R. 7 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; many brown (10YR 4/3) mixings; weak fine granular structure; very friable; many very fine and common fine roots; neutral; clear smooth boundary.

Bw1—9 to 17 inches; brown (10YR 4/3) fine sandy loam; moderate very fine subangular blocky structure; very friable; common very fine roots; slightly acid; clear smooth boundary.

Bw2—17 to 37 inches; brown (10YR 4/3) fine sandy loam; weak very fine subangular blocky structure; very friable; few very fine roots; slightly acid; clear smooth boundary.

Bw3—37 to 52 inches; dark brown (10YR 3/3) fine sandy loam; moderate very fine subangular blocky structure; very friable; few very fine roots; slightly acid; clear smooth boundary.

Bw4—52 to 60 inches; brown (10YR 4/3) fine sandy loam; weak very fine subangular blocky structure; friable; neutral.

The Bw horizon has value of 3 or 4. It is fine sandy loam or loam.

The 2C horizon, where present, has value of 4 or 5 and chroma of 3, 4, or 6. It ranges from fine sandy loam to fine sand or the gravelly analogues of these textures.

Racoon Series

The Racoon series consists of very deep, poorly drained, slowly permeable soils on high flood plains. These soils formed in alluvium. Slopes range from 0 to 3 percent.

Soils of the Racoon series are fine-silty, mixed, superactive, mesic Typic Endoaqualfs.

Typical pedon of Racoon silt loam, 0 to 3 percent slopes, rarely flooded; USGS Cooper Hill topographic quadrangle; latitude 38 degrees 28 minutes 52 seconds N.; longitude 91 degrees 38 minutes 59 seconds W.; 1,450 feet south and 2,600 feet east of the northwest corner of sec. 13, T. 43 N., R. 7 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable; many very fine and common fine roots; neutral; clear smooth boundary.

Eg1—6 to 15 inches; light brownish gray (10YR 6/2) silt loam; weak very fine subangular blocky structure; very friable; common fine roots; common fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; neutral; gradual smooth boundary.

Eg2—15 to 26 inches; light brownish gray (10YR 6/2) silt loam; weak very fine subangular blocky

structure; very friable; few very fine roots; common fine iron-manganese nodules with distinct boundaries; common faint light gray (10YR 7/2) clay depletions; common fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; strongly acid; gradual smooth boundary.

Btg1—26 to 48 inches; grayish brown (10YR 5/2) silty clay loam; moderate fine subangular blocky structure; friable; few very fine roots; common distinct clay films on faces of peds; common faint light gray (10YR 7/2) clay depletions; common fine prominent yellowish brown (10YR 5/6) and few medium faint brown (10YR 5/3) irregularly shaped masses of iron accumulation; very strongly acid; clear smooth boundary.

Btg2—48 to 60 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; many fine iron-manganese nodules with distinct boundaries (heavy accumulation at horizon base); common fine prominent dark yellowish brown (10YR 4/6) and few fine prominent yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; common faint light gray (10YR 7/2) clay depletions; strongly acid.

The Ap horizon has value of 4 or 5.

The Btg horizon has value of 4 or 5 and chroma of 1 or 2.

Rueter Series

The Rueter series consists of very deep, somewhat excessively drained, moderately permeable soils on uplands. These soils formed in colluvium from interbedded cherty dolomite and sandstone and residuum from dolomite. Slopes range from 8 to 35 percent.

Soils of the Rueter series are loamy-skeletal, siliceous, active, mesic Typic Paleudalfs.

Typical pedon of Rueter very gravelly silt loam, 15 to 35 percent slopes, very stony; USGS Westphalia West topographic quadrangle; latitude 38 degrees 23 minutes 52 seconds N.; longitude 92 degrees 6 minutes 50 seconds W.; 1,700 feet north and 1,300 feet east of the southwest corner of sec. 11, T. 42 N., R. 11 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) very gravelly silt loam; weak very fine subangular blocky structure parting to moderate fine granular structure; very friable; many very fine, fine, and coarse and common medium roots; 35 percent chert gravel; extremely acid; clear smooth boundary.

E—3 to 14 inches; brown (10YR 5/3) very gravelly silt loam; weak very fine subangular blocky structure; very friable; many fine and common very fine and coarse roots; 45 percent chert gravel; very strongly acid; clear wavy boundary.

Bt1—14 to 25 inches; yellowish brown (10YR 5/4) extremely cobbly loam; weak very fine subangular blocky structure; friable; common very fine, fine, and medium roots; common faint clay films on faces of peds; 30 percent chert gravel and 30 percent chert cobbles; very strongly acid; clear wavy boundary.

Bt2—25 to 35 inches; yellowish brown (10YR 5/6) very gravelly loam; weak very fine subangular blocky structure; friable; common very fine and fine and few medium roots; common faint clay films on faces of peds; 40 percent chert gravel and 10 percent chert cobbles; very strongly acid; clear wavy boundary.

Bt3—35 to 45 inches; yellowish brown (10YR 5/6) very gravelly sandy clay loam; weak very fine subangular blocky structure; friable; few very fine, fine, and medium roots; common faint and few distinct clay films on faces of peds; 40 percent chert gravel and 10 percent chert cobbles; very strongly acid; clear wavy boundary.

2Bt4—45 to 55 inches; strong brown (7.5YR 5/6), red (2.5YR 4/6), and grayish brown (10YR 5/2) clay; moderate fine subangular blocky structure; firm; few very fine and fine roots; common distinct and few prominent clay films on faces of peds; 1 percent chert gravel; extremely acid; clear wavy boundary.

3Bt5—55 to 80 inches; strong brown (7.5YR 5/6), red (2.5YR 4/6), and grayish brown (10YR 5/2) extremely cobbly clay; firm; few very fine and fine roots; common distinct and few prominent clay films on faces of peds; 80 percent chert cobbles; very strongly acid; clear smooth boundary.

The A horizon has value of 3 to 5 and chroma of 1 to 3. It is very gravelly silt loam or gravelly silt loam.

The E horizon has value of 4 to 6 and chroma of 3 or 4. It is silt loam, loam, or the gravelly to very cobbly analogues of these textures.

The upper Bt horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 4, 6, or 8. It is clay loam, loam, fine sandy loam, sandy clay loam, silt loam, silty clay loam, or the very gravelly to extremely cobbly analogues of these textures.

The lower Bt horizon, where present, has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 2, 3, 4, 6, or 8. Texture ranges from clay to extremely cobbly silty clay.

Sarpy Series

The Sarpy series consists of very deep, excessively drained, rapidly permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Sarpy series are mixed, mesic Typic Udipsamments.

Typical pedon of Sarpy fine sand, 0 to 2 percent slopes, frequently flooded; USGS Morrison topographic quadrangle; latitude 38 degrees 42 minutes 18 seconds N.; longitude 91 degrees 42 minutes 47 seconds W.; 4,950 feet north and 400 feet east of the southwest corner of sec. 33, T. 46 N., R. 7 W.

A—0 to 1 inch; dark grayish brown (10YR 4/2) fine sand; weak very fine granular structure; very friable; many very fine and fine and common medium roots; strong effervescence; slightly alkaline; abrupt smooth boundary.

C—1 to 60 inches; stratified brown (10YR 5/3) and grayish brown (10YR 5/2) fine sand; single grained; loose; common very fine, fine, and medium roots; strong effervescence; moderately alkaline.

The A horizon is has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The C horizon has value of 4 or 5 and chroma of 2 or 3. It is fine sand or loamy fine sand.

Swiss Series

The Swiss series consists of very deep, moderately well drained, very slowly permeable soils on uplands. These soils formed in clayey residuum. Slopes range from 5 to 35 percent.

Soils of the Swiss series are fine, mixed, semiactive, mesic Oxyaquic Hapludalfs.

Typical pedon of Swiss gravelly silt loam, 15 to 35 percent slopes, stony; USGS Fredericksburg topographic quadrangle; latitude 38 degrees 33 minutes 30 seconds N.; longitude 91 degrees 44 minutes 3 seconds W.; 900 feet east and 500 feet south of the northwest corner of sec. 20, T. 44 N., R. 7 W.

A—0 to 3 inches; dark brown (10YR 3/3) gravelly silt loam, pale brown (10YR 6/3) dry; weak very fine granular structure; very friable; common very fine, fine, and medium roots; common very fine and fine vesicular pores; 25 percent subrounded chert gravel and 5 percent subrounded sandstone cobbles; strongly acid; clear smooth boundary.

E—3 to 9 inches; light yellowish brown (10YR 6/4) gravelly silt loam; weak fine granular structure; friable; common very fine, fine, and medium roots; common very fine and fine vesicular pores; 25 percent subrounded chert gravel and 5 percent subrounded sandstone cobbles; very strongly acid; clear smooth boundary.

2Bt1—9 to 16 inches; yellowish red (5YR 5/6) clay; moderate very fine subangular blocky structure; firm; common very fine, fine, and medium roots between peds; few very fine vesicular pores; few distinct discontinuous clay films on faces of peds; common fine reddish brown (2.5YR 4/4) irregular soft masses of iron accumulation between peds; 5 percent subrounded sandstone cobbles; very strongly acid; clear smooth boundary.

2Bt2—16 to 20 inches; 50 percent yellowish red (5YR 5/6) and 50 percent reddish brown (2.5YR 4/4) clay; moderate fine subangular blocky structure; firm; common fine and medium roots between peds; few distinct discontinuous clay films on faces of peds; 5 percent subrounded sandstone cobbles; very strongly acid; clear smooth boundary.

2Bt3—20 to 26 inches; red (2.5YR 4/6) clay; moderate medium angular blocky structure; firm; few very fine and fine roots between peds; common distinct discontinuous clay films on faces of peds; common fine yellowish red (5YR 5/6) irregular soft masses of iron accumulation between peds; common fine prominent very pale brown (10YR 8/2) and common fine prominent grayish brown (10YR 5/2) irregular mottles between peds; 5 percent subrounded sandstone cobbles; very strongly acid; gradual smooth boundary.

2Bt4—26 to 32 inches; weak red (10R 5/2) clay; weak fine prismatic structure parting to strong fine subangular blocky; very firm; few very fine and fine roots between peds; common distinct discontinuous clay films on faces of peds; common fine yellowish red (5YR 5/6) irregular soft masses of iron accumulation between peds; common fine prominent very pale brown (10YR 8/2) irregular mottles between peds; 5 percent subrounded sandstone cobbles; very strongly acid; gradual smooth boundary.

2Bt5—32 to 40 inches; 50 percent very pale brown (10YR 8/2) and 50 percent weak red (10R 5/2) silty clay; weak fine prismatic structure parting to strong fine subangular blocky; very firm; few very fine and fine roots between peds; common distinct discontinuous clay films on faces of peds; 5 percent subrounded sandstone cobbles; very strongly acid; gradual smooth boundary.

2Cd—40 to 80 inches; weak red (10R 5/2) clay loam; common fine distinct very pale brown (10YR 8/2) irregular mottles between fracture planes; massive,

with angular fracture planes 1 to 2 centimeters apart; extremely firm; few very fine and fine roots between fracture planes; 5 percent subrounded sandstone cobbles; moderately acid.

The A horizon has value of 3 to 5 and chroma of 2 or 3. It is gravelly silt loam or gravelly loam.

The E horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is silt loam, loam, or the gravelly or very gravelly analogues of these textures.

The 2Bt horizon has hue of 10YR to 2.5YR, value of 4 to 8, and chroma of 1, 2, 3, 4, 6, or 8. It is clay, silty clay, or the gravelly analogues of these textures.

The 2Cd horizon has hue of 10R to 10YR, value of 1 to 8, and chroma of 1, 2, 3, 4, 6, or 8. It is clay loam, silty clay loam, or clay. This horizon consists of hard unweathered fire clay.

Tanglenook Series

The Tanglenook series consists of very deep, poorly drained, slowly permeable soils on high flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Tanglenook series are fine, mixed, superactive, mesic Typic Argiaquolls.

Typical pedon of Tanglenook silty clay, 0 to 2 percent slopes, rarely flooded; USGS Osage City topographic quadrangle; latitude 38 degrees 33 minutes 7 seconds N.; longitude 92 degrees 0 minutes 50 seconds W.; 4,500 feet north and 3,850 feet west of the southeast corner of sec. 22, T. 44 N., R. 10 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay; strong fine subangular blocky structure; friable; common very fine and fine roots; slightly acid; abrupt smooth boundary.

AB—7 to 15 inches; very dark gray (10YR 3/1) silty clay; common fine distinct dark brown (10YR 3/3) mottles; weak fine subangular blocky structure; firm; common very fine and fine roots; few faint clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt—15 to 33 inches; very dark gray (10YR 3/1) silty clay; few fine distinct dark brown (10YR 3/3 and 7.5YR 3/2) mottles; weak fine subangular blocky structure; very firm; few fine roots; common faint clay films on faces of peds; slightly acid; gradual smooth boundary.

Btg1—33 to 42 inches; dark gray (10YR 4/1) silty clay; weak fine subangular blocky structure; very firm; few fine roots; common faint dark grayish brown (2.5Y 4/2) clay films on faces of peds; few fine prominent dark brown (7.5YR 3/4) irregularly shaped masses of iron accumulation; neutral; gradual smooth boundary.

Btg2—42 to 54 inches; dark grayish brown (2.5Y 4/2) silty clay; weak fine subangular blocky structure; very firm; common faint clay films on faces of peds; few fine prominent dark yellowish brown (10YR 4/6) irregularly shaped masses of iron accumulation; neutral; gradual smooth boundary.

Btg3—54 to 60 inches; grayish brown (2.5Y 5/2) silty clay; weak fine subangular blocky structure; very firm; few faint clay films on faces of peds; common fine prominent dark yellowish brown (10YR 4/6) irregularly shaped masses of iron accumulation; neutral.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silty clay or silty clay loam.

The Bt horizon has value of 2 or 3 and chroma of 1. It is silty clay or silty clay loam.

The Btg horizon and the Cg horizon, where present, have hue of 10YR to 5Y, or the horizon is neutral with value of 4 or 5 and chroma of 1 or 2. Texture is silty clay or silty clay loam.

Union Series

The Union series consists of very deep, moderately well drained soils that have a fragipan in the subsoil. These soils are on uplands. These soils formed in a thin layer of loess and residuum. Permeability is moderate above the fragipan and slow within the fragipan. Slopes range from 3 to 8 percent.

Soils of the Union series are fine, mixed, active, mesic Oxyaquic Fragiudalfs.

Typical pedon of Union silt loam, 3 to 8 percent slopes; USGS Argyle topographic quadrangle; latitude 38 degrees 3 minutes 45 seconds N.; longitude 92 degrees 21 minutes 15 seconds W.; 1,800 feet north, 250 feet east of the southwest corner of sec. 29, T. 42 N., R. 10 W.

Ap—0 to 4 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many very fine and fine roots; strongly acid; clear smooth boundary.

Ap2—4 to 9 inches; brown (10YR 4/3) silt loam; weak very fine subangular blocky and moderate fine granular structure; friable; 10 percent strong brown (7.5YR 5/6) mixings; many very fine and fine roots; strongly acid; abrupt smooth boundary.

Bt1—9 to 23 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; many very fine and fine roots; common distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—23 to 30 inches; brown (10YR 5/3) silty clay loam; moderate fine subangular blocky structure; firm; many very fine and fine roots; common faint and few distinct clay films on faces of peds; few faint iron-manganese concentrations on faces of peds; common fine faint grayish brown (10YR 5/2) iron depletions; many fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; very strongly acid; clear wavy boundary.

2Btx1—30 to 45 inches; brown (10YR 5/3) extremely gravelly silt loam; massive; very firm; 65 percent brittle; few very fine roots; few faint clay films and iron-manganese concentrations on faces of peds; few fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; 60 percent chert gravel; very strongly acid; gradual smooth boundary.

2Btx2—45 to 53 inches; brown (10YR 5/3) extremely cobbly loam; massive; extremely firm; 65 percent brittle; few faint clay films and iron-manganese concentrations on faces of peds; few fine distinct yellowish brown (10YR 5/6) irregularly shaped masses of iron accumulation; 40 percent chert gravel and 40 percent chert cobbles; strongly acid; clear wavy boundary.

3Bt—53 to 80 inches; yellowish brown (10YR 5/6) and yellowish red (5YR 4/6) clay; moderate very fine subangular blocky structure; firm; common distinct clay films and few faint iron-manganese concentrations on faces of peds; common fine prominent grayish brown (10YR 5/2) iron depletions; 5 percent chert and sandstone gravel; slightly acid.

The Bt horizon has hue of 7.5YR or 10YR and chroma of 2, 3, 4, or 6.

The 2Btx horizon is silt loam, loam, silty clay loam, or the extremely gravelly or extremely cobbly analogues of these textures.

The 3Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 or 6. It is gravelly clay or clay.

Useful Series

The Useful series consists of deep, moderately well drained, moderately slowly permeable soils on uplands. These soils formed in a thin layer of loess and clayey residuum. Slopes range from 3 to 15 percent.

Soils of the Useful series are fine, mixed, active, mesic Oxyaquic Hapludalfs.

Typical pedon of Useful silt loam, 8 to 15 percent slopes, eroded; USGS Belle topographic quadrangle; latitude 38 degrees 19 minutes 12 seconds N.; longitude 91 degrees 40 minutes 9 seconds W.; 850 feet north and 1,580 feet west of the southeast corner of sec. 2, T. 41 N., R. 7 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; moderately acid; clear wavy boundary.

Bt1—7 to 13 inches; yellowish red (5YR 4/6) silty clay; moderate very fine subangular blocky structure; firm; common very fine and fine roots; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—13 to 21 inches; brown (10YR 5/3) silty clay; moderate fine subangular blocky structure; firm; common very fine and fine roots; common distinct clay films on faces of peds; many fine prominent red (2.5YR 4/6) irregularly shaped masses of iron accumulation; neutral; gradual smooth boundary.

Bt3—21 to 31 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay; strong fine subangular blocky structure; firm; few very fine roots; common prominent clay films and common fine iron-manganese concentrations on faces of peds; common fine prominent yellowish red (5YR 4/6) irregularly shaped masses of iron accumulation; few chert pebbles; neutral; gradual smooth boundary.

2Bt4—31 to 39 inches; grayish brown (10YR 5/2) silty clay; strong fine subangular blocky structure; firm; few very fine roots; few fine iron-manganese nodules with distinct boundaries; many prominent clay films and common iron-manganese concentrations on faces of peds; common fine prominent strong brown (7.5YR 4/6) irregularly shaped masses of iron accumulation; 10 percent chert gravel; slightly alkaline; gradual smooth boundary.

2Bt5—39 to 45 inches; light yellowish brown (2.5Y 6/4) and light gray (2.5Y 7/2) silty clay; strong medium subangular blocky structure; firm; few very fine roots; many prominent grayish brown (2.5Y 5/2) clay films and few iron-manganese concentrations on faces of peds; common fine prominent olive yellow (2.5Y 6/8) irregularly shaped masses of iron accumulation; common fine white (2.5Y 8/0) iron depletions; 5 percent chert gravel; slightly alkaline; clear wavy boundary.

2Bt/Cr—45 to 53 inches; light gray (5Y 7/2) and olive yellow (2.5Y 6/8) very gravelly silty clay; strong medium subangular blocky structure; firm; few very fine roots; few prominent grayish brown (2.5Y 5/2) clay films and few fine iron-manganese concentrations on faces of peds; 50 percent weathered dolomite protrusions and rounded

fragments in places; slightly alkaline; abrupt wavy boundary.
R—53 inches; dolomite.

Depth to bedrock ranges from 40 to 59 inches.

The A or Ap horizon has value of 3 to 6 and chroma of 2 to 4. Where the value of the A or Ap horizon is 3 and chroma is 3 or less moist, dry value is 6 or more.

The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 2, 3, 4, or 6.

The 2Bt and 2Bt/Cr horizons have hue of 5Y to 2.5YR, value of 4 to 7, and chroma of 2, 3, 4, 6, or 8. Texture ranges from silty clay loam to very gravelly clay. The colors and textures refer to material (50 percent) between weathered dolomite fragments (50 percent).

Waldron Series

The Waldron series consists of very deep, somewhat poorly drained, slowly permeable soils on flood plains. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Soils of the Waldron series are fine, smectitic, calcareous, mesic Aeric Fluvaquents.

Typical pedon of Waldron silty clay loam, 0 to 2 percent slopes, occasionally flooded; USGS Morrison topographic quadrangle; latitude 38 degrees 41 minutes 36 seconds N.; longitude 91 degrees 41 minutes 0 seconds W.; 950 feet north and 1,500 feet west of the southeast corner of sec. 34, T. 46 N., R. 7 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; firm; few very fine and fine roots; slight effervescence; slightly alkaline; clear smooth boundary.
Cg1—11 to 17 inches; stratified dark grayish brown (10YR 4/2) silty clay; few medium faint very dark grayish brown (10YR 3/2) mottles; weak coarse bedding planes with thin discontinuous brown (10YR 5/3) strata; weak fine angular blocky structure; firm; few very fine roots; slight effervescence; neutral; clear smooth boundary.
Cg2—17 to 36 inches; stratified dark grayish brown (2.5Y 4/2) silty clay; weak coarse bedding planes with thin discontinuous brown (10YR 5/3) strata; weak fine angular blocky structure; firm; few very fine roots; slight effervescence; common fine distinct gray (10YR 5/1) iron depletions; few fine distinct olive brown (2.5Y 4/4) irregularly shaped masses of iron accumulation; slightly alkaline; gradual smooth boundary.
Cg3—36 to 49 inches; stratified dark grayish brown (2.5Y 4/2) and gray (10YR 5/1) silty clay; weak coarse bedding planes with thin discontinuous brown (10YR 5/3) strata; firm; few very fine roots; slight effervescence; common fine prominent dark brown (7.5YR 3/4) irregularly shaped masses of iron accumulation; slightly alkaline; clear smooth boundary.
Cg4—49 to 60 inches; stratified dark grayish brown (2.5Y 4/2) silty clay; weak coarse bedding planes with thin discontinuous brown (10YR 5/3) strata; weak medium platy structure; firm; slight effervescence; common fine distinct gray (10YR 5/1) iron depletions; common fine prominent strong brown (7.5YR 4/6) irregularly shaped masses of iron accumulation; slightly alkaline.

The Ap horizon has chroma of 1 to 3. It is silt loam or silty clay loam.

The Cg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3.

Wrengart Series

The Wrengart series consists of very deep, moderately well drained, moderately slowly permeable soils on uplands. These soils formed in loess and residuum. Slopes range from 2 to 35 percent.

Soils of the Wrengart series are fine-silty, mixed, active, mesic Fragic Oxyaquic Hapludalfs.

Typical pedon of Wrengart silt loam, in an area of Wrengart-Swiss complex, 5 to 9 percent slopes; USGS Fredericksburg topographic quadrangle; latitude 38 degrees 33 minutes 24 seconds N.; longitude 91 degrees 42 minutes 52 seconds W.; 870 feet south and 900 feet east of the northwest corner of sec. 21, T. 44 N., R. 7 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; very friable; many very fine, fine, medium, and coarse roots; strongly acid; clear smooth boundary.
Bt1—8 to 12 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common very fine, fine, medium, and coarse roots; common distinct pale brown (10YR 6/3) clay depletions; very strongly acid; clear smooth boundary.
Bt2—12 to 17 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; firm; common very fine, fine, medium, and coarse roots; common faint clay films on faces of peds; very strongly acid; gradual smooth boundary.
Bt3—17 to 25 inches; yellowish brown (10YR 5/6) and yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; firm;

few very fine, fine, medium, and coarse roots; common faint clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt4—25 to 31 inches; brown (7.5YR 4/4) silty clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; firm; few very fine, fine, medium, and coarse roots; common prominent clay films and clay depletions on faces of peds; common fine prominent grayish brown (10YR 5/2) iron depletions; very strongly acid; clear smooth boundary.

Bt5—31 to 36 inches; dark yellowish brown (10YR 4/6) silty clay loam; moderate fine prismatic structure; firm; few very fine roots; common prominent clay films and few iron-manganese concentrations on faces of peds; common fine prominent grayish brown (10YR 5/2) iron depletions; very strongly acid; clear smooth boundary.

2Btx1—36 to 53 inches; yellowish brown (10YR 5/4) gravelly silt loam; weak coarse prismatic structure; very firm; 40 percent brittle; few fine roots; few faint clay films and iron-manganese concentrations on faces of peds; common fine distinct light brownish gray (10YR 6/2) iron depletions; 16 percent chert gravel; strongly acid; gradual smooth boundary.

2Btx2—53 to 61 inches; strong brown (7.5YR 5/6) silty clay loam; common prominent pale brown (10YR 6/3) streaks; weak coarse prismatic structure; very firm; 40 percent brittle; few very fine and fine roots; few faint clay films and few iron-manganese concentrations on faces of peds; moderately acid.

3Bt—61 to 80 inches; red (2.5YR 4/6) gravelly silty clay; strong fine subangular blocky structure; firm; few very fine roots; few distinct clay films on faces of peds; few fine iron and manganese oxide stains; many prominent clay depletions; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; 20 percent chert gravel, 5 percent chert cobbles, and 5 percent chert stones; slightly acid.

The A horizon has value of 3 to 5 and chroma of 2 to 4.

The E horizon, where present, has hue of 10YR or 7.5YR, value or 4 to 6, and chroma of 3 or 4.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2, 3, 4, or 6. It is silt loam or silty clay loam.

The 2Btx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2, 3, 4, or 6. It is silt loam, silty clay loam, or the gravelly to extremely gravelly analogues of these textures.

The 3Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 or 6. It is silty clay loam, clay loam, silty clay, or the gravelly or very gravelly analogues of these textures.

Formation of the Soils

This section relates the soils in the survey area to the major factors of soil formation.

Soil is the product of soil-forming processes acting on accumulated or deposited geologic material. The characteristics of the soil are determined by the type of parent material; the plant and animal life on and in the soil; the climate under which the soil-forming factors were active; topography, or lay of the land; and the length of time these forces have been active.

The parent material affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Plant and animal life are the active factors of soil formation. The climate determines the amount of water available for leaching and the amount of heat for physical and chemical changes. Together, climate and plant and animal life act on the parent material and slowly change it to a natural body that has genetically related horizons. Topography often modifies these other factors. Finally, time is required for changes in the parent material to result in the formation of a soil. Generally, a long time is required for the development of distinct soil horizons.

These factors of soil formation are all so closely interrelated in their effects on the soil that few generalizations can be made about the effect of any one factor unless conditions are specified for the other four. Soil formation is complex, and many processes of soil development are still unknown.

Parent Material

Parent material is the unconsolidated mass from which soil is formed. The formation or the deposition of this material is the first step in the development of a soil profile. The characteristics of the material determine the chemical and mineralogical composition of the soil. In Osage County, three kinds of parent material, alone or in combinations of two or more, have contributed to the formation of the soils. These three kinds of parent material are residuum, or material weathered from bedrock; loess, or wind-deposited material; and alluvium, or water-deposited material.

The youngest residual parent materials in the county are Pennsylvanian clays, sandstone, shale, and the associated chert of unknown origin. These materials lie unconformably on eroded surfaces of the Ordovician System, primarily Jefferson City dolomite. Filled sink deposits of refractory clays are common at the contact point of these systems. Many of these clay pits have been mined. Sandstone rimrock commonly is associated with these filled sinks. Swiss soils formed in deposits of clay or in material weathered from these rocks and the associated chert.

Most of the exposed dolomite in Osage County is from the Jefferson City Formation. The underlying Roubidoux and Gasconade Formations contain more chert, as well as interbedded sandstone and sandy dolomite, and are less extensive, occurring mainly in the southeastern part of the county. Gatewood and Moko soils formed mainly in the less cherty, argillaceous residuum of the Jefferson City Formation, and Rueter soils formed in the loamy residuum from the Roubidoux Formation with higher proportions of chert. Alred soils formed in the argillaceous residuum of the Gasconade Formation.

Loess, a silty material transported by the wind, is an extensive parent material in Osage County. Loess probably once covered all of the survey area. It was deposited during the most recent postglacial period. The sources of this material were the flood plains along the Missouri River and its tributaries. Choked with sediment deposited by glacial meltwater and nearly barren in the still frigid climate, these valleys were the focus of violent dust storms. The resulting deposits blanketed the landscape to depths that were greatest on the river hills and decreased with distance from the source. Erosion removed the loess at widely varying rates. It apparently kept pace with the rate of deposition on the steep, sun-warmed south and west exposures where, in many places, all the loess was removed. In contrast, north and east aspects remained frozen longer and thus retained an appreciable amount of the loess. The thickness of the loess on the more stable landforms ranges from about 20 inches to 10 feet.

Marion and Menfro soils formed in thick deposits of loess. The upper part of Gunlock, Mariosa, Plato, Useful, and Wrengart soils also formed in loess.

Alluvium is material that was transported by water and deposited on nearly level flood plains. The soils on

the flood plains in Osage County formed in alluvial deposits ranging in thickness from about 3 feet to more than 30 feet. These soils differ widely in texture and chemical composition, reflecting a diversity of origin, varying floodwater velocity, and various kinds of primary source material. The soils on the Missouri River flood plain have a vast watershed as their source of material and are rich in unweathered minerals. Waldron soils formed in clayey deposits in slackwater areas. Haynie soils occur in higher areas on bottomland and have loamy soil textures. Sarpy soils formed in sandy material deposited by swift currents, mainly along the edge of the river. The soils on the smaller flood plains in the county, namely those along the Gasconade, Osage, and Maries Rivers and their tributaries, formed mainly in silty and loamy alluvium. The basal deposits commonly are gravel, and the soil particles or coarse fragments decrease in size toward the surface. A similar gradation occurs as the distance downstream increases. The gravelly Cedargap soils are in narrow upstream reaches, and the silty Jamesfin soils dominate the broader flood plains. The Gladden soils lie intermediately between these two soils and comprise a large portion of the flood plains in the county. The abundance of loess as a source material and predictable decreases in stream velocity and gradient along descending watercourses cause this gradation.

Living Organisms

Plants and animals living on or in the soil are active in the soil-forming process. Plants furnish organic matter to the soil and bring up plant nutrients from underlying layers to the surface layer. As plants die and decay, they contribute organic matter to the soil. Bacteria and fungi decompose the plant remains and help to incorporate the organic matter into the soil.

The kind of native vegetation is one factor that has greatly influenced soil formation in Osage County. The basic kinds of native vegetation were prairie grasses and forest vegetation. Additions of organic matter to soils that formed under prairie grasses are largely a result of the yearly decomposition of plant materials. Plant tops decompose at the surface, and the roots decompose at various depths in the soil. As a result, soils that formed under prairie grasses have a thick, dark surface layer. The wet Tanglenook soils and grassy glades of the Moko soils are examples.

Additions of organic matter to soils that formed under forest vegetation are mostly the result of leaves and twigs that decompose on the surface. These soils have a thin, dark surface layer. The Plato series is an example of soils that formed under these conditions.

Insects, worms, humans, and other animals affect soil formation. Bacteria and fungi cause rotting of organic materials, fix nitrogen, and improve tilth. Burrowing animals and insects loosen and mix various soil horizons.

In a relatively short time, human activities have greatly affected the processes of soil formation. The major alterations have resulted in changes of vegetation, drainage of wet areas, and accelerated erosion. Row crops have replaced native grasses and many forested areas. Nearly all of the flood plains and much of the upland areas are now farmed. These changes have increased food production but have had an adverse effect in terms of sustained productivity. Accelerated erosion continues to reduce the potential of many upland soils, and the loss of cropland to urban development is virtually irreversible.

Climate

Climate has been and still is an important factor of soil formation. Geologic erosion; plant and animal life; and, in more recent times, accelerated erosion all have varied with the climate.

The glacial periods that so greatly affected the soil-forming processes were a result of climatic changes. Thousands of years of cold temperatures resulted in glaciers that moved into the area. Several soil-forming periods have occurred since the last ice sheet left northern Missouri. Geologic evidence indicates that the climate was colder and wetter than the present climate during some soil-forming periods and was warmer during others. The warmer weather and high winds resulted in severe geologic erosion, and much of the area was covered by loess.

High temperatures and adequate rainfall encourage rapid chemical and physical changes. This type of climate is conducive to the breakdown of minerals and the relocation of clay within the soil. The clay is moved downward into the soil profile, and this downward movement results in the formation of the subsoil. Nearly all of the upland soils in the county show evidence of this illuviation.

Surplus moisture in the spring and late fall creates zones of saturation in some soils and influences the color of the subsoil. In general, gray colors are indicative of wetness because of reduction of iron in the soil. Conversely, brown or red colors are associated with oxidation in the soil and indicate free movement of water through the soil. Some soils, such as those of the Tanglenook series, have a continuous water table beneath their upper boundary. Other soils, such those of the Plato series, have noncontinuous zones of saturation that occur because of subsoil horizons that

hold the water up temporarily (perched water table). Some soils that are saturated for long periods support indicator plant species, such as smartweed, various sedges, silver maple, or cottonwood. This saturation affects the suitability of a soil for some agricultural crops that are sensitive to wetness, such as alfalfa, and also the effective length of the growing season in areas where cultivation and seedbed preparation are delayed by the seasonal wetness.

The influence of the regional climate on soil formation is modified in many places by local conditions. For example, the Moko soils on south- and west-facing slopes formed under the influence of a microclimate that is warmer and less humid than that which occurs on opposite north- and east-facing slopes.

Topography

Topography, or relief, affects soil formation through its influence on drainage, runoff, the rate of water infiltration, and geologic erosion. Topography is characterized by the length, shape, aspect, and degree of slope. It is important in determining the pattern and distribution of soils.

The amount of water entering the soil depends on steepness of slope, permeability, and the intensity of rainfall. Because runoff is rapid in steep areas, very little water passes through the soil and soil formation is slow. Geologic erosion almost keeps pace with the soil-forming processes. In gently sloping areas, runoff is slow, erosion is minimal, and more of the water passes through the soil. Leaching, the translocation of clay, and other soil-forming processes are intensified in these areas. Soils in these areas generally show maximum profile development.

Soils on steep, south-facing slopes receive more direct sunlight and are drier than similar soils on north-facing slopes. Drier conditions influence soil formation by affecting the kind of vegetation, the susceptibility to erosion, and the cycles of freezing and thawing.

Concave areas are generally wetter than other slopes because as runoff converges in these areas, the water flow is concentrated and the volume that goes over and through the soil is greater. Convex areas are drier because the divergent water flow pattern disperses the water, resulting in a smaller volume going over and through the soil.

Time

Other factors being equal, the degree of profile development is dependent on the length of time that the parent material has been in place and subject to the soil-forming processes. Older soils show the effects of leaching and clay movement and have developed distinct horizons. Young soils show little profile development.

The youngest soils in Osage County are those that formed in alluvium. Dockery soils, for example, do not show any profile development. Alluvial material is added to the surface nearly every year. Deible, Freeburg, Gabriel, Jemerson, Racoon, and Tanglenook soils are the oldest alluvial soils. They are on high flood plains and show a moderate degree of profile development.

The oldest soils in the survey area formed in cherty residuum on upland side slopes. Long periods of time were necessary for the bedrock matrix to weather and for the cherty residuum to accumulate. Alred, Gatewood, and Rueter soils formed in these areas. Swiss soils are of similar age, but they formed in clayey residuum that did not weather directly from bedrock.

Many areas reflect dual chronologies. In Gunlock, Mariosa, Plato, Useful, and Wrengart soils, the underlying material is older and has strongly expressed horizons. This material is covered by younger loess, which has in turn developed horizons of its own.

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Glossary

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.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

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

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

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

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Backslopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottomland. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil,

expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

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 depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

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.

Clayey soil. Silty clay, sandy clay, or clay.

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.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas 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 or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Effective cation-exchange capacity. The sum of ammonium acetate extractable bases plus potassium chloride extractable aluminum used for soils that have pH value less than 5.5.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide 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.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide

plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the 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.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head out. To form a flower head.

High flood plain. An old alluvial plain, ordinarily flat or undulating, bordering a stream or river.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

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. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. 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.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydraulic conductivity (K). The current standard for measuring a soil's ability to transmit water. Hydraulic conductivity is a numerical variable in an equation that can be either measured or estimated. It is one of the terms in Darcy's law: Q=KAi—where "Q" is outflow (volume), "K" is the hydraulic conductivity of the material, "A" is the area through which the fluid moves per unit time, and "i" is the pressure gradient.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

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

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
*Controlled flooding.*Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Ksat. See Saturated hydraulic conductivity.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

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, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

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. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a

color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

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 affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 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, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

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 or very 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.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending

through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly 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

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Saturated hydraulic conductivity (Ksat). Refers to the amount of water that would move vertically through a unit time under unit hydraulic gradient. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields. Terms describing Ksat are as follows:

Ksat class	cm/hr	in/hr
Very low	<0.0036	<0.001417
Low	0.00360 to <0.036	0.001417 to <0.1417
Moderately low	0.0360 to <0.360	0.01417 to <0.1417
Moderately high	0.360 to <3.60	0.1417 to <1.417
High	3.60 to <36.0	1.417 to <14.17
Very high	>36.0	>14.17

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

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. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the backslope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). 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.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner,

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

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.

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.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

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 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, considered collectively. It includes all subdivisions of these horizons.

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. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The textural classes are *C—clay, CL—clay loam, COS—coarse sand, COSL—coarse sandy loam, FS—fine sand, FSL—fine sandy loam, L—loam, LCOS—loamy coarse sand, LFS—loamy fine sand, LS—loamy sand, LVFS—loamy very fine sand, S—sand, SC—sandy clay, SCL—sandy clay loam, SI—silt, SIC—silty clay, SICL—silty clay loam, SIL—silt loam, SL—sandy loam, VFS—very fine sand, and VFSL—very fine sandy loam.* Terms used in lieu of texture are *WB—weathered bedrock and UWB—unweathered bedrock.* The texture modifiers that may apply to textural classes are *BY—bouldery, BYV—very bouldery, BYX—extremely bouldery, CB—cobbly, CBV—very cobbly, CBX—extremely cobbly, CN—channery, CNV—very channery, CNX—extremely channery, FL—flaggy, FLV—very flaggy, FLX—extremely flaggy, GR—gravelly, GRV—very gravelly, GRX—extremely gravelly, SR—stratified, ST—stony, STV—very stony, and STX—extremely stony.*

Thin layer (in tables). Otherwise suitable soil material that is 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.

Toeslope. The outermost inclined surface at the base of a hill; part of a footslope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily

rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1962-90 at Vienna, Missouri)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	39.8	17.4	28.6	70	-15	4	1.77	0.74	2.76	4	5.6
February	44.8	21.8	33.3	74	-10	12	2.06	0.92	3.04	4	4.5
March	55.6	31.8	43.7	84	2	68	3.91	2.48	5.20	6	3.2
April	68.2	42.5	55.4	89	21	222	3.71	2.21	5.05	6	.4
May	76.6	51.7	64.1	90	31	442	4.75	2.88	6.42	7	.0
June	84.1	60.2	72.2	96	42	665	4.22	1.50	6.48	6	.0
July	89.7	64.7	77.2	101	48	842	3.09	1.30	4.61	5	.0
August	88.7	62.9	75.8	103	46	799	3.78	1.89	5.42	5	.0
September	80.7	54.7	67.7	97	32	533	3.89	1.81	5.67	5	.0
October	70.1	42.6	56.3	91	22	243	3.89	1.88	5.63	5	.0
November	56.4	32.9	44.7	81	10	66	3.64	1.41	5.51	5	1.5
December	43.7	22.5	33.1	72	-9	11	3.06	1.25	4.59	5	3.4
Yearly:											
Average	66.5	42.2	54.3	---	---	---	---	---	---	---	---
Extreme	110	-27	---	104	-18	---	---	---	---	---	---
Total	---	---	---	---	---	3,907	41.76	32.37	48.29	63	18.6

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1962-90 at Vienna, Missouri)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 14	April 23	May 8
2 years in 10 later than--	April 9	April 18	May 3
5 years in 10 later than--	March 31	April 10	April 24
First freezing temperature in fall:			
1 year in 10 earlier than--	October 18	September 30	September 25
2 years in 10 earlier than--	October 23	October 6	September 30
5 years in 10 earlier than--	November 3	October 18	October 9

Table 3.--Growing Season

(Recorded in the period 1962-90 at Vienna, Missouri)

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	198	170	150
8 years in 10	204	177	156
5 years in 10	216	190	167
2 years in 10	228	203	179
1 year in 10	234	210	185

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
15002	McGirk silt loam, 1 to 3 percent slopes	1,095	0.3
60001	Menfro silt loam, 5 to 9 percent slopes	4,686	1.2
60002	Menfro silt loam, footslopes, 5 to 9 percent slopes	1,533	0.4
60003	Menfro silt loam, 9 to 14 percent slopes, eroded	3,598	0.9
60004	Menfro silt loam, 14 to 20 percent slopes, eroded	3,224	0.8
60005	Menfro silt loam, 20 to 35 percent slopes	8,036	2.1
60006	Marion silt loam, 2 to 5 percent slopes	2,000	0.5
60007	Menfro-Gatewood complex, 20 to 50 percent slopes	3,806	1.0
64000	Racoon silt loam, 0 to 3 percent slopes, rarely flooded	5,049	1.3
64001	Freeburg silt loam, 0 to 3 percent slopes, rarely flooded	3,730	1.0
64002	Freeburg silt loam, 1 to 3 percent slopes	1,303	0.3
64003	Freeburg silt loam, 3 to 8 percent slopes	1,410	0.4
66003	Jemerson silt loam, 0 to 2 percent slopes, rarely flooded	3,450	0.9
66004	Dockery silt loam, 0 to 2 percent slopes, frequently flooded	775	0.2
66005	Deible silt loam, 0 to 2 percent slopes, rarely flooded	904	0.2
66006	Waldron silty clay loam, 0 to 2 percent slopes, occasionally flooded	1,461	0.4
66007	Leta silty clay, 0 to 2 percent slopes, occasionally flooded	2,198	0.6
66008	Leta silt loam, 0 to 2 percent slopes, overwash, occasionally flooded	196	*
66009	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	3,288	0.8
66010	Sarpy fine sand, 0 to 2 percent slopes, frequently flooded	1,271	0.3
66011	Moville silt loam, 0 to 2 percent slopes, occasionally flooded	386	*
66012	Blake silt loam, 0 to 2 percent slopes, frequently flooded	1,906	0.5
66013	Waldron silt loam, 0 to 2 percent slopes, rarely flooded	285	*
70028	Moko-Rock outcrop complex, 3 to 15 percent slopes, very stony	1,311	0.3
70029	Moko-Rock outcrop complex, 15 to 50 percent slopes, very stony	11,524	2.9
73035	Gravois silt loam, 8 to 15 percent slopes	11,347	2.9
73088	Rueter very gravelly silt loam, 8 to 15 percent slopes, very stony	2,719	0.7
73089	Rueter very gravelly silt loam, 15 to 35 percent slopes, very stony	27,332	7.0
73090	Useful silt loam, 3 to 8 percent slopes	1,325	0.3
73091	Useful silt loam, 8 to 15 percent slopes, eroded	3,582	0.9
73092	Gatewood very gravelly silt loam, 3 to 8 percent slopes, stony	1,265	0.3
73093	Gatewood very gravelly silt loam, 8 to 15 percent slopes, stony	5,871	1.5
73094	Gatewood very gravelly silt loam, 15 to 35 percent slopes, stony	72,736	18.6
73095	Gravois silt loam, 15 to 20 percent slopes	3,599	0.9
73096	Swiss gravelly silt loam, 8 to 15 percent slopes, stony	2,852	0.7
73097	Swiss gravelly silt loam, 15 to 35 percent slopes, stony	11,175	2.9
73098	Plato silt loam, 1 to 3 percent slopes	4,722	1.2
73099	Plato silt loam, 3 to 8 percent slopes	16,299	4.2
73100	Wrengart silt loam, 2 to 5 percent slopes	742	0.2
73101	Wrengart silt loam, 5 to 9 percent slopes	12,274	3.1
73102	Wrengart silt loam, footslopes, 5 to 9 percent slopes	2,853	0.7
73103	Wrengart silt loam, 9 to 14 percent slopes	17,474	4.5
73104	Wrengart silt loam, 14 to 20 percent slopes, eroded	6,795	1.7
73105	Wrengart-Gatewood complex, 14 to 35 percent slopes	20,759	5.3
73106	Mariosa silt loam, 0 to 2 percent slopes	857	0.2
73107	Wrengart-Swiss complex, 5 to 9 percent slopes	5,009	1.3
73108	Gravois-Gatewood complex, 3 to 8 percent slopes	10,330	2.6
73109	Alred gravelly silt loam, 15 to 35 percent slopes, stony	1,385	0.4
73110	Gravois-Gatewood complex, 15 to 35 percent slopes	11,354	2.9
73112	Gunlock silt loam, 3 to 8 percent slopes	927	0.2
73135	Union silt loam, 3 to 8 percent slopes	14,545	3.7
74633	Hartville silt loam, 1 to 3 percent slopes	1,096	0.3
74634	Hartville silt loam, 3 to 8 percent slopes	4,950	1.3
74635	Tanglenook silty clay, 0 to 2 percent slopes, rarely flooded	814	0.2
75376	Cedargap gravelly silt loam, 0 to 3 percent slopes, frequently flooded	6,426	1.6
75391	Possumtrot fine sandy loam, 0 to 3 percent slopes, occasionally flooded	662	0.2
75395	Jamesfin silt loam, 0 to 3 percent slopes, occasionally flooded	5,232	1.3
75398	Kaintuck fine sandy loam, 0 to 3 percent slopes, frequently flooded	1,856	0.5
75399	Jamesfin silt loam, 0 to 3 percent slopes, frequently flooded	8,966	2.3
75400	Gladden silt loam, 0 to 3 percent slopes, frequently flooded	16,353	4.2
75407	Gabriel silt loam, 0 to 2 percent slopes, rarely flooded	991	0.3

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
99000	Pits, quarries	66	*
99001	Water	5,032	1.3
99003	Miscellaneous water	5	*
	Total	391,002	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
15002	McGirk silt loam, 1 to 3 percent slopes (where drained)
60006	Marion silt loam, 2 to 5 percent slopes
64000	Racoon silt loam, 0 to 3 percent slopes, rarely flooded (where drained)
64001	Freeburg silt loam, 0 to 3 percent slopes, rarely flooded
64002	Freeburg silt loam, 1 to 3 percent slopes
66003	Jemerson silt loam, 0 to 2 percent slopes, rarely flooded
66004	Dockery silt loam, 0 to 2 percent slopes, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
66005	Deible silt loam, 0 to 2 percent slopes, rarely flooded (where drained)
66006	Waldron silty clay loam, 0 to 2 percent slopes, occasionally flooded
66007	Leta silty clay, 0 to 2 percent slopes, occasionally flooded
66008	Leta silt loam, 0 to 2 percent slopes, overwash, occasionally flooded
66009	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded
66011	Moville silt loam, 0 to 2 percent slopes, occasionally flooded
66012	Blake silt loam, 0 to 2 percent slopes, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
66013	Waldron silt loam, 0 to 2 percent slopes, rarely flooded
73098	Plato silt loam, 1 to 3 percent slopes
73100	Wrengart silt loam, 2 to 5 percent slopes
73106	Mariosa silt loam, 0 to 2 percent slopes (where drained)
74633	Hartville silt loam, 1 to 3 percent slopes
74635	Tanglenook silty clay, 0 to 2 percent slopes, rarely flooded (where drained)
75391	Possumtrot fine sandy loam, 0 to 3 percent slopes, occasionally flooded
75395	Jamesfin silt loam, 0 to 3 percent slopes, occasionally flooded
75398	Kaintuck fine sandy loam, 0 to 3 percent slopes, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
75399	Jamesfin silt loam, 0 to 3 percent slopes, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
75400	Gladden silt loam, 0 to 3 percent slopes, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
75407	Gabriel silt loam, 0 to 2 percent slopes, rarely flooded (where drained)

Table 6.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of nonirrigated management by component. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land Capability	Corn	Grain sorghum	Orchardgrass-red clover hay	Soybeans	Tall fescue	Winter wheat
		Bu	Bu	Tons	Bu	AUM*	Bu
15002:							
McGirk	IIe	83.0	66.0	3.0	28.0	4.5	33.0
60001:							
Manfro	IIIe	108.0	94.0	3.7	40.0	6.0	44.0
60002:							
Manfro	IIIe	115.0	100.0	4.3	43.0	6.4	47.0
60003:							
Manfro	IIIe	102.0	89.0	3.8	38.0	5.7	42.0
60004:							
Manfro	IVe	94.0	83.0	3.5	35.0	5.3	38.0
60005:							
Manfro	VIe	---	---	3.3	---	4.8	---
60006:							
Marion	IIIe	97.0	85.0	3.6	36.0	5.4	39.0
60007:							
Manfro	VIIe	---	---	3.3	---	4.8	---
Gatewood	VIIe	---	---	1.0	---	1.5	---
64000:							
Racoon	IIw	91.0	81.0	3.4	34.0	5.1	37.0
64001:							
Freeburg	IIw	124.0	108.0	4.6	46.0	6.9	50.0
64002:							
Freeburg	IIe	119.0	104.0	4.4	44.0	6.6	48.0
64003:							
Freeburg	IIIe	110.0	96.0	4.1	41.0	6.1	44.0
66003:							
Jemerson	I	125.0	115.0	4.2	42.0	6.3	46.0
66004:							
Dockery	IIIw	91.0	81.0	3.4	34.0	5.1	37.0
66005:							
Deible	IVw	91.0	81.0	3.4	34.0	5.1	37.0
66006:							
Waldron	IIw	91.0	81.0	3.4	34.0	5.1	37.0
66007:							
Leta	IIw	108.0	94.0	4.0	40.0	6.0	44.0
66008:							
Leta	IIw	110.0	96.0	4.1	41.0	6.0	45.0

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land Capability	Corn	Grain sorghum	Orchardgrass-red clover hay	Soybeans	Tall fescue	Winter wheat
		Bu	Bu	Tons	Bu	AUM*	Bu
66009: Haynie	IIw	108.0	94.0	4.0	40.0	6.0	44.0
66010: Sarpy	IVw	---	---	1.0	---	1.5	20.0
66011: Moville	IIw	108.0	94.0	4.0	40.0	6.0	44.0
66012: Blake	Vw	---	---	---	---	---	---
66013: Waldron	IIw	124.0	108.0	4.6	46.0	6.9	50.0
70028: Moko	VIs	---	---	---	---	0.9	---
Rock outcrop.							
70029: Moko	VIIs	---	---	---	---	0.3	---
Rock outcrop.							
73035: Gravois	IVe	65.0	58.0	3.1	20.0	4.6	23.0
73088: Rueter	IVs	---	---	1.9	---	2.6	---
73089: Rueter	VIIe	---	---	1.3	---	2.6	---
73090: Useful	IIIe	84.0	73.0	3.1	31.0	4.6	34.0
73091: Useful	IVe	70.0	61.0	2.6	26.0	3.9	28.0
73092: Gatewood	IVe	---	---	2.0	---	3.0	---
73093: Gatewood	VIe	---	---	1.7	---	2.6	---
73094: Gatewood	VIIe	---	---	1.0	---	1.5	---
73095: Gravois	VIe	---	---	2.8	---	4.2	---
73096: Swiss	VIe	---	---	2.3	---	3.4	---
73097: Swiss	VIIe	---	---	1.7	---	2.6	---
73098: Plato	IIe	75.0	66.0	2.8	28.0	4.2	31.0

See footnote at end of table.

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land Capability	Corn	Grain sorghum	Orchardgrass-red clover hay	Soybeans	Tall fescue	Winter wheat
		Bu	Bu	Tons	Bu	AUM*	Bu
73099: Plato	IIIe	70.0	61.0	2.6	26.0	3.9	28.0
73100: Wrengart	IIe	119.0	104.0	4.4	44.0	6.6	48.0
73101: Wrengart	IIIe	113.0	99.0	4.2	42.0	6.3	46.0
73102: Wrengart	IIIe	120.0	105.0	4.5	45.0	6.7	49.0
73103: Wrengart	IVe	105.0	92.0	3.9	39.0	3.9	43.0
73104: Wrengart	VIe	---	---	3.4	---	5.1	---
73105: Wrengart	VIe	---	---	3.3	---	5.0	---
Gatewood	VIIe	---	---	1.0	---	1.5	---
73106: Mariosa	IIIw	87.0	76.0	3.2	32.0	4.8	35.0
73107: Wrengart	IIIe	113.0	99.0	4.2	42.0	6.3	46.0
Swiss	IVe	---	---	2.6	---	3.9	---
73108: Gravois	IIIe	73.0	66.0	3.4	27.0	5.1	30.0
Gatewood	IVe	---	---	2.0	---	3.0	---
73109: Alred	VIIe	---	---	1.7	---	2.6	---
73110: Gravois	VIIe	---	---	2.5	---	3.7	---
Gatewood	VIIe	---	---	1.0	---	1.5	---
73112: Gunlock	IIIe	75.0	68.0	3.4	29.0	5.1	34.0
73135: Union	IIIe	70.0	63.0	2.9	24.0	4.5	28.0
74633: Hartville	IIe	97.0	85.0	3.6	36.0	5.4	39.0
74634: Hartville	IIIe	91.0	81.0	3.4	34.0	5.1	37.0
74635: Tanglenook	IIIw	113.0	99.0	4.2	42.0	6.3	46.0

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and Soil name	Land Capability	Corn	Grain sorghum	Orchardgrass-red clover hay	Soybeans	Tall fescue	Winter wheat
		Bu	Bu	Tons	Bu	AUM*	Bu
75391: Possumtrot	IIw	81.0	71.0	2.8	30.0	4.2	33.0
75395: Jamesfin	IIw	108.0	94.0	4.0	40.0	6.0	44.0
75398: Kaintuck	Vw	---	---	2.0	---	3.0	---
75399: Jamesfin	IIw	91.0	81.0	3.4	34.0	5.1	37.0
75400: Gladden	IIIw	65.0	57.0	2.4	24.0	3.6	26.0
75407: Gabriel	IIw	135.0	118.0	5.0	50.0	7.5	55.0
99000. Pits, quarries							
99001. Water							
99003. Miscellaneous water							

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 7.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed)

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume* of wood fiber	
									m3/ha	
15002:										
McGirk	3W	Slight	Severe	Severe	Moderate	Severe	White oak	55	3	Green ash, pecan, pin oak, sweetgum
60001, 60002, 60003:										
Manfro	4A	Slight	Slight	Slight	Slight	Severe	Black oak	73	4	Black walnut, white ash, sugar maple, tuliptree, white oak
							Northern red oak	81	4	
							Sugar maple	68	3	
							White ash	70	3	
							White oak	59	3	
60004:										
Manfro	4R	Moderate	Slight	Slight	Slight	Severe	Black oak	73	4	Black walnut, white ash, sugar maple, tuliptree, white oak
							Northern red oak	81	4	
							Sugar maple	68	3	
							White ash	70	3	
							White oak	59	3	
60005:										
Manfro	4R	Moderate	Moderate	Slight	Slight	Severe	Black oak	73	4	Black walnut, white ash, sugar maple, tuliptree, white oak
							Northern red oak	81	4	
							Sugar maple	68	3	
							White ash	70	3	
							White oak	59	3	
60006:										
Marion	2W	Slight	Slight	Moderate	Severe	Severe	White oak	50	2	Shortleaf pine, black oak, eastern redcedar
							Black oak	57	---	
60007:										
Manfro	4R	Severe	Severe	Slight	Slight	Severe	Black oak	73	4	White ash, tuliptree, white oak, black walnut
							Northern red oak	81	4	
							Sugar maple	68	3	
							White oak	59	3	
Gatewood	2R	Moderate	Severe	Slight	Slight	Moderate	Black oak	42	2	Eastern redcedar, shortleaf pine
							Eastern redcedar	40	3	
							Post oak	43	2	
							White oak	45	2	
64000:										
Racoon	4W	Slight	Severe	Severe	Severe	Severe	Pin oak	80	4	Baldcypress, pin oak, red maple, green ash, pecan
							Green ash	---	---	
							White oak	---	---	
64001:										
Freeburg	3A	Slight	Slight	Moderate	Slight	Severe	White oak	65	3	Black oak, green ash, pecan, tuliptree,
							Green ash	---	---	
							Pecan	---	---	

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume* of wood fiber	
									m3/ha	
64002:										
Freeburg	3A	Slight	Slight	Moderate	Slight	Severe	White oak	65	3	Green ash, pecan, tuliptree, white oak
							Green ash	---	---	
							Pecan	---	---	
64003:										
Freeburg	3A	Slight	Slight	Moderate	Slight	Severe	White oak	65	3	Green ash, pecan, tuliptree, white oak
							Eastern cottonwood	---	---	
							Green ash	---	---	
66003:										
Jemerson	3A	Slight	Slight	Slight	Slight	Severe	Black oak	65	3	Black oak, white ash, northern red oak
							Northern red oak	60	3	
							White oak	65	3	
66004:										
Dockery	4W	Slight	Moderate	Moderate	Slight	Severe	Pin oak	76	4	Eastern cottonwood, pecan, pin oak
							Eastern cottonwood	---	---	
66005:										
Deible	4W	Slight	Severe	Severe	Severe	Severe	Pin oak	76	4	Eastern cottonwood, green ash, pin oak, pecan
							Northern red oak	---	---	
							Green ash	---	---	
							Silver maple	---	---	
66006:										
Waldron	11C	Slight	Moderate	Moderate	Slight	Severe	Eastern cottonwood	110	11	Black willow, eastern cottonwood, green ash, pecan, pin oak, silver maple
							Pin oak	80	4	
66007:										
Leta	7C	Slight	Moderate	Severe	Moderate	Severe	Eastern cottonwood	90	7	Eastern cottonwood, green ash, pecan, silver maple
							Black willow	---	---	
							Silver maple	85	3	
66008:										
Leta	7C	Slight	Slight	Moderate	Moderate	Severe	Eastern cottonwood	90	7	Eastern cottonwood, green ash, pecan, silver maple
							Black willow	---	---	
66009:										
Haynie	11A	Slight	Slight	Slight	Slight	Severe	American sycamore	110	11	Black walnut, eastern cottonwood, pecan, green ash
							Black walnut	---	---	
							Eastern cottonwood	110	11	
							Green ash	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume* of wood fiber	
									m3/ha	
66010:										
Sarpy	3S	Slight	Severe	Severe	Slight	Slight	Eastern cottonwood	95	8	American sycamore, black willow, eastern cottonwood
							Silver maple	90	3	
66011:										
Moville	11A	Slight	Slight	Moderate	Slight	Severe	American sycamore	110	11	Black walnut, eastern cottonwood, green ash
							Black walnut	---	---	
							Eastern cottonwood	110	11	
							Green ash	---	---	
66012:										
Blake	12A	Slight	Severe	Moderate	Slight	Severe	Eastern cottonwood	115	12	American sycamore, eastern cottonwood, green ash, silver maple
							Americal sycamore	---	---	
							Silver maple	---	---	
66013:										
Waldron	11C	Slight	Slight	Moderate	Slight	Severe	Eastern cottonwood	110	11	Black willow, eastern cottonwood, green ash, pecan, pin oak, silver maple
							Pin oak	80	4	
70028:										
Moko	2X	Slight	Slight	Severe	Severe	Slight	Eastern redcedar	30	2	Eastern redcedar
Rock outcrop.										
70029:										
Moko	2R	Severe	Severe	Severe	Severe	Slight	Eastern redcedar	30	2	Eastern redcedar
Rock outcrop.										
73035:										
Gravois	3D	Slight	Slight	Slight	Moderate	Moderate	Black oak	58	3	Northern red oak, scarlet oak, shortleaf pine
							Northern red oak	62	3	
							White oak	53	6	
73088:										
Rueter	3F	Slight	Slight	Severe	Slight	Moderate	Black oak	61	3	Shortleaf pine, white oak, northern red oak
							Northern red oak	61	3	
							White oak	61	6	
73089:										
Rueter	3R	Moderate	Moderate	Severe	Slight	Moderate	Black oak	61	3	Shortleaf pine, white oak, northern red
							Northern red oak	61	3	
							White oak	61	6	

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume* of wood fiber	
									m3/ha	
73090, 73091:										
Useful	3A	Slight	Slight	Slight	Slight	Moderate	White oak	61	3	White ash,
							Black oak	---	---	tuliptree,
							Northern red oak	---	---	white oak,
							Post oak	---	---	shortleaf pine
							Sugar maple	---	---	
73092, 73093:										
Gatewood	2F	Slight	Slight	Slight	Slight	Moderate	Black oak	42	2	Eastern
							Eastern redcedar	40	3	redcedar,
							Post oak	43	2	shortleaf pine
							White oak	45	2	
73094:										
Gatewood	2R	Moderate	Moderate	Moderate	Slight	Moderate	Black oak	42	2	Eastern
							Eastern redcedar	40	3	redcedar,
							Post oak	43	2	shortleaf pine
							White oak	45	2	
73095:										
Gravois	3R	Moderate	Slight	Slight	Moderate	Moderate	Black oak	58	3	Northern red
							Northern red oak	62	3	oak, scarlet
							White oak	53	6	oak, shortleaf
										pine
73096:										
Swiss	2C	Slight	Slight	Slight	Slight	Moderate	White oak	48	2	Black oak,
							Black oak	---	---	shortleaf pine,
										eastern
										redcedar
73097:										
Swiss	2R	Moderate	Moderate	Slight	Slight	Moderate	White oak	48	2	Black oak,
							Black oak	---	---	shortleaf pine,
										eastern
										redcedar
73098, 73099:										
Plato	3D	Slight	Slight	Moderate	Moderate	Severe	Black oak	60	3	Black oak, post
							White oak	---	---	oak, shortleaf
										pine
73100, 73101, 73102:										
Wrengart	3A	Slight	Slight	Slight	Slight	Moderate	Black oak	63	3	Black oak,
							White oak	53	3	northern red
							Northern red oak	---	---	oak, shortleaf
										pine
73103:										
Wrengart	3R	Slight	Slight	Slight	Slight	Moderate	Black oak	63	3	Black oak,
							White oak	53	3	northern red
							Northern red oak	---	---	oak, shortleaf
										pine

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume* of wood fiber	
									m3/ha	
73104:										
Wrengart	3R	Moderate	Slight	Slight	Slight	Moderate	Black oak	63	3	Black oak, northern red oak, shortleaf pine
							White oak	53	3	
							Northern red oak	---	---	
73105:										
Wrengart	3R	Moderate	Moderate	Slight	Slight	Moderate	Black oak	63	3	Black oak, northern red oak, shortleaf pine
							White oak	53	3	
							Northern red oak	---	---	
Gatewood	2R	Moderate	Moderate	Slight	Slight	Moderate	Black oak	42	2	Eastern redcedar, shortleaf pine
							Eastern redcedar	40	3	
							Post oak	43	2	
							White oak	45	2	
73107:										
Wrengart	3A	Slight	Slight	Slight	Slight	Severe	Black oak	63	3	Black oak, northern red oak, shortleaf pine
							White oak	53	3	
							Northern red oak	---	---	
Swiss	2C	Slight	Slight	Slight	Slight	Moderate	White oak	48	2	Eastern redcedar, northern red oak, shortleaf pine
							Eastern redcedar	---	---	
73108:										
Gravois	3D	Slight	Slight	Slight	Moderate	Moderate	Black oak	58	3	Northern red oak, scarlet oak, shortleaf pine, white oak
							Northern red oak	62	3	
							White oak	53	6	
Gatewood	2F	Slight	Slight	Slight	Slight	Moderate	Black oak	42	2	Eastern redcedar, shortleaf pine
							Eastern redcedar	40	3	
							Post oak	43	2	
							White oak	45	2	
73109:										
Alred	3R	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	65	3	White oak, shortleaf pine, red oak
							White oak	70	8	
73110:										
Gravois	3R	Moderate	Moderate	Slight	Moderate	Moderate	Black oak	58	3	Northern red oak, scarlet oak, shortleaf pine, white oak
							Northern red oak	62	3	
							Shortleaf pine	53	6	
							White oak	50	3	
Gatewood	2R	Moderate	Moderate	Slight	Slight	Moderate	Black oak	42	2	Eastern redcedar, shortleaf pine
							Eastern redcedar	40	3	
							Post oak	43	2	
							White oak	45	2	

Table 7.--Woodland Management and Productivity--Continued

Map symbol and Soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume* of wood fiber	
									m3/ha	
73112:										
Gunlock	3A	Slight	Slight	Slight	Moderate	Moderate	Black oak	60	3	Black oak, northern red oak, shortleaf pine, white oak
							Northern red oak	60	3	
							White oak	57	3	
73135:										
Union	3D	Slight	Slight	Slight	Moderate	Moderate	Black oak	58	3	Northern red oak, scarlet oak, shortleaf pine, white oak
							Northern red oak	62	3	
							Shortleaf pine	53	6	
							White oak	50	3	
74633, 74634:										
Hartville	3C	Slight	Slight	Moderate	Slight	Severe	White oak	55	3	Eastern cottonwood, pin oak
74635:										
Tanglenook	2W	Slight	Severe	Severe	Moderate	Moderate	Eastern cottonwood	90	7	American sycamore, common hackberry, eastern cottonwood, green ash, pin oak, silver maple
							Silver maple	80	2	
75376:										
Cedargap	3W	Slight	Moderate	Slight	Slight	Moderate	Black oak	66	3	Black oak, shortleaf pine
75391:										
Possumtrot	4A	Slight	Slight	Slight	Slight	Moderate	American sycamore	85	6	Black walnut, shortleaf pine, white oak
							Bitternut hickory	---	---	
							Black walnut	---	---	
							White oak	75	4	
75395:										
Jamesfin	8A	Slight	Slight	Slight	Slight	Severe	Black walnut	100	8	Black walnut, white ash, sweetgum
							White ash	102	---	
75398:										
Kaintuck	7W	Slight	Moderate	Slight	Slight	Moderate	American sycamore	90	7	American sycamore, black walnut, green ash, northern red oak
							Black walnut	---	---	
							River birch	---	---	
							White oak	---	---	
75399:										
Jamesfin	8A	Slight	Moderate	Slight	Slight	Severe	Black walnut	100	8	Black walnut, sweetgum, white ash
							White ash	102	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Map symbol and soil name	Ordination symbol	Management concerns					Potential productivity			Suggested trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume* of wood fiber	
									m3/ha	
75400:										
Gladden---------	4A	Slight	Slight	Slight	Slight	Severe	American sycamore---	85	6	Shortleaf pine,
							Black walnut--------	---	---	American
							White oak----------	75	4	sycamore
75407:										
Gabriel---------	7W	Slight	Slight	Severe	Slight	Severe	Eastern cottonwood--	90	7	American
							Silver maple--------	80	2	sycamore, common hackberry, eastern cottonwood, green ash, silver maple

* Volume is the yield in cubic meters per hectare per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

Table 8.--Windbreak Suitability Groups

Map symbol	Soil name	Component name	Windbreak suitability group
15002	McGirk silt loam, 1 to 3 percent slopes	McGirk	4
60001	Manfro silt loam, 5 to 9 percent slopes	Manfro	3
60002	Manfro silt loam, footslopes, 5 to 9 percent slopes	Manfro	3
60003	Manfro silt loam, 9 to 14 percent slopes, eroded	Manfro	3
60004	Manfro silt loam, 14 to 20 percent slopes, eroded	Manfro	3
60005	Manfro silt loam, 20 to 35 percent slopes	Manfro	3
60006	Marion silt loam, 2 to 5 percent slopes	Marion	4
60007	Manfro-Gatewood complex, 20 to 50 percent slopes	Manfro	3
		Gatewood	6D
64000	Racoon silt loam, 0 to 3 percent slopes, rarely flooded	Racoon	2
64001	Freeburg silt loam, 0 to 3 percent slopes, rarely flooded	Freeburg	1
64002	Freeburg silt loam, 1 to 3 percent slopes	Freeburg	1
64003	Freeburg silt loam, 3 to 8 percent slopes	Freeburg	1
66003	Jemerson silt loam, 0 to 2 percent slopes, rarely flooded	Jemerson	3
66004	Dockery silt loam, 0 to 2 percent slopes, frequently flooded	Dockery	1
66005	Deible silt loam, 0 to 2 percent slopes, rarely flooded	Deible	2
66006	Waldron silty clay loam, 0 to 2 percent slopes, occasionally flooded	Waldron	1
66007	Leta silty clay, 0 to 2 percent slopes, occasionally flooded	Leta	4C
66008	Leta silt loam, 0 to 2 percent slopes, overwash, occasionally flooded	Leta	1K
66009	Haynie silt loam, 0 to 2 percent slopes, occasionally flooded	Haynie	1
66010	Sarpy fine sand, 0 to 2 percent slopes, frequently flooded	Sarpy	1
66011	Moville silt loam, 0 to 2 percent slopes, occasionally flooded	Moville	1
66012	Blake silt loam, 0 to 2 percent slopes, frequently flooded	Blake	1
66013	Waldron silt loam, 0 to 2 percent slopes, rarely flooded	Waldron	1
70028	Moko-Rock outcrop complex, 3 to 15 percent slopes, very stony	Moko	10
		Rock outcrop	---
70029	Moko-Rock outcrop complex, 15 to 50 percent slopes, very stony	Moko	10
		Rock outcrop	---
73035	Gravois silt loam, 8 to 15 percent slopes	Gravois	4
73088	Rueter very gravelly silt loam, 8 to 15 percent slopes, very stony	Rueter	10
73089	Rueter very gravelly silt loam, 15 to 35 percent slopes, very stony	Rueter	10
73090	Useful silt loam, 3 to 8 percent slopes	Useful	3
73091	Useful silt loam, 8 to 15 percent slopes, eroded	Useful	3
73092	Gatewood very gravelly silt loam, 3 to 8 percent slopes, stony	Gatewood	6D
73093	Gatewood very gravelly silt loam, 8 to 15 percent slopes, stony	Gatewood	6D
73094	Gatewood very gravelly silt loam, 15 to 35 percent slopes, stony	Gatewood	6D
73095	Gravois silt loam, 15 to 20 percent slopes	Gravois	10
73096	Swiss gravelly silt loam, 8 to 15 percent slopes, stony	Swiss	4
73097	Swiss gravelly silt loam, 15 to 35 percent slopes, stony	Swiss	4
73098	Plato silt loam, 1 to 3 percent slopes	Plato	4
73099	Plato silt loam, 3 to 8 percent slopes	Plato	4
73100	Wrengart silt loam, 2 to 5 percent slopes	Wrengart	3
73101	Wrengart silt loam, 5 to 9 percent slopes	Wrengart	3
73102	Wrengart silt loam, footslopes, 5 to 9 percent slopes	Wrengart	3
73103	Wrengart silt loam, 9 to 14 percent slopes	Wrengart	3
73104	Wrengart silt loam, 14 to 20 percent slopes, eroded	Wrengart	3
73105	Wrengart-Gatewood complex, 14 to 35 percent slopes	Wrengart	3
		Gatewood	6D
73106	Mariosa silt loam, 0 to 2 percent slopes	Mariosa	2
73107	Wrengart-Swiss complex, 5 to 9 percent slopes	Swiss	4
		Wrengart	3
73108	Gravois-Gatewood complex, 3 to 8 percent slopes	Gravois	4
		Gatewood	6D
73109	Alred gravelly silt loam, 15 to 35 percent slopes, stony	Alred	10
73110	Gravois-Gatewood complex, 15 to 35 percent slopes	Gravois	4
		Gatewood	6D
73112	Gunlock silt loam, 3 to 8 percent slopes	Gunlock	3
73135	Union silt loam, 3 to 8 percent slopes	Union	6D
74633	Hartville silt loam, 1 to 3 percent slopes	Hartville	4
74634	Hartville silt loam, 3 to 8 percent slopes	Hartville	4
74635	Tanglenook silty clay, 0 to 2 percent slopes, rarely flooded	Tanglenook	2
75376	Cedargap gravelly silt loam, 0 to 3 percent slopes, frequently flooded	Cedargap	1
75391	Possumtrot fine sandy loam, 0 to 3 percent slopes, occasionally flooded	Possumtrot	1

Table 8.--Windbreak Suitability Groups--Continued

Map symbol	Soil name	Component name	Windbreak suitability group
75395	Jamesfin silt loam, 0 to 3 percent slopes, occasionally flooded	Jamesfin	1
75398	Kaintuck fine sandy loam, 0 to 3 percent slopes, frequently flooded	Kaintuck	1
75399	Jamesfin silt loam, 0 to 3 percent slopes, frequently flooded	Jamesfin	1
75400	Gladden silt loam, 0 to 3 percent slopes, frequently flooded	Gladden	1
75407	Gabriel silt loam, 0 to 2 percent slopes, rarely flooded	Gabriel	1
99000	Pits, quarries	Pits, quarries	---
99001	Water	Water	---
99003	Miscellaneous water	Water	---

Table 9.--Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
15002:					
McGirk	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
60001, 60002:					
Manfro	Slight	Slight	Severe: slope	Slight	Slight
60003:					
Manfro	Moderate: slope	Moderate: slope	Severe: slope	Severe: erodes easily	Moderate: slope
60004:					
Manfro	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily	Severe: slope
60005:					
Manfro	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily slope	Severe: slope
60006:					
Marion	Severe: percs slowly wetness	Severe: percs slowly	Severe: percs slowly wetness	Moderate: wetness	Moderate: wetness
60007:					
Manfro	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily slope	Severe: slope
Gatewood	Severe: slope	Severe: slope	Severe: slope small stones	Severe: slope	Severe: slope small stones
64000:					
Racoon	Severe: flooding wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness
64001:					
Freeburg	Severe: flooding wetness	Moderate: wetness percs slowly	Severe: wetness	Moderate: wetness	Moderate: wetness
64002:					
Freeburg	Severe: wetness	Moderate: wetness percs slowly	Severe: wetness	Moderate: wetness	Moderate: wetness
64003:					
Freeburg	Severe: wetness	Moderate: wetness percs slowly	Severe: slope wetness	Moderate: wetness	Moderate: wetness
66003:					
Jemerson	Severe: flooding	Slight	Slight	Slight	Slight

Table 9.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
66004:					
Dockery	Severe: flooding	Moderate: flooding, wetness	Severe: flooding	Moderate: flooding, wetness	Severe: flooding
66005:					
Deible	Severe: flooding, percs slowly, wetness	Severe: percs slowly, wetness	Severe: wetness, percs slowly	Severe: wetness	Severe: wetness
66006:					
Waldron	Severe: flooding, wetness	Moderate: percs slowly, wetness	Severe: wetness	Moderate: wetness	Moderate: flooding, wetness
66007:					
Leta	Severe: flooding, too clayey, wetness	Severe: too clayey	Severe: too clayey, wetness	Severe: too clayey	Severe: too clayey
66008:					
Leta	Severe: flooding, wetness	Moderate: percs slowly, wetness	Severe: wetness	Moderate: wetness	Moderate: flooding, wetness
66009:					
Haynie	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding
66010:					
Sarpy	Severe: flooding, too sandy	Severe: too sandy	Severe: flooding, too sandy	Severe: too sandy	Severe: flooding
66011:					
Moville	Severe: flooding, percs slowly	Severe: wetness, percs slowly	Moderate: flooding, wetness	Moderate: wetness	Moderate: flooding, wetness
66012:					
Blake	Severe: flooding	Moderate: flooding, wetness	Severe: flooding	Moderate: flooding	Severe: flooding
66013:					
Waldron	Severe: flooding, wetness	Moderate: percs slowly, wetness	Severe: wetness	Moderate: wetness	Moderate: wetness
70028:					
Moko	Severe: depth to rock	Severe: depth to rock	Severe: slope, small stones, depth to rock	Moderate: large stones, too stony	Severe: depth to rock
Rock outcrop.					
70029:					

Table 9.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
70029: Rock outcrop.					
73035: Gravois	Moderate: percs slowly, slope, wetness	Moderate: percs slowly, slope, wetness	Severe: slope	Severe: erodes easily	Moderate: slope, wetness
73088: Rueter	Severe: small stones	Severe: small stones	Severe: slope, small stones	Moderate: large stones	Severe: small stones
73089: Rueter	Severe: slope, small stones	Severe: slope, small stones	Severe: slope, small stones	Severe: slope	Severe: slope, small stones
73090: Useful	Moderate: percs slowly, wetness	Moderate: percs slowly, wetness	Severe: slope	Slight	Slight
73091: Useful	Moderate: percs slowly, slope, wetness	Moderate: percs slowly, slope, wetness	Severe: slope	Severe: erodes easily	Moderate: slope
73092, 73093: Gatewood	Severe: small stones	Severe: small stones	Severe: slope, small stones	Moderate: wetness	Severe: small stones
73094: Gatewood	Severe: slope	Severe: slope	Severe: slope, small stones	Severe: slope	Severe: slope
73095: Gravois	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily	Severe: slope
73096: Swiss	Severe: percs slowly	Severe: percs slowly	Severe: percs slowly, slope, small stones	Slight	Moderate: slope, small stones
73097: Swiss	Severe: percs slowly, slope	Severe: percs slowly, slope	Severe: percs slowly, slope, small stones	Severe: slope	Severe: slope
73098: Plato	Severe: percs slowly, wetness	Severe: percs slowly	Severe: percs slowly, wetness	Moderate: wetness	Moderate: wetness, droughty

Table 9.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
73099:					
Plato	Severe: percs slowly, wetness	Severe: percs slowly	Severe: percs slowly, slope, wetness	Moderate: wetness	Moderate: wetness, droughty
73100:					
Wrengart	Moderate: wetness, percs slowly	Moderate: wetness, percs slowly	Moderate: slope, wetness, percs slowly	Slight	Slight
73101, 73102:					
Wrengart	Moderate: wetness, percs slowly	Moderate: wetness, percs slowly	Severe: slope	Slight	Slight
73103:					
Wrengart	Moderate: slope, wetness, percs slowly	Moderate: slope, wetness, percs slowly	Severe: slope	Severe: erodes easily	Moderate: slope
73104:					
Wrengart	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily	Severe: slope
73105:					
Wrengart	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily, slope	Severe: slope
Gatewood	Severe: slope	Severe: slope	Severe: slope, small stones	Severe: slope	Severe: slope
73106:					
Mariosa	Severe: percs slowly, wetness	Severe: percs slowly, wetness	Severe: percs slowly, wetness	Severe: wetness	Severe: wetness
73107:					
Wrengart	Moderate: wetness, percs slowly	Moderate: wetness, percs slowly	Severe: slope	Slight	Slight
Swiss	Severe: percs slowly	Severe: percs slowly	Severe: percs slowly, slope, small stones	Slight	Moderate: small stones
73108:					
Gravois	Moderate: percs slowly, wetness	Moderate: percs slowly, wetness	Severe: slope	Moderate: wetness	Moderate: wetness
Gatewood	Moderate: small stones, wetness, percs slowly	Severe: small stones, wetness, percs slowly	Severe: slope, small stones	Moderate: wetness	Moderate: small stones, wetness, depth to rock

Table 9.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
73109:					
Alred	Severe: slope	Severe: slope	Severe: slope, small stones	Severe: slope	Severe: slope
73110:					
Gravois	Severe: slope	Severe: slope	Severe: slope	Severe: erodes easily, slope	Severe: slope
Gatewood	Severe: slope	Severe: slope	Severe: slope, small stones	Severe: slope	Severe: slope
73112:					
Gunlock	Moderate: percs slowly, wetness	Moderate: percs slowly, wetness	Severe: slope	Moderate: wetness	Moderate: wetness
73135:					
Union	Moderate: percs slowly, wetness	Moderate: percs slowly, wetness	Severe: slope	Moderate: wetness	Moderate: wetness
74633:					
Hartville	Moderate: percs slowly, wetness	Moderate: percs slowly, wetness	Moderate: percs slowly, slope, wetness	Moderate: wetness	Moderate: wetness
74634:					
Hartville	Moderate: percs slowly, wetness	Moderate: percs slowly, wetness	Severe: slope	Moderate: wetness	Moderate: wetness
74635:					
Tanglenook	Severe: flooding, too clayey, wetness	Severe: too clayey, wetness	Severe: too clayey, wetness	Severe: too clayey, wetness	Severe: too clayey, wetness
75376:					
Cedargap	Severe: flooding	Moderate: flooding, small stones	Severe: flooding, small stones	Moderate: flooding	Severe: flooding
75391:					
Possumtrot	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding
75395:					
Jamesfin	Severe: flooding	Slight	Moderate: flooding	Slight	Moderate: flooding
75398:					
Kaintuck	Severe: flooding	Moderate: flooding	Severe: flooding	Moderate: flooding	Severe: flooding
75399:					
Jamesfin	Severe: flooding	Moderate: flooding	Severe: flooding	Moderate: flooding	Severe: flooding

Table 9.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
75400: Gladden	Severe: flooding	Moderate: flooding	Severe: flooding	Moderate: flooding	Severe: flooding
75407: Gabriel	Severe: flooding wetness	Moderate: percs slowly wetness	Severe: wetness	Moderate: wetness	Moderate: wetness
99000. Pits, quarries					
99001. Water					
99003. Miscellaneous water					

Table 10.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Potential for habitat elements							Potential as habitat for—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
15002:											
McGirk	Fair	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor	---
60001, 60002, 60003:											
Manfro	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	---
60004:											
Manfro	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	---
60005:											
Manfro	Very poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	---
60006:											
Marion	Fair	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor	---
60007:											
Manfro	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor	---
Gatewood	Very poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	---
64000:											
Racoon	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good	---
64001, 64002:											
Freeburg	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	---
64003:											
Freeburg	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor	---
66003:											
Jemerson	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	---
66004:											
Dockery	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	---
66005:											
Deible	Fair	Good	Poor	Good	Good	Good	Fair	Fair	Good	Fair	---
66006:											
Waldron	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Fair	Fair	---
66007, 66008:											
Leta	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Fair	Fair	---
66009:											
Haynie	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	---
66010:											
Sarpy	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	---

Table 10.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for-			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
66011:											
Moville	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	---
66012:											
Blake	Fair	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair	---
66013:											
Waldron	Fair	Fair	Fair	Good	Good	Fair	Fair	Fair	Fair	Fair	---
70028:											
Moko	Very poor	Poor	Poor	Very poor	Poor	Very poor	Very poor	Poor	Poor	Very poor	---
Rock outcrop.											
70029:											
Moko	Very poor	Poor	Poor	Very poor	Poor	Very poor	Very poor	Very poor	Poor	Very poor	---
Rock outcrop.											
73035:											
Gravois	Fair	Good	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	---
73088:											
Rueter	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	---
73089:											
Rueter	Very poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	---
73090, 73091:											
Useful	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor	---
73092, 73093, 73094:											
Gatewood	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	---
73095:											
Gravois	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	---
73096, 73097:											
Swiss	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	---
73098, 73099:											
Plato	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor	---
73100, 73101, 73102, 73103, 73104:											
Wrengart	Fair	Good	Good	Good	Fair	Poor	Very poor	Good	Good	Very poor	---

Table 10.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
73105:											
Gatewood	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	---
73106:											
Mariosa	Fair	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor	---
73107:											
Wrengart	Fair	Good	Good	Good	Fair	Poor	Very poor	Good	Good	Very poor	---
Swiss	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor	---
73108:											
Gravois	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	---
Gatewood	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	---
73109:											
Alred	Very poor	Poor	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	---
73110:											
Gravois	Very poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	---
Gatewood	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	---
73112:											
Gunlock	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor	---
73135:											
Union	Fair	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor	---
74633:											
Hartville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	---
74634:											
Hartville	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	---
74635:											
Tanglenook	Poor	Fair	Poor	Fair	Poor	Good	Good	Poor	Fair	Good	---
75376:											
Cedargap	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor	---
75391:											
Possumtrot	Fair	Fair	Good	Good	Good	Poor	Very poor	Fair	Good	Very poor	---
75395:											
Jamesfin	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor	---

Table 10.--Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for-			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
75398: Kaintuck	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Very poor	---
75399: Jamesfin	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Very poor	---
75400: Gladdan	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor	---
75407: Gabriel	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair	---
99000. Pits, quarries											
99001. Water											
99003. Miscellaneous water											

Table 11.--Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
15002:						
McGirk	Severe: wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: frost action low strength shrink-swell wetness	Severe: wetness
60001, 60002:						
Menfro	Slight	Moderate: shrink-swell	Moderate: shrink-swell	Moderate: shrink-swell slope	Severe: frost action low strength	Slight
60003:						
Menfro	Moderate: slope	Moderate: shrink-swell slope	Moderate: shrink-swell slope	Severe: slope	Severe: frost action low strength	Moderate: slope
60004, 60005:						
Menfro	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: frost action low strength slope	Severe: slope
60006:						
Marion	Severe: wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: low strength shrink-swell	Moderate: wetness
60007:						
Menfro	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: frost action low strength slope	Severe: slope
Gatewood	Severe: slope wetness depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope wetness depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: slope small stones
64000:						
Racoon	Severe: wetness	Severe: flooding wetness	Severe: flooding shrink-swell wetness	Severe: flooding wetness	Severe: frost action low strength wetness	Severe: wetness
64001:						
Freeburg	Severe: wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: frost action low strength	Moderate: wetness
64002, 64003:						
Freeburg	Severe: wetness	Severe: wetness	Severe: wetness	Severe: wetness	Severe: frost action low strength	Moderate: wetness

Table 11.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
66003:						
Jamerson	Moderate: wetness	Severe: flooding	Severe: flooding	Severe: flooding	Severe: frost action	Slight
66004:						
Dockery	Severe: wetness	Severe: flooding	Severe: flooding wetness	Severe: flooding	Severe: flooding frost action low strength	Severe: flooding
66005:						
Deible	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: low strength shrink-swell wetness	Severe: wetness
66006:						
Waldron	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding frost action low strength shrink-swell	Moderate: flooding wetness
66007:						
Leta	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding wetness	Severe: flooding shrink-swell wetness	Severe: flooding frost action low strength shrink-swell	Severe: too clayey
66008:						
Leta	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding wetness	Severe: flooding shrink-swell wetness	Severe: flooding frost action low strength shrink-swell	Moderate: flooding wetness
66009:						
Haynie	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding frost action low strength	Moderate: flooding
66010:						
Sarpy	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
66011:						
Moville	Severe: wetness	Severe: flooding	Severe: flooding shrink-swell wetness	Severe: flooding	Severe: flooding frost action low strength	Moderate: flooding wetness
66012:						
Blake	Severe: wetness	Severe: flooding	Severe: flooding wetness	Severe: flooding	Severe: flooding frost action low strength	Severe: flooding

Table 11.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
66013:						
Waldron	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: frost action low strength shrink-swell	Moderate: wetness
70028:						
Moko	Severe: depth to rock	Severe: depth to rock	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock
Rock outcrop.						
70029:						
Moko	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock
Rock outcrop.						
73035:						
Gravois	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: wetness	Severe: slope	Severe: low strength	Moderate: slope wetness
73088:						
Rueter	Moderate: slope	Moderate: slope	Moderate: slope	Severe: slope	Moderate: frost action slope	Severe: small stones
73089:						
Rueter	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope small stones
73090:						
Useful	Severe: wetness	Severe: shrink-swell	Severe: shrink-swell wetness	Severe: shrink-swell	Severe: low strength shrink-swell	Slight
73091:						
Useful	Severe: wetness	Severe: shrink-swell	Severe: shrink-swell wetness	Severe: shrink-swell slope	Severe: low strength shrink-swell	Moderate: slope
73092:						
Gatewood	Severe: wetness depth to rock	Severe: shrink-swell	Severe: shrink-swell wetness depth to rock	Severe: shrink-swell	Severe: low strength shrink-swell	Severe: small stones
73093:						
Gatewood	Severe: wetness depth to rock	Severe: shrink-swell	Severe: shrink-swell wetness depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell	Severe: small stones

Table 11.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
73094:						
Gatewood	Severe: slope wetness depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope wetness depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: slope small stones
73095:						
Gravois	Severe: slope wetness	Severe: slope	Severe: slope wetness	Severe: slope	Severe: low strength slope	Severe: slope
73096:						
Swiss	Severe: wetness	Severe: shrink-swell	Severe: shrink-swell wetness	Severe: shrink-swell slope	Severe: low strength shrink-swell	Moderate: slope
73097:						
Swiss	Severe: slope wetness	Severe: shrink-swell slope	Severe: shrink-swell slope wetness	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: slope
73098, 73099:						
Plato	Severe: wetness	Severe: wetness shrink-swell	Severe: wetness	Severe: wetness shrink-swell	Severe: shrink-swell low strength	Moderate: wetness droughty
73100:						
Wrengart	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell wetness	Severe: low strength	Slight
73101, 73102:						
Wrengart	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: low strength	Slight
73103:						
Wrengart	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: wetness	Severe: slope	Severe: low strength	Moderate: slope
73104:						
Wrengart	Severe: slope wetness	Severe: slope	Severe: slope wetness	Severe: slope	Severe: low strength slope	Severe: slope
73105:						
Wrengart	Severe: slope wetness	Severe: slope	Severe: slope wetness	Severe: slope	Severe: low strength slope	Severe: slope
Gatewood	Severe: slope wetness depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope wetness	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: slope small stones

Table 11.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
73106:						
Mariosa	Severe: wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: shrink-swell wetness	Severe: frost action low strength shrink-swell wetness	Severe: wetness
73107:						
Wrengart	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: low strength	Slight
Swiss	Severe: wetness	Severe: shrink-swell	Severe: shrink-swell wetness	Severe: shrink-swell	Severe: low strength shrink-swell	Moderate: small stones
73108:						
Gravois	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: low strength	Moderate: wetness
Gatewood	Severe: wetness depth to rock	Severe: shrink-swell	Severe: shrink-swell wetness depth to rock	Severe: shrink-swell	Severe: low strength shrink-swell	Moderate: small stones wetness depth to rock
73109:						
Alred	Severe: slope	Severe: slope	Severe: slope shrink-swell	Severe: slope	Severe: slope	Severe: slope
73110:						
Gravois	Severe: slope wetness	Severe: slope	Severe: slope wetness	Severe: slope	Severe: low strength slope	Severe: slope
Gatewood	Severe: slope wetness depth to rock	Severe: shrink-swell slope	Severe: shrink-swell slope wetness depth to rock	Severe: shrink-swell slope	Severe: low strength shrink-swell slope	Severe: slope
73112:						
Gunlock	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: low strength	Moderate: wetness
73135:						
Union	Severe: wetness	Moderate: shrink-swell wetness	Severe: wetness	Moderate: shrink-swell slope wetness	Severe: low strength	Moderate: wetness
74633, 74634:						
Hartville	Severe: wetness	Severe: shrink-swell	Severe: shrink-swell wetness	Severe: shrink-swell	Severe: frost action low strength shrink-swell	Moderate: wetness

Table 11.--Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
74635: Tanglenook	Severe: wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: flooding shrink-swell wetness	Severe: frost action low strength shrink-swell wetness	Severe: too clayey wetness
75376: Cedargap	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
75391: Possumtrot	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Moderate: flooding
75395: Jamesfin	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding low strength frost action	Moderate: flooding
75398: Kaintuck	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
75399: Jamesfin	Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding low strength frost action	Severe: flooding
75400: Gladden	Severe: cutbanks cave	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
75407: Gabriel	Severe: wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: frost action low strength	Moderate: wetness
99000. Pits, quarries						
99001. Water						
99003. Miscellaneous water						

Table 12.--Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
15002:					
McGirk	Severe: percs slowly wetness	Severe: wetness	Severe: too clayey wetness	Severe: wetness	Poor: hard to pack too clayey wetness
60001, 60002:					
Manfro	Moderate: percs slowly	Severe: slope	Moderate: too clayey	Slight	Fair: too clayey
60003:					
Manfro	Moderate: percs slowly slope	Severe: slope	Moderate: slope too clayey	Moderate: slope	Fair: slope too clayey
60004, 60005:					
Manfro	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope
60006:					
Marion	Severe: percs slowly wetness	Severe: wetness	Severe: too clayey wetness	Severe: wetness	Poor: hard to pack too clayey wetness
60007:					
Manfro	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Poor: slope
Gatewood	Severe: percs slowly slope wetness depth to rock	Severe: slope wetness depth to rock	Severe: slope wetness depth to rock too clayey	Severe: slope depth to rock	Poor: hard to pack slope too clayey depth to rock
64000:					
Racoon	Severe: percs slowly wetness	Severe: wetness	Severe: wetness	Severe: wetness	Poor: wetness
64001, 64002, 64003:					
Freeburg	Severe: percs slowly wetness	Severe: wetness	Severe: wetness	Severe: wetness	Poor: wetness
66003:					
Jemerson	Severe: wetness	Moderate: wetness	Severe: wetness	Moderate: flooding wetness	Fair: too clayey
66004:					
Dockery	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Fair: wetness

Table 12.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
66005:					
Deible	Severe: percs slowly wetness	Severe: wetness	Severe: too clayey wetness	Severe: wetness	Poor: hard to pack too clayey wetness
66006:					
Waldron	Severe: flooding percs slowly wetness	Severe: flooding wetness	Severe: flooding too clayey wetness	Severe: flooding wetness	Poor: hard to pack too clayey wetness
66007, 66008:					
Leta	Severe: flooding percs slowly wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Poor: wetness
66009:					
Haynie	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Good
66010:					
Sarpy	Severe: flooding poor filter	Severe: flooding seepage	Severe: flooding seepage too sandy	Severe: flooding seepage	Poor: seepage too sandy
66011:					
Moville	Severe: flooding wetness percs slowly	Severe: flooding wetness	Severe: flooding wetness too clayey	Severe: flooding	Poor: too clayey hard to pack wetness
66012:					
Blake	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Severe: flooding wetness	Fair: wetness
66013:					
Waldron	Severe: percs slowly wetness	Severe: wetness	Severe: too clayey wetness	Severe: wetness	Poor: hard to pack too clayey wetness
70028:					
Moko	Severe: depth to rock	Severe: slope depth to rock	Severe: depth to rock	Severe: depth to rock	Poor: depth to rock
Rock outcrop.					
70029:					
Moko	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Severe: slope depth to rock	Poor: slope depth to rock
Rock outcrop.					

Table 12.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
73035:					
Gravois	Severe: percs slowly wetness	Severe: slope wetness	Severe: wetness	Moderate: slope wetness	Fair: slope wetness too clayey
73088:					
Rueter	Moderate: slope	Severe: seepage slope	Severe: seepage	Severe: seepage	Poor: seepage small stones
73089:					
Rueter	Severe: slope	Severe: seepage slope	Severe: seepage slope	Severe: seepage slope	Poor: seepage slope small stones
73090:					
Useful	Severe: percs slowly wetness	Severe: wetness	Severe: too clayey depth to rock	Moderate: wetness depth to rock	Poor: too clayey
73091:					
Useful	Severe: percs slowly wetness	Severe: slope wetness	Severe: too clayey depth to rock	Moderate: wetness depth to rock	Poor: too clayey
73092:					
Gatewood	Severe: percs slowly wetness depth to rock	Severe: wetness depth to rock	Severe: too clayey wetness depth to rock	Severe: depth to rock	Poor: hard to pack too clayey depth to rock
73093:					
Gatewood	Severe: percs slowly wetness depth to rock	Severe: slope wetness depth to rock	Severe: too clayey wetness depth to rock	Severe: depth to rock	Poor: hard to pack too clayey depth to rock
73094:					
Gatewood	Severe: percs slowly slope wetness depth to rock	Severe: slope wetness depth to rock	Severe: slope too clayey wetness depth to rock	Severe: slope depth to rock	Poor: hard to pack slope too clayey depth to rock
73095:					
Gravois	Severe: percs slowly slope wetness	Severe: slope wetness	Severe: slope wetness	Severe: slope	Poor: slope
73096:					
Swiss	Severe: percs slowly wetness	Severe: slope wetness	Severe: too clayey	Moderate: slope wetness	Poor: hard to pack too clayey
73097:					
Swiss	Severe: percs slowly slope wetness	Severe: slope wetness	Severe: slope too clayey	Severe: slope	Poor: hard to pack slope too clayey

Table 12.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
73098, 73099:					
Plato	Severe: percs slowly wetness	Severe: wetness	Severe: wetness	Severe: wetness	Poor: wetness
73100:					
Wrengart	Severe: percs slowly wetness	Severe: wetness	Moderate: too clayey wetness	Moderate: wetness	Fair: too clayey wetness
73101, 73102:					
Wrengart	Severe: percs slowly wetness	Severe: slope wetness	Moderate: too clayey wetness	Moderate: wetness	Fair: too clayey wetness
73103:					
Wrengart	Severe: percs slowly wetness	Severe: slope wetness	Moderate: slope too clayey wetness	Moderate: slope wetness	Fair: slope too clayey wetness
73104:					
Wrengart	Severe: percs slowly slope wetness	Severe: slope wetness	Severe: slope	Severe: slope	Poor: slope
73105:					
Wrengart	Severe: percs slowly slope wetness	Severe: slope wetness	Severe: slope	Severe: slope	Poor: slope
Gatewood	Severe: percs slowly slope wetness depth to rock	Severe: slope wetness depth to rock	Severe: slope wetness depth to rock too clayey	Severe: slope depth to rock	Poor: hard to pack slope too clayey depth to rock
73106:					
Mariosa	Severe: percs slowly wetness	Severe: wetness	Severe: wetness	Severe: wetness	Poor: wetness hard to pack
73107:					
Wrengart	Severe: percs slowly wetness	Severe: slope wetness	Moderate: too clayey wetness	Moderate: wetness	Fair: too clayey wetness
Swiss	Severe: percs slowly wetness	Severe: slope wetness	Severe: too clayey	Moderate: wetness	Poor: hard to pack too clayey
73108:					
Gravois	Severe: percs slowly wetness	Severe: wetness	Severe: wetness	Moderate: wetness	Fair: too clayey wetness
73108:					

Table 12.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
73109:					
Alred	Severe: slope, percs slowly	Severe: slope	Severe: slope, too clayey	Severe: slope	Poor: hard to pack, slope, too clayey
73110:					
Gravois	Severe: percs slowly, slope, wetness	Severe: slope, wetness	Severe: slope, wetness	Severe: slope	Poor: slope
Gatewood	Severe: percs slowly, slope, wetness, depth to rock	Severe: slope, wetness, depth to rock	Severe: slope, too clayey, wetness, depth to rock	Severe: slope, depth to rock	Poor: hard to pack, slope, too clayey, depth to rock
73112:					
Gunlock	Severe: percs slowly, wetness	Severe: wetness	Severe: too clayey, wetness	Moderate: wetness	Fair: too clayey, wetness
73135:					
Union	Severe: percs slowly, wetness	Severe: wetness	Severe: wetness	Moderate: wetness	Fair: too clayey, wetness
74633, 74634:					
Hartville	Severe: percs slowly, wetness	Severe: wetness	Severe: too clayey, wetness	Moderate: wetness	Poor: hard to pack, too clayey
74635:					
Tanglenook	Severe: percs slowly, wetness	Severe: wetness	Severe: too clayey, wetness	Severe: wetness	Poor: hard to pack, too clayey, wetness
75376:					
Cedargap	Severe: flooding, percs slowly	Severe: flooding	Severe: flooding	Severe: flooding	Poor: small stones
75391:					
Possumtrot	Severe: flooding, poor filter	Severe: flooding, seepage	Severe: flooding, seepage	Severe: flooding	Fair: thin layer
75395:					
Jamesfin	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Good
75398:					
Kaintuck	Severe: flooding, poor filter	Severe: flooding, seepage	Severe: flooding, seepage	Severe: flooding, seepage	Fair: too sandy
75399:					
Jamesfin	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Good

Table 12.--Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
75400: Gladden	Severe: flooding	Severe: flooding seepage	Severe: flooding seepage	Severe: flooding seepage	Fair: thin layer
75407: Gabriel	Severe: percs slowly wetness	Severe: wetness	Severe: wetness	Severe: wetness	Poor: wetness
99000. Pits, quarries					
99001. Water					
99003. Miscellaneous water					

Table 13.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
15002:				
McGirk	Poor: low strength, shrink-swell, wetness	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey, wetness
60001, 60002:				
Manfro	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
60003:				
Manfro	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: slope, too clayey
60004:				
Manfro	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: slope
60005:				
Manfro	Poor: low strength, slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
60006:				
Marion	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey
60007:				
Manfro	Poor: low strength, slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
Gatewood	Poor: low strength, shrink-swell, slope, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope, thin layer, too clayey, small stones
64000:				
Racoon	Poor: low strength, wetness	Improbable: excess fines	Improbable: excess fines	Poor: wetness
64001, 64002, 64003:				
Freeburg	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
66003:				
Jemerson	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
66004:				
Dockery	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Good

Table 13.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
66005:				
Deible	Poor: low strength, shrink-swell, wetness	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey, wetness
66006:				
Waldron	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey
66007, 66008:				
Leta	Fair: low strength, wetness	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey
66009:				
Haynie	Fair: low strength	Improbable: excess fines	Improbable: excess fines	Good
66010:				
Sarpy	Good	Probable	Improbable: too sandy	Poor: too sandy
66011:				
Moville	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Fair: thin layer
66012:				
Blake	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Good
66013:				
Waldron	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey
70028:				
Moko	Poor: depth to rock	Improbable: thin layer, excess fines	Improbable: thin layer, excess fines	Poor: depth to rock
Rock outcrop.				
70029:				
Moko	Poor: slope, depth to rock	Improbable: thin layer, excess fines	Improbable: thin layer, excess fines	Poor: slope, depth to rock
Rock outcrop.				
73035:				
Gravois	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim
73088:				
Ruster	Good	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, small stones

Table 13.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
73089:				
Rueter	Poor: slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, slope, small stones
73090, 73091:				
Useful	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey
73092, 73093:				
Gatewood	Poor: low strength, shrink-swell, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones, thin layer, too clayey
73094:				
Gatewood	Poor: low strength, shrink-swell, slope, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones, thin layer, too clayey
73095:				
Gravois	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, slope
73096:				
Swiss	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: small stones, thin layer, too clayey
73097:				
Swiss	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones, thin layer, too clayey
73098, 73099:				
Plato	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, small stones, thin layer
73100, 73101, 73102:				
Wrangart	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
73103:				
Wrangart	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: slope, too clayey
73104:				
Wrangart	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: slope

Table 13.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
73105:				
Wrengart	Poor: low strength, slope	Improbable: excess fines	Improbable: excess fines	Poor: slope
Gatewood	Poor: low strength, shrink-swell, slope, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones, thin layer, too clayey
73106:				
Mariosa	Poor: low strength, shrink-swell, wetness	Improbable: excess fines	Improbable: excess fines	Poor: thin layer, too clayey, wetness
73107:				
Wrengart	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
Swiss	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: small stones, thin layer, too clayey
73108:				
Gravois	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim
Gatewood	Poor: low strength, shrink-swell, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: small stones, thin layer, too clayey
73109:				
Alred	Poor: low strength, shrink-swell, slope	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones
73110:				
Gravois	Poor: low strength, slope	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, slope
Gatewood	Poor: low strength, shrink-swell, slope, depth to rock	Improbable: excess fines	Improbable: excess fines	Poor: slope, small stones, thin layer, too clayey
73112:				
Gunlock	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim
73135:				
Union	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, too clayey

Table 13.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
74633, 74634:				
Hartville	Poor: low strength, shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: too clayey
74635:				
Tanglenook	Poor: low strength, shrink-swell, wetness	Improbable: excess fines	Improbable: excess fines	Poor: too clayey, wetness
75376:				
Cedargap	Fair: shrink-swell	Improbable: excess fines	Improbable: excess fines	Poor: area reclaim, small stones
75391:				
Possumtrot	Good	Probable	Probable	Poor: area reclaim
75395:				
Jamesfin	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Good
75398:				
Kaintuck	Good	Probable	Probable	Good
75399:				
Jamesfin	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Good
75400:				
Gladden	Good	Probable	Probable	Poor: area reclaim
75407:				
Gabriel	Poor: low strength	Improbable: excess fines	Improbable: excess fines	Fair: too clayey
99000. Pits, quarries				
99001. Water				
99003. Miscellaneous water				

Table 14.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Limitations for--			Features affecting-			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
15002:							
McGirk	Slight	Severe: hard to pack wetness	Severe: no water	Limitation: frost action percs slowly	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness
60001, 60002:							
Menfro	Moderate: seepage slope	Moderate: piping	Severe: no water	Limitation: frost action slope deep to water	Limitation: erodes easily slope	Limitation: erodes easily	Limitation: erodes easily
60003, 60004, 60005:							
Menfro	Severe: slope	Moderate: piping	Severe: no water	Limitation: frost action slope deep to water	Limitation: erodes easily slope	Limitation: erodes easily slope	Limitation: erodes easily slope
60006:							
Marion	Moderate: slope	Moderate: hard to pack wetness	Severe: no water	Limitation: percs slowly slope	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness
60007:							
Menfro	Severe: slope	Moderate: piping	Severe: no water	Limitation: frost action slope deep to water	Limitation: erodes easily slope	Limitation: erodes easily slope	Limitation: erodes easily slope
Gatewood	Severe: slope	Severe: hard to pack thin layer	Severe: no water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope wetness depth to rock	Limitation: percs slowly slope wetness depth to rock	Limitation: percs slowly slope depth to rock
64000:							
Racoon	Slight	Severe: wetness	Severe: no water	Limitation: frost action percs slowly wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness
64001, 64002:							
Freeburg	Slight	Moderate: piping wetness	Severe: no water	Limitation: frost action	Limitation: erodes easily wetness	Limitation: erodes easily wetness	Limitation: erodes easily wetness
64003:							
Freeburg	Moderate: slope	Moderate: piping wetness	Severe: no water	Limitation: frost action slope	Limitation: erodes easily slope wetness	Limitation: erodes easily wetness	Limitation: erodes easily wetness
66003:							
Jemerson	Moderate: seepage	Moderate: piping wetness	Severe: no water	Limitation: frost action deep to water	Limitation: erodes easily	Limitation: erodes easily	Limitation: erodes easily

Table 14.--Water Management--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting- Drainage	Irrigation	Terraces and diversions	Grassed waterways
66004:							
Dockery	Moderate: seepage	Severe: wetness	Severe: no water	Limitation: flooding frost action	Limitation: erodes easily flooding wetness	Limitation: erodes easily wetness	Limitation: erodes easily
66005:							
Deible	Slight	Severe: wetness	Severe: no water	Limitation: percs slowly	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness
66006:							
Waldron	Slight	Severe: hard to pack wetness	Severe: no water	Limitation: flooding frost action percs slowly	Limitation: flooding percs slowly wetness	Limitation: percs slowly wetness	Limitation: percs slowly wetness
66007:							
Leta	Moderate: seepage	Severe: piping wetness	Severe: no water	Limitation: flooding frost action percs slowly	Limitation: flooding percs slowly slow intake wetness	Limitation: percs slowly wetness	Limitation: percs slowly wetness
66008:							
Leta	Moderate: seepage	Severe: piping wetness	Severe: no water	Limitation: flooding frost action percs slowly	Limitation: flooding percs slowly wetness	Limitation: percs slowly wetness	Limitation: percs slowly wetness
66009:							
Haynie	Moderate: seepage	Severe: piping	Severe: no water	Limitation: flooding frost action deep to water	Limitation: flooding	Favorable	Favorable
66010:							
Sarpy	Severe: seepage	Severe: seepage piping	Severe: no water cutbanks cave	Limitation: flooding cutbanks cave deep to water	Limitation: fast intake flooding soil blowing droughty	Limitation: too sandy soil blowing	Limitation: droughty
66011:							
Moville	Slight	Severe: hard to pack	Severe: no water	Limitation: flooding frost action percs slowly	Limitation: erodes easily flooding percs slowly wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly
66012:							
Blake	Moderate: seepage	Moderate: piping wetness	Severe: no water	Limitation: flooding frost action	Limitation: flooding wetness	Limitation: wetness	Favorable
66013:							
Waldron	Slight	Severe: hard to pack wetness	Severe: no water	Limitation: frost action percs slowly	Limitation: percs slowly wetness	Limitation: percs slowly wetness	Limitation: percs slowly wetness

Table 14.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting-			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
70028, 70029:							
Moko	Severe: slope, depth to rock	Severe: thin layer	Severe: no water, depth to rock	Limitation: slope, deep to water, depth to rock	Limitation: slope, depth to rock, droughty	Limitation: slope, depth to rock	Limitation: slope, depth to rock, droughty
Rock outcrop.							
73035:							
Gravois	Severe: slope	Moderate: wetness, piping	Severe: no water	Limitation: percs slowly, slope	Limitation: erodes easily, percs slowly, slope, wetness	Limitation: erodes easily, percs slowly, slope, wetness	Limitation: erodes easily, percs slowly, slope
73088, 73089:							
Rueter	Severe: seepage, slope	Moderate: large stones, piping	Severe: no water	Limitation: large stones, slope, deep to water	Limitation: large stones, slope, droughty	Limitation: large stones, slope	Limitation: large stones, slope, droughty
73090:							
Useful	Moderate: seepage, slope, depth to rock	Moderate: hard to pack, piping, thin layer, wetness	Severe: no water	Limitation: slope	Limitation: erodes easily, slope, wetness	Limitation: erodes easily, wetness	Limitation: erodes easily
73091:							
Useful	Severe: slope	Moderate: hard to pack, piping, thin layer, wetness	Severe: no water	Limitation: slope	Limitation: erodes easily, slope, wetness	Limitation: erodes easily, slope, wetness	Limitation: erodes easily, slope
73092:							
Gatewood	Moderate: slope, depth to rock	Severe: hard to pack, thin layer	Severe: no water	Limitation: percs slowly, slope, depth to rock	Limitation: percs slowly, slope, wetness, depth to rock	Limitation: percs slowly, wetness, depth to rock	Limitation: percs slowly, depth to rock
73093, 73094:							
Gatewood	Severe: slope	Severe: hard to pack, thin layer	Severe: no water	Limitation: percs slowly, slope, depth to rock	Limitation: percs slowly, slope, wetness, depth to rock	Limitation: percs slowly, slope, wetness, depth to rock	Limitation: percs slowly, slope, depth to rock
73095:							
Gravois	Severe: slope	Moderate: piping, wetness	Severe: no water	Limitation: percs slowly, slope	Limitation: erodes easily, percs slowly, slope, wetness	Limitation: erodes easily, percs slowly, slope, wetness	Limitation: erodes easily, percs slowly, slope
73096, 73097:							
Swiss	Severe: slope	Severe: hard to pack	Severe: no water	Limitation: percs slowly, slope	Limitation: percs slowly, slope, wetness	Limitation: percs slowly, slope, wetness	Limitation: percs slowly, slope

Table 14.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting-			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
73098:							
Plato	Slight	Moderate: wetness piping hard to pack	Severe: no water	Limitation: percs slowly	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly rooting depth wetness	Limitation: erodes easily percs slowly rooting depth wetness
73099:							
Plato	Moderate: slope	Moderate: wetness piping hard to pack	Severe: no water	Limitation: percs slowly slope	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly rooting depth wetness	Limitation: erodes easily percs slowly rooting depth wetness
73100, 73101, 73102:							
Wrengart	Moderate: seepage slope	Moderate: piping wetness	Severe: no water	Limitation: slope	Limitation: erodes easily slope wetness	Limitation: erodes easily wetness	Limitation: erodes easily
73103, 73104:							
Wrengart	Severe: slope	Moderate: piping wetness	Severe: no water	Limitation: slope	Limitation: erodes easily slope wetness	Limitation: erodes easily slope wetness	Limitation: erodes easily slope
73105:							
Wrengart	Severe: slope	Moderate: piping wetness	Severe: no water	Limitation: slope	Limitation: erodes easily slope wetness	Limitation: erodes easily slope wetness	Limitation: erodes easily slope
Gatewood	Severe: slope	Severe: hard to pack thin layer	Severe: no water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope wetness depth to rock	Limitation: percs slowly slope wetness depth to rock	Limitation: percs slowly slope depth to rock
73106:							
Mariosa	Slight	Severe: wetness hard to pack	Severe: no water	Limitation: frost action percs slowly	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness
73107:							
Wrengart	Moderate: seepage slope	Moderate: piping wetness	Severe: no water	Limitation: slope	Limitation: erodes easily slope wetness	Limitation: erodes easily wetness	Limitation: erodes easily
Swiss	Moderate: slope	Severe: hard to pack	Severe: no water	Limitation: percs slowly slope	Limitation: percs slowly slope wetness	Limitation: percs slowly wetness	Limitation: percs slowly
73108:							
Gravois	Moderate: slope	Moderate: piping wetness	Severe: no water	Limitation: percs slowly slope	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly

Table 14.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting-			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
73108:							
Gatewood	Moderate: slope depth to rock	Severe: hard to pack thin layer	Severe: no water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope wetness depth to rock	Limitation: percs slowly wetness depth to rock	Limitation: percs slowly depth to rock
73109:							
Alred	Severe: slope	Severe: hard to pack	Severe: no water	Limitation: percs slowly slope deep to water	Limitation: percs slowly slope droughty	Limitation: percs slowly slope	Limitation: percs slowly slope droughty
73110:							
Gravois	Severe: slope	Moderate: piping wetness	Severe: no water	Limitation: percs slowly slope	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly slope
Gatewood	Severe: slope	Severe: hard to pack thin layer	Severe: no water	Limitation: percs slowly slope depth to rock	Limitation: percs slowly slope wetness depth to rock	Limitation: percs slowly slope wetness depth to rock	Limitation: percs slowly slope depth to rock
73112:							
Gunlock	Moderate: slope	Moderate: piping wetness	Severe: no water	Limitation: percs slowly slope	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly
73135:							
Union	Moderate: slope	Moderate: piping wetness	Severe: no water	Limitation: percs slowly slope	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly rooting depth wetness	Limitation: erodes easily percs slowly rooting depth
74633:							
Hartville	Slight	Moderate: hard to pack wetness	Severe: no water	Limitation: frost action percs slowly	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly
74634:							
Hartville	Moderate: slope	Moderate: hard to pack wetness	Severe: no water	Limitation: frost action percs slowly slope	Limitation: erodes easily percs slowly slope wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily percs slowly
74635:							
Tanglenook	Slight	Severe: wetness	Severe: no water	Limitation: frost action percs slowly	Limitation: erodes easily percs slowly slow intake wetness	Limitation: erodes easily percs slowly wetness	Limitation: erodes easily wetness percs slowly

Table 14.--Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting-			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
75376: Cedargap	Moderate: seepage	Slight	Severe: no water	Limitation: flooding deep to water	Limitation: flooding	Favorable	Favorable
75391: Possumtrot	Severe: seepage	Severe: piping	Severe: no water	Limitation: flooding deep to water	Limitation: flooding soil blowing	Limitation: soil blowing	Favorable
75395: Jamesfin	Moderate: seepage	Severe: piping	Severe: no water	Limitation: flooding deep to water	Limitation: erodes easily flooding frost action	Limitation: erodes easily	Limitation: erodes easily
75398: Kaintuck	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: flooding deep to water	Limitation: flooding soil blowing	Limitation: soil blowing	Favorable
75399: Jamesfin	Moderate: seepage	Severe: piping	Severe: no water	Limitation: flooding deep to water	Limitation: erodes easily flooding frost action	Limitation: erodes easily	Limitation: erodes easily
75400: Gladden	Severe: seepage	Severe: seepage piping	Severe: no water	Limitation: flooding deep to water	Limitation: flooding	Favorable	Favorable
75407: Gabriel	Slight	Severe: wetness	Severe: no water	Limitation: frost action	Limitation: wetness	Limitation: wetness	Limitation: wetness
99000. Pits, quarries							
99001. Water							
99003. Miscellaneous water							

Table 15.--Engineering Index Properties

(The symbol > means more than. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage Passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
15002:												
McGirk----------	0-8	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-15
	8-15	SICL	CH, CL	A-7	0	0	100	100	95-100	85-95	40-55	15-30
	15-45	SIC	CH, MH	A-7	0	0	100	85-100	80-100	75-95	50-75	25-40
	45-80	SIC, SICL	CH, MH	A-7	0	0	100	85-100	80-100	70-95	50-75	25-40
60001, 60002:												
Manfro----------	0-6	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	25-35	4-16
	6-11	SIL	CL-ML, CL	A-6, A-4	0	0	100	100	90-100	70-90	25-35	6-16
	11-34	SICL, SIL	CL-ML, CL	A-6, A-7, A-4	0	0	100	100	90-100	70-95	25-45	6-25
	34-60	SIL, SICL	CL, CL-ML	A-6, A-4, A-7	0	0	100	100	90-100	70-95	25-45	6-25
60003, 60004:												
Manfro----------	0-5	SIL	CL-ML, CL	A-6, A-4	0	0	100	100	90-100	70-90	25-35	4-16
	5-28	SICL, SIL	CL-ML, CL	A-6, A-7, A-4	0	0	100	100	90-100	70-95	25-45	6-25
	28-63	SIL, SICL	CL-ML, CL	A-6, A-7, A-4	0	0	100	100	90-100	70-95	25-45	5-25
60005:												
Manfro----------	0-4	SIL	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	25-35	4-16
	4-16	SIL	CL-ML, CL	A-4	0	0	100	100	90-100	70-90	25-35	4-16
	16-29	SICL, SIL	CL, CL-ML	A-6, A-7, A-4	0	0	100	100	90-100	70-95	25-45	5-25
	29-62	SIL, SICL	CL-ML, CL	A-7, A-4, A-6	0	0	100	100	90-100	70-95	25-45	5-25
60006:												
Marion----------	0-6	SIL	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-20
	6-10	SIL	CL	A-6	0	0	100	100	90-100	70-90	30-40	10-20
	10-39	SIC, SICL	CH	A-7	0	0	100	100	95-100	90-95	50-65	30-50
	39-56	SIL, SICL	CL	A-6, A-7	0	0	100	100	95-100	70-90	30-56	17-33
	56-65	SIC, SICL	CH	A-7	0	0	100	100	95-100	90-95	50-65	30-40
60007:												
Manfro----------	0-4	SIL	CL-ML, CL	A-6, A-4	0	0	100	100	90-100	70-90	25-35	4-16
	4-16	SIL	CL-ML, CL	A-4	0	0	100	100	90-100	70-90	25-35	4-16
	16-29	SICL, SIL	CL, CL-ML	A-6, A-4, A-7	0	0	100	100	90-100	70-95	25-45	5-25
	29-62	SIL, SICL	CL-ML, CL	A-4, A-6, A-7	0	0	100	100	90-100	70-95	25-45	5-25
Gatewood--------	0-2	GRV-SIL	GC, GC-GM	A-4, A-6	0	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	2-10	GRV-SIL	GC, GC-GM	A-4, A-6	0-5	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	10-28	C	CH	A-7	0-5	0-10	75-100	70-95	60-85	50-80	50-75	25-45
	28-60	UWB			---	---	---	---	---	---	---	---
64000:												
Racoon----------	0-6	SIL	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	20-40	5-20
	6-26	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-40	5-20
	26-60	SICL	CL	A-6, A-7	0	0	100	100	95-100	85-95	35-50	15-30
64001:												
Freeburg--------	0-9	SIL	CL-ML, CL	A-6, A-4	0	0	100	100	90-100	70-90	25-35	5-15
	9-13	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	25-35	5-15
	13-52	SIL, SICL	CL	A-6, A-7	0	0	100	100	90-100	70-95	30-45	10-25
	52-80	SICL	CL	A-6, A-7	0	0	100	100	95-100	85-95	35-45	15-25
64002, 64003:												
Freeburg--------	0-7	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	25-35	5-15
	7-60	SICL, SIL	CL	A-7, A-6, A-4	0	0	100	100	90-100	70-95	25-45	5-25
66003:												

Table 15.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage Passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
66004:												
Dockery	0-8	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	25-35	5-15
	8-65	SIL, SICL	CL	A-7, A-4, A-6	0	0	100	100	90-100	70-90	25-45	5-25
66005:												
Deible	0-10	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	25-35	5-15
	10-15	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	25-35	5-15
	15-37	SIC, C	CH, CL	A-7	0	0	100	100	90-100	70-90	45-70	25-45
	37-80	SICL, SIC	CL, CH	A-7	0	0	100	100	95-100	75-80	35-65	15-40
66006:												
Waldron	0-11	SICL	CH, CL	A-7	0	0	100	100	95-100	85-95	45-55	20-35
	11-60	SR- SIC, SICL	CH	A-7	0	0	100	100	95-100	90-95	55-75	35-50
66007:												
Leta	0-10	SIC	CH, CL	A-7	0	0	100	100	95-100	90-95	45-75	20-50
	10-24	SICL, SIC	CH, CL	A-7	0	0	100	100	95-100	85-100	45-75	20-50
	24-60	SR- SIL VFSL LVFS	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	50-90	15-30	5-15
66008:												
Leta	0-11	SIL	CL	A-6	0	0	100	100	90-100	70-80	30-45	10-20
	11-22	SICL	CH, CL	A-6, A-7	0	0	100	100	95-100	85-95	40-55	20-35
	22-34	SIC, SICL	CH, CL	A-7	0	0	100	100	95-100	90-95	45-75	20-50
	34-60	SR- SL SIL	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	50-90	5-30	5-15
66009:												
Haynie	0-16	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-15
	16-64	SR- VFSL SIL	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	50-90	25-35	5-15
66010:												
Sarpy	0-1	FS	SC-SM, SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
	1-60	SR- FS LFS	SC-SM, SM	A-2-4	0	0	100	100	65-80	20-35	0-14	NP
66011:												
Moville	0-8	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-35	4-15
	8-27	SR- SIL	CL-ML, CL	A-6, A-4	0	0	100	100	90-100	70-90	20-35	4-15
	27-60	SIC	CH	A-7	0	0	100	100	90-100	75-95	60-75	35-50
66012:												
Blake	0-7	SIL	CL	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-20
	7-60	SR- VFSL SIL SICL	CL-ML, CL	A-6, A-7, A-4	0	0	100	100	80-100	60-90	25-50	5-25
66013:												
Waldron	0-10	SIL	CL	A-6	0	0	100	100	90-100	70-90	25-40	10-22
	10-60	SR- SICL SIC	CH, CL	A-7	0	0	100	100	95-100	85-95	40-65	20-45
70028:												
Moko	0-3	GR-L	GC, CL	A-2	0-5	0-15	50-80	45-75	40-70	25-55	25-35	10-15
	3-8	GRV-L	GC, CL, SC	A-6, A-7	0-5	0-15	60-80	55-75	50-70	35-55	25-45	10-20
	8-60	UWB			---	---	---	---	---	---	---	---
Rock outcrop.												
70029:												
Moko	0-4	GR-CL	CL, SC, GC	A-6, A-7	0-3	0-20	55-80	50-75	45-75	35-60	35-45	15-20
	4-7	CNV-CL, CNV-L, FLV-SIL	CL, GC, SC	A-6, A-7	0-5	10-30	30-70	25-65	20-60	15-55	25-45	10-20
	7-60	UWB			---	---	---	---	---	---	---	---
Rock outcrop.												

Table 15.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage Passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
73035:												
Gravois---	0-6	SIL	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	75-100	65-90	23-36	6-16
	6-25	SICL, SIL	CL	A-6, A-7	0	0-7	90-100	85-100	80-100	75-95	30-43	11-22
	25-35	SICL, GR-SICL, GRV-SIL	CL, GC, SC	A-4, A-6, A-7	0	0-15	30-100	25-95	20-90	15-80	26-43	5-20
	35-50	GRV-SICL, SICL, GRV-SIL	GC-GM, GC	A-6, A-7, A-4	0	0-15	20-80	15-75	10-75	10-70	26-43	8-22
	50-80	CBV-C, GRV-SIC, GR-SIC	GC	A-2-7, A-7	0	0-30	45-80	15-75	10-75	10-65	48-86	25-59
73088, 73089:												
Rueter---	0-3	GRV-SIL	GC, GC-GM, GM	A-2-4	0-5	0-10	30-55	25-50	25-50	20-45	15-35	3-15
	3-14	GRV-SIL, GRX-SIL	GC-GM, GC	A-2-4, A-2-6, A-4, A-6	0-5	0-10	25-55	20-50	15-45	10-40	15-35	3-15
	14-45	GRV-CBX-L, GRV-SCL	GC-GM, GC	A-6, A-1-a, A-2-6, A-2-4	0-5	10-30	25-65	20-60	15-50	10-45	15-40	2-20
	45-80	CBX-C, GRV-C, C	GC-GM	A-2-7, A-7	0-5	10-50	25-65	20-60	15-55	10-50	40-70	20-35
73090:												
Useful---	0-7	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-15
	7-31	SIC, SICL	CL	A-7	0	0-10	95-100	85-100	80-100	70-95	40-50	20-30
	31-45	SIC, GRV-SIC, C, GRV-C	CL, CH, GC	A-6, A-7	0	0-10	55-100	50-100	45-100	40-95	40-65	20-40
	45-53	SICL, SIC	CH, CL	A-7	0	0	95-100	85-100	80-100	75-95	40-60	20-30
	53-60	UWB			---	---	---	---	---	---	---	---
73091:												
Useful---	0-7	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-15
	7-31	SIC, SICL	CL	A-7	0	0-10	95-100	85-100	80-100	70-95	40-50	20-30
	31-45	SIC, GRV-SIC, C, GRV-C	CL, GC, CH	A-6, A-7	0	0-10	55-100	50-100	45-95	40-95	40-65	20-40
	45-53	SICL, SIC	CH, CL	A-7	0	0	95-100	85-100	80-95	75-95	40-60	20-30
	53-60	UWB			---	---	---	---	---	---	---	---
73092, 73093, 73094:												
Gatewood---	0-2	GRV-SIL	GC, GC-GM	A-4, A-6	0	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	2-10	GRV-SIL	GC, GC-GM	A-4, A-6	0-5	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	10-28	C	CH	A-7	0-5	0-10	75-100	70-95	60-85	50-80	50-75	25-45
	28-60	UWB			---	---	---	---	---	---	---	---
73095:												
Gravois---	0-6	SIL	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	75-100	65-90	23-36	6-16
	6-25	SICL, SIL	CL	A-6, A-7	0	0-7	90-100	85-100	80-100	75-95	30-43	11-22
	25-35	SICL, GR-SICL, GRV-SIL	CL, SC, GC	A-4, A-7, A-6	0	0-15	30-100	25-95	20-90	15-80	26-43	5-20
	35-50	GRV-SICL, SICL, GRV-SIL	GC-GM, GC	A-6, A-7, A-4	0	0-15	20-80	15-75	10-75	10-70	26-43	8-22
	50-80	CBV-C, GRV-SIC, GR-SIC	GC	A-2-7, A-7	0	0-30	45-80	15-75	10-75	10-65	48-86	25-59
73096:												
Swiss---	0-3	GR-SIL	CL, SC	A-4, A-6	0	0-25	60-95	50-90	45-90	30-85	24-43	7-22
	3-9	GR-SIL, GR-L	CL, SC	A-4, A-6	0	0-25	60-95	50-90	45-90	30-85	24-43	7-22
	9-40	C, GR-C, SIC, GR-SIC	CH, SC	A-7	0	0-25	55-100	50-100	45-100	40-95	56-76	33-49
	40-80	CL, C, SIC	CH, CL	A-7	0	0-25	100	100	90-100	90-100	43-66	22-40
73097:												
Swiss---	0-3	GR-SIL	CL, SC	A-4, A-6	0	0-25	60-95	50-90	45-90	30-85	24-43	7-22

Table 15.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage Passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
73098, 73099:												
Plato----------	0-8	SIL	CL-ML, CL	A-6, A-4	0	0	100	100	90-100	70-90	23-37	6-16
	8-20	SIC	CL, CH	A-6, A-7	0	0-5	100	100	95-100	90-95	35-65	15-40
	20-48	GRX-SIL, SIL, GRV-SICL	GC, GC-GM	A-1-b, A-6, A-4	0	0-5	25-55	20-50	15-50	10-45	25-45	5-20
	48-60	C, GR-C, GR-SICL	CH, CL	A-6, A-7	0	0-5	55-75	50-70	45-70	40-65	40-70	15-45
73100, 73101, 73102:												
Wrengart-------	0-8	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	20-40	5-15
	8-36	SICL, SIL	CL	A-6	0	0	100	95-100	85-100	65-90	30-45	10-20
	36-61	SICL, SIL, GR-SICL, GR-SIL	CL	A-4, A-6	0	0-5	55-100	50-100	45-100	35-90	25-40	8-20
	61-80	GR-SIC, SIC, GR-C	CH, CL	A-7	0	0-15	60-95	55-90	50-90	40-85	44-70	25-45
73103:												
Wrengart--------	0-5	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	20-40	5-15
	5-30	SICL	CL	A-6	0	0	100	95-100	85-97	65-90	35-45	15-25
	30-62	SICL, SIL	CL	A-4, A-6	0	0-5	55-100	50-100	45-100	35-90	25-40	8-20
	62-80	GR-SIC, SIC, GR-C	CL, CH	A-7	0	0-15	60-95	55-90	50-90	40-85	44-70	25-45
73104:												
Wrengart--------	0-5	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-40	5-15
	5-30	SICL	CL	A-6	0	0	100	95-100	85-100	65-90	35-45	15-25
	30-62	SICL, SIL	CL	A-4, A-6	0	0-5	55-100	50-100	45-100	35-90	25-40	8-20
	62-80	GR-SIC, SIC, GR-C	CL, CH	A-7	0	0-15	60-95	55-90	50-90	40-85	44-70	25-45
73105:												
Wrengart--------	0-5	SIL	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	20-40	5-15
	5-30	SICL	CL	A-6	0	0	100	95-100	85-100	65-90	35-45	15-25
	30-62	SICL, SIL	CL	A-4, A-6	0	0-5	55-100	50-100	45-100	35-90	25-40	8-20
	62-80	GR-SIC, SIC, GR-C	CL, CH	A-7	0	0-15	60-95	55-90	50-90	40-85	44-70	25-45
Gatewood--------	0-2	GRV-SIL	GC, GC-GM	A-4, A-6	0	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	2-10	GRV-SIL	GC, GC-GM	A-4, A-6	0-5	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	10-28	C	CH	A-7	0-5	0-10	75-100	70-95	60-85	50-80	50-75	25-45
	28-60	UWB			---	---	---	---	---	---	---	---
73106:												
Mariosa---------	0-7	SIL	CL	A-6	0	0	100	100	90-100	70-90	25-45	10-25
	7-11	SIL	CL	A-6	0	0	100	100	90-100	70-90	25-45	10-25
	11-38	SIC, SICL	CH, CL	A-7-6	0	0	100	100	95-100	85-95	45-75	30-50
	38-80	SIL, SICL	CH, CL	A-6, A-7-6	0	0	95-100	90-100	85-100	65-95	35-55	15-35
73107:												
Wrengart--------	0-8	SIL	CL, CL-ML	A-6, A-4	0	0	100	100	90-100	70-90	20-40	5-15
	8-36	SICL, SIL	CL	A-6	0	0	100	95-100	85-95	65-90	30-45	10-20
	36-61	SICL, SIL, GR-SICL, GR-SIL	CL	A-4, A-6	0	0-5	55-100	50-100	45-100	35-90	25-40	8-20
	61-80	GR-SIC, SIC, GR-C	CH, CL	A-7	0	0-15	60-95	55-90	50-85	40-80	44-70	25-45
Swiss-----------	0-3	GR-SIL	CL, GC, SC	A-4, A-6	0	0-25	60-95	50-90	45-85	30-80	24-43	7-22
	3-9	GR-SIL, GR-L	GC, CL, SC	A-4, A-6	0	0-25	60-95	50-90	45-85	30-80	24-43	7-22
	9-40	C, GR-C, SIC, GR-SIC	GC, CH, SC	A-7	0	0-25	55-100	50-100	45-100	40-95	56-76	33-49
	40-80	CL, C		A-7	0	0-25	100	100	90-100	90-100	43-66	22-40

Table 15.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage Passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
73108:												
Gravois---	0-6	SIL	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	75-100	65-90	23-36	6-16
	6-25	SICL, SIL	CL	A-6, A-7	0	0-7	90-100	85-100	80-100	75-95	30-43	11-22
	25-35	SICL, GR-SICL, GRV-SIL	CL, SC, GC	A-7, A-6, A-4	0	0-15	30-100	25-95	20-90	15-80	26-43	5-50
	35-50	GRV-SICL, SICL, GRV-SIL	GC-GM, GC	A-7, A-4, A-6	0	0-15	20-80	15-75	10-75	10-70	26-43	8-22
	50-80	CBV-C, GRV-SIC, GR-SIC	GC	A-2-7, A-7	0	0-30	45-80	15-75	10-75	10-65	48-86	25-59
Gatewood---	0-2	GRV-SIL	GC, GC-GM	A-4, A-6	0	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	2-10	GRV-SIL	GC-GM, GC	A-4, A-6	0-5	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	10-28	C	CH	A-7	0-5	0-10	75-100	70-95	60-85	50-80	50-75	25-45
	28-60	UWB			---	---	---	---	---	---	---	---
73109:												
Alred---	0-7	GR-SIL	CL-ML, CL	A-4	0-5	0-20	55-85	50-75	45-75	35-70	20-30	6-11
	7-15	GRV-L	GC-GM, GC	A-2, A-1, A-4, A-6	0-5	0-20	20-70	15-50	15-50	10-45	20-30	6-11
	15-21	GRV-L, GRX-SICL	GC-GM, GC	A-6, A-2, A-4	0-5	0-20	25-65	20-50	20-50	15-45	25-40	8-15
	21-80	CB-C, GR-C, C	CH	A-7	0	0-20	60-100	55-100	50-100	40-85	51-75	30-45
73110:												
Gravois---	0-6	SIL	CL, CL-ML	A-4, A-6	0	0	90-100	85-100	75-100	65-90	23-36	6-16
	6-25	SICL, SIL	CL	A-6, A-7	0	0-7	90-100	85-100	80-100	75-95	30-43	11-22
	25-35	SICL, GR-SICL, GRV-SIL	CL, GC, SC	A-7, A-4, A-6	0	0-15	30-100	25-95	20-90	15-80	26-43	5-20
	35-50	GRV-SICL, SICL, GRV-SIL	GC-GM, GC	A-6, A-7, A-4	0	0-15	20-80	15-75	10-75	10-70	26-43	8-22
	50-80	CBV-C, GRV-SIC, GR-SIC	GC	A-2-7, A-7	0	0-30	45-80	15-75	10-75	10-65	48-86	25-59
Gatewood---	0-2	GRV-SIL	GC, GC-GM	A-4, A-6	0	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	2-10	GRV-SIL	GC, GC-GM	A-4, A-6	0-5	0-20	30-70	20-65	15-60	10-55	20-35	7-15
	10-28	C	CH	A-7	0-5	0-10	75-100	70-95	60-85	50-80	50-75	25-45
	28-60	UWB			---	---	---	---	---	---	---	---
73112:												
Gunlock---	0-5	SIL	CL, CL-ML	A-4, A-6	0	0-5	100	95-100	85-100	65-90	25-40	5-15
	5-25	SICL, SIC	CH, CL	A-6, A-7	0	0-5	90-100	85-100	80-100	70-95	35-60	15-30
	25-43	SICL, GR-SICL, GRV-SIL, SIL	GC, CL, SC	A-6, A-7	0	0-10	45-95	40-90	35-90	30-85	30-45	5-20
	43-55	GRX-SICL, GRX-SIC	GC	A-7, A-2-7	0	0-10	25-55	20-50	15-50	15-45	45-70	25-40
	55-80	GR-SIC, C, SIC	CH, CL	A-7	0	0-10	55-95	50-90	45-85	35-80	45-70	25-45
73135:												
Union---	0-9	SIL	CL, CL-ML	A-4, A-6	0	0	95-100	90-100	85-95	65-85	22-35	5-15
	9-30	SICL, SIC	CH, CL	A-6, A-7	0	0-10	90-100	85-95	80-95	70-80	35-60	15-30
	30-53	GRX-SIL, CBX-L, SIL	GC, CL, SC	A-4, A-6, A-2, A-7	0	0-20	30-95	25-90	20-85	15-75	25-45	8-22
	53-80	C, GRV-C, GR-SIC	GC, CL, SC, CH	A-7	0	0-20	50-95	40-85	35-80	30-70	45-70	25-45
74633, 74634:												
Hartville---	0-7	SIL	CL, CL-ML	A-6, A-4	0	0	100	95-100	85-100	65-90	25-40	7-15
	7-12	SIL	CL, CL-ML	A-6, A-4	0	0	100	95-100	85-100	65-90	25-40	7-15
	12-48	SICL, SIC	CH	A-7-6	0	0	100	95-100	90-100	80-95	45-55	20-30
	48-80	SICL	CL	A-6, A-7-6	0	0	95-100	90-100	85-100	75-95	40-50	20-30

Table 15.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage Passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
74635:												
Tanglenook------	0-6	SIC	CH, CL	A-7	0	0	100	100	90-100	90-95	45-55	25-40
	6-17	SIC	CH, CL	A-7	0	0	100	100	90-100	90-95	45-55	25-40
	17-56	SIC	CH, CL	A-7	0	0	100	100	90-100	90-95	45-55	25-40
	56-60	SIC	CH, CL	A-7	0	0	100	100	90-100	90-95	45-55	25-40
75376:												
Cedargap--------	0-9	GR-SIL	CL-ML, CL	A-4, A-6	0	0-10	55-80	50-75	45-75	35-70	20-35	3-15
	9-49	GRV-SCL, GRV-L	GC, GC-GM	A-2-4	0	0-10	30-55	25-50	20-50	10-30	20-45	5-20
	49-60	C, GRV-C, GRV-SIC	GC	A-2-7, A-7-6	0	5-15	30-55	25-50	20-50	10-40	50-70	25-45
75391:												
Possumtrot------	0-9	FSL	SM, SC-SM, ML, CL-ML	A-4	0	0	80-100	75-100	55-85	30-55	10-25	NP-10
	9-40	FSL, L, SL	CL-ML, ML, SC-SM, SM	A-2-4, A-4	0	0	60-100	55-100	35-95	15-75	10-25	NP-10
	40-80	GR-LS, GR-S, GRV-S	GM, GC-GM, SM, GP-GM	A-1-b, A-1-a	0	0-30	20-100	10-100	5-75	5-30	0-15	NP-5
75395:												
Jamesfin--------	0-10	SIL	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-18
	10-60	SIL, SICL	CL, CL-ML	A-4, A-7, A-6	0	0	100	100	90-100	70-90	25-46	5-23
75398:												
Kaintuck--------	0-6	FSL	ML, CL-ML, SC-SM, SM	A-4	0	0	80-100	75-100	70-85	40-55	10-20	NP-5
	6-80	SR- FS LFS FSL L SIL	ML, SM, CL-ML, SC-SM	A-4	0	0-15	80-100	75-100	70-85	40-55	10-20	NP-5
75399:												
Jamesfin--------	0-10	SIL	CL-ML	A-4, A-6	0	0	100	100	90-100	70-90	25-40	5-18
	10-60	SIL, SICL	CL, CL-ML	A-4, A-7, A-6	0	0	100	100	90-100	70-90	25-46	5-23
75400:												
Gladden---------	0-6	SIL	CL-ML, CL	A-6, A-4	0	0	85-100	80-100	75-100	60-90	20-35	5-15
	6-38	SIL, L	CL-ML, ML, CL	A-4	0	0	85-100	80-100	70-100	50-90	20-30	NP-10
	38-60	SR- GRX-S, GRV-LS, GRX-L	GM, GC, SM, SC	A-1, A-2-4	0	0-20	15-55	10-50	5-50	1-35	0-25	NP-10
75407:												
Gabriel---------	0-14	SIL	CL	A-6	0	0	100	100	90-100	70-90	25-35	5-15
	14-46	SICL, SIL	CL	A-7, A-6	0	0	100	100	90-100	70-95	35-42	15-20
	46-81	SICL, SIL	CL	A-7, A-6	0	0	100	100	90-100	70-95	35-42	15-20
99000. Pits, quarries												
99001. Water												
99003. Miscellaneous water												

Table 16.--Physical and Chemical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity (Ksat)	Available water capacity	Cation-exchange capacity	Soil reaction	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	g/cc	um/sec	In/in	meq/100g	pH	Pct	Pct					
15002:														
McGirk	0-8	15-27	1.30-1.45	4.00-14.00	0.22-0.24	8.0-16	5.1-7.3	0.1-2.9	1.0-2.0	.43	.43	3	6	48
	8-15	27-35	1.30-1.40	1.40-4.00	0.18-0.20	10-20	4.5-6.0	3.0-5.9	0.5-1.0	.43	.43			
	15-45	40-60	1.25-1.35	0.42-1.40	0.10-0.18	20-35	4.5-6.0	6.0-8.9	0.5-1.0	.32	.32			
	45-80	30-60	1.25-1.35	0.42-1.40	0.10-0.18	20-30	4.5-7.3	6.0-8.9	0.1-0.5	.32	.32			
60001, 60002:														
Menfro	0-6	10-27	1.25-1.40	4.00-14.00	0.22-0.24	10-16	5.1-7.3	0.1-2.9	0.5-2.0	.37	.37	5	6	48
	6-11	15-27	1.30-1.40	4.00-14.00	0.20-0.22	12-16	5.1-7.3	0.1-2.9	0.5-1.0	.37	.37			
	11-34	15-35	1.30-1.45	4.00-14.00	0.18-0.20	15-20	5.1-7.0	3.0-5.9	0.1-0.5	.37	.37			
	34-60	15-35	1.30-1.45	4.00-14.00	0.18-0.22	15-20	5.1-7.0	3.0-5.9	0.1-0.5	.37	.37			
60003, 60004:														
Menfro	0-5	12-27	1.25-1.40	4.00-14.00	0.22-0.24	10-18	5.1-7.3	0.1-2.9	0.5-2.0	.37	.37	5	6	48
	5-28	15-35	1.30-1.45	4.00-14.00	0.18-0.20	16-22	5.1-7.3	3.0-5.9	0.5-1.0	.37	.37			
	28-63	15-35	1.30-1.45	4.00-14.00	0.18-0.22	15-20	5.1-7.3	3.0-5.9	0.1-0.5	.37	.37			
60005:														
Menfro	0-4	12-27	1.25-1.40	4.00-14.00	0.22-0.24	10-16	5.1-7.3	0.1-2.9	0.5-2.0	.37	.37	5	6	48
	4-16	12-27	1.25-1.40	4.00-14.00	0.20-0.22	10-16	5.1-7.3	0.1-2.9	0.5-1.0	.37	.37			
	16-29	15-35	1.30-1.45	4.00-14.00	0.18-0.22	15-23	5.1-7.3	3.0-5.9	0.1-0.5	.37	.37			
	29-62	15-35	1.30-1.45	4.00-14.00	0.18-0.22	13-20	5.1-7.3	3.0-5.9	0.1-0.5	.37	.37			
60006:														
Marion	0-6	12-27	1.30-1.45	4.00-14.00	0.22-0.24	7.0-16	4.5-7.3	0.1-2.9	0.5-3.0	.43	.43	3	6	48
	6-10	12-27	1.30-1.45	4.00-14.00	0.22-0.24	7.0-16	4.5-7.3	0.1-2.9	0.5-1.0	.43	.43			
	10-39	35-60	1.30-1.65	0.00-0.40	0.11-0.13	24-34	3.6-5.5	6.0-8.9	0.1-0.5	.32	.32			
	39-56	20-40	1.30-1.55	4.00-14.00	0.18-0.20	15-27	4.5-6.5	3.0-5.9	0.1-0.5	.43	.43			
	56-65	27-60	1.35-1.45	1.40-4.00	0.10-0.12	12-37	5.1-6.5	6.0-8.9	0.1-0.5	.32	.32			
60007:														
Menfro	0-4	12-27	1.25-1.40	4.00-14.00	0.22-0.24	10-16	5.1-7.3	0.1-2.9	0.5-2.0	.37	.37	5	6	48
	4-16	12-27	1.25-1.40	4.00-14.00	0.20-0.22	10-16	5.1-7.3	0.1-2.9	0.5-1.0	.37	.37			
	16-29	15-35	1.30-1.45	4.00-14.00	0.18-0.22	15-23	5.1-7.3	3.0-5.9	0.1-0.5	.37	.37			
	29-62	15-35	1.30-1.45	4.00-14.00	0.18-0.22	13-20	5.1-7.3	3.0-5.9	0.1-0.5	.37	.37			
Gatewood	0-2	12-27	1.10-1.40	4.00-14.00	0.14-0.16	10-30	5.1-7.3	0.1-2.9	0.5-3.0	.28	.43	2	8	0
	2-10	12-27	1.10-1.30	4.00-14.00	0.12-0.14	10-18	5.1-7.3	0.1-2.9	0.5-1.0	.28	.43			
	10-28	40-80	1.35-1.60	0.42-1.40	0.08-0.14	30-44	5.1-7.8	6.0-8.9	0.5-1.0	.20	.28			
	28-60	---	---	0.07-0.40	---	---	---	---	---	---	---			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity (Ksat)	Available water capacity	Cation-exchange capacity	Soil reaction	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	g/cc	um/sec	In/in	meq/100g	pH	Pct	Pct					
64000:														
Racoon	0-6	12-27	1.30-1.50	1.40-4.00	0.22-0.24	14-20	4.5-7.3	0.1-2.9	1.0-2.0	.37	.37	5	6	48
	6-26	12-27	1.35-1.50	1.40-4.00	0.20-0.22	11-16	4.5-7.3	0.1-2.9	0.2-1.0	.37	.37			
	26-60	27-40	1.35-1.60	0.42-1.40	0.18-0.20	16-23	4.5-5.5	3.0-5.9	0.2-1.0	.37	.37			
64001:														
Freeburg	0-9	12-27	1.20-1.45	4.00-14.00	0.22-0.24	14-20	4.5-7.3	0.1-2.9	1.0-3.0	.37	.37	5	6	48
	9-13	12-27	1.40-1.50	4.00-14.00	0.18-0.20	11-20	4.5-6.0	0.1-2.9	0.5-2.0	.37	.37			
	13-52	20-40	1.40-1.50	1.40-4.00	0.18-0.20	13-20	4.5-6.0	3.0-5.9	0.5-1.0	.37	.37			
	52-80	27-35	1.35-1.50	1.40-4.00	0.16-0.19	14-20	4.5-7.3	3.0-5.9	0.2-0.8	.37	.37			
64002, 64003:														
Freeburg	0-7	12-27	1.20-1.45	4.00-14.00	0.22-0.24	14-20	4.5-7.3	0.1-2.9	1.0-2.0	.37	.37	5	6	48
	7-60	12-40	1.40-1.50	1.40-4.00	0.18-0.20	13-29	4.5-7.3	3.0-5.9	0.2-0.8	.37	.37			
66003:														
Jemerson	0-9	12-27	1.25-1.40	4.00-14.00	0.22-0.24	10-16	5.1-7.3	0.1-2.9	0.5-2.0	.37	.37	5	6	48
	9-50	12-35	1.30-1.50	4.00-14.00	0.18-0.22	12-18	5.1-7.3	3.0-5.9	0.1-1.0	.37	.37			
	50-60	15-27	1.30-1.45	4.00-14.00	0.17-0.22	12-18	5.1-7.3	0.1-2.9	0.1-0.5	.37	.37			
66004:														
Dockery	0-8	12-27	1.35-1.45	4.00-14.00	0.22-0.24	8.0-14	5.6-7.3	0.1-2.9	2.0-4.0	.37	.37	5	6	48
	8-65	12-35	1.35-1.45	4.00-14.00	0.18-0.24	8.0-14	5.6-7.8	3.0-5.9	0.5-1.0	.43	.43			
66005:														
Deible	0-10	12-27	1.30-1.45	4.00-14.00	0.22-0.24	7.0-20	4.5-7.8	0.1-2.9	1.0-4.0	.43	.43	3	5	56
	10-15	12-27	1.30-1.45	4.00-14.00	0.20-0.22	7.0-20	4.5-7.8	0.1-2.9	0.5-2.0	.43	.43			
	15-37	40-80	1.35-1.50	0.00-0.42	0.08-0.12	20-35	4.5-7.8	6.0-8.9	0.1-1.0	.32	.32			
	37-80	27-60	1.35-1.50	1.40-4.00	0.08-0.11	10-20	5.1-7.8	6.0-8.9	0.1-0.5	.32	.32			
66006:														
Waldron	0-11	27-40	1.35-1.50	1.40-4.00	0.21-0.23	20-28	6.6-7.8	3.0-5.9	2.0-4.0	.32	.32	5	7	38
	11-60	27-60	1.35-1.45	0.42-1.40	0.11-0.13	30-40	6.6-7.8	6.0-8.9	0.5-2.0	.32	.32			
66007:														
Leta	0-10	40-60	1.30-1.50	0.42-1.40	0.12-0.19	20-30	6.6-7.8	6.0-8.9	2.0-4.0	.28	.28	5	4	86
	10-24	35-60	1.30-1.50	0.42-1.40	0.11-0.20	22-28	6.6-7.8	6.0-8.9	1.0-2.0	.28	.28			
	24-60	5-20	1.30-1.50	4.00-14.00	0.14-0.22	5.0-10	7.4-8.4	0.1-2.9	0.1-0.5	.28	.28			
66008:														
Leta	0-11	12-27	1.30-1.45	1.40-4.00	0.22-0.24	12-18	6.6-7.8	0.1-2.9	1.5-4.0	.28	.28	5	4L	86
	11-22	27-40	1.30-1.50	0.42-1.40	0.18-0.20	20-28	6.6-7.8	3.0-5.9	1.0-2.0	.28	.28			
	22-34	27-60	1.30-1.50	0.42-1.40	0.11-0.20	20-32	6.5-7.8	6.0-8.9	0.5-2.0	.28	.28			
	34-60	5-20	1.30-1.50	4.00-14.00	0.14-0.22	5.0-15	6.5-8.4	0.1-2.9	0.1-0.5	.28	.28			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity (Ksat)	Available water capacity	Cation-exchange capacity	Soil reaction	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	g/cc	um/sec	In/in	meq/100g	pH	Pct	Pct					
66009:														
Haynie	0-16	12-27	1.20-1.35	4.00-14.00	0.18-0.23	15-20	6.6-8.4	0.1-2.9	1.0-3.0	.32	.32	5	4L	86
	16-64	5-20	1.20-1.35	4.00-14.00	0.14-0.22	15-20	7.4-8.4	0.1-2.9	0.1-1.0	.43	.43			
66010:														
Sarpy	0-1	0-15	1.20-1.40	42.00-141.00	0.05-0.09	2.0-8.0	6.6-8.4	0.1-2.9	0.5-1.0	.15	.15	5	1	250
	1-60	0-15	1.20-1.50	42.00-141.00	0.05-0.09	2.0-8.0	6.6-8.4	0.1-2.9	0.1-0.5	.15	.15			
66011:														
Moville	0-8	10-27	1.25-1.35	4.00-14.00	0.18-0.23	15-20	7.4-8.4	0.1-2.9	1.0-3.0	.37	.37	5	4L	86
	8-27	10-27	1.25-1.35	4.00-14.00	0.18-0.23	15-20	7.4-8.4	0.1-2.9	0.5-1.0	.37	.37			
	27-60	45-60	1.35-1.45	0.00-0.42	0.11-0.13	41-55	6.6-7.8	6.0-8.9	2.0-4.0	.28	.28			
66012:														
Blake	0-7	12-27	1.25-1.30	4.00-14.00	0.22-0.24	20-25	7.4-8.4	0.1-2.9	1.0-3.0	.32	.32	5	4L	86
	7-60	12-40	1.30-1.35	4.00-14.00	0.18-0.22	10-26	7.4-8.4	3.0-5.9	0.1-0.5	.43	.43			
66013:														
Waldron	0-10	12-27	1.35-1.50	1.40-4.00	0.22-0.24	20-28	6.0-7.0	3.0-5.9	2.0-4.0	.32	.32	5	7	38
	10-60	27-60	1.45-1.60	0.42-1.40	0.10-0.17	25-37	7.4-8.4	6.1-8.9	0.5-2.0	.32	.32			
70028:														
Moko	0-3	7-27	1.25-1.50	4.00-14.00	0.07-0.13	15-40	6.6-7.8	0.1-2.9	2.0-6.0	.24	.43	1	8	0
	3-8	7-27	1.25-1.60	4.00-14.00	0.03-0.14	15-40	6.6-7.8	0.1-2.9	2.0-6.0	.28	.43			
	8-60	---	---	0.00-1.40	---	---	---	---	---	---	---			
Rock outcrop.														
70029:														
Moko	0-4	27-40	1.25-1.50	4.00-14.00	0.11-0.12	15-40	6.6-7.8	0.1-2.9	2.0-6.0	.24	.37	1	8	0
	4-7	18-40	1.25-1.60	4.00-14.00	0.03-0.14	15-40	6.6-7.8	0.1-2.9	2.0-6.0	.28	.43			
	7-60	---	---	0.00-1.40	---	---	---	---	---	---	---			
Rock outcrop.														
73035:														
Gravois	0-6	12-27	1.20-1.50	4.00-14.00	0.20-0.22	8.0-15	5.1-6.5	0.1-2.9	1.0-2.5	.37	.37	4	5	56
	6-25	20-35	1.30-1.50	1.40-4.20	0.12-0.18	10-24	4.5-6.5	3.0-5.9	0.3-1.0	.43	.43			
	25-35	15-35	1.50-1.70	0.42-1.40	0.08-0.12	10-18	4.0-6.5	0.1-2.9	0.1-0.5	.32	.43			
	35-50	15-35	1.45-1.65	1.40-4.20	0.10-0.13	10-18	4.0-6.5	3.0-5.9	0.1-0.5	.32	.43			
	50-80	40-80	1.30-1.50	1.40-4.20	0.04-0.10	25-36	6.5-8.0	6.0-8.9	0.1-0.5	.28	.32			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity (Ksat)	Available water capacity	Cation-exchange capacity	Soil reaction	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	g/cc	um/sec	In/in	meq/100g	pH	Pct	Pct					
73088, 73089:														
Rueter	0-3	4-27	1.20-1.40	14.00-42.00	0.07-0.12	1.0-11	4.1-6.0	0.1-2.9	0.5-2.0	.28	.37	3	8	0
	3-14	4-27	1.20-1.40	14.00-42.00	0.07-0.12	4.0-10	4.1-6.0	0.1-2.9	0.5-1.0	.37	.43			
	14-45	7-35	1.30-1.50	14.00-42.00	0.05-0.10	2.0-12	4.1-6.0	0.1-2.9	0.1-0.5	.32	.43			
	45-80	40-80	1.20-1.40	4.00-14.00	0.02-0.05	10-32	4.5-6.0	6.0-8.9	0.1-0.5	.20	.32			
73090, 73091:														
Useful	0-7	15-27	1.35-1.45	4.00-14.00	0.22-0.24	10-17	5.1-6.5	0.1-2.9	2.0-4.0	.37	.37	4	6	48
	7-31	35-45	1.25-1.35	4.00-14.00	0.11-0.18	18-23	4.5-6.0	6.0-8.9	0.5-1.0	.32	.32			
	31-45	35-60	1.25-1.55	1.40-4.00	0.05-0.12	20-30	4.5-7.3	6.0-8.9	0.1-0.5	.32	.32			
	45-53	35-60	1.25-1.50	1.40-4.00	0.05-0.12	18-30	4.5-7.3	6.0-8.9	0.1-0.5	.32	.43			
	53-60	---	---	0.07-0.40	---	---	---	---	---	---	---			
73092, 73093, 73094:														
Gatewood	0-2	12-27	1.10-1.40	4.00-14.00	0.14-0.16	10-30	5.1-7.3	0.1-2.9	0.5-3.0	.28	.43	2	8	0
	2-10	12-27	1.10-1.30	4.00-14.00	0.12-0.14	10-18	5.1-7.3	0.1-2.9	0.5-1.0	.28	.43			
	10-28	40-80	1.35-1.60	0.42-1.40	0.08-0.14	30-44	5.1-7.8	6.0-8.9	0.5-1.0	.20	.28			
	28-60	---	---	0.07-0.40	---	---	---	---	---	---	---			
73095:														
Gravois	0-6	12-27	1.20-1.50	4.00-14.00	0.20-0.22	8.0-15	5.1-6.5	0.1-2.9	1.0-2.5	.37	.37	4	5	56
	6-25	20-35	1.30-1.50	1.40-4.20	0.12-0.18	10-24	4.5-6.5	3.0-5.9	0.3-1.0	.43	.43			
	25-35	15-35	1.50-1.70	0.42-1.40	0.08-0.12	10-18	4.0-6.5	0.1-2.9	0.1-0.5	.32	.43			
	35-50	15-35	1.45-1.65	1.40-4.20	0.10-0.13	10-18	4.0-6.5	3.0-5.9	0.1-0.5	.32	.43			
	50-80	40-80	1.30-1.50	1.40-4.20	0.04-0.10	25-36	6.5-8.0	6.0-8.9	0.1-0.5	.28	.32			
73096, 73097:														
Swiss	0-3	8-27	1.10-1.40	14.00-42.00	0.10-0.19	15-22	4.5-6.5	0.1-2.9	2.5-4.5	.32	.37	3	8	0
	3-9	7-27	1.10-1.45	14.00-42.00	0.10-0.19	5.0-12	4.5-6.5	0.1-2.9	0.5-1.2	.32	.37			
	9-40	40-65	1.40-1.55	0.01-0.42	0.08-0.10	20-26	3.5-7.0	6.0-8.9	0.2-0.8	.24	.32			
	40-80	27-65	1.50-1.90	0.01-0.42	0.05-0.10	6.0-12	5.0-6.5	3.0-5.9	0.1-0.2	.20	.32			
73098, 73099:														
Plato	0-8	12-27	1.20-1.50	4.00-14.00	0.22-0.24	6.0-16	5.1-7.3	0.1-2.9	1.0-2.0	.43	.43	4	5	56
	8-20	40-60	1.30-1.50	1.40-4.00	0.11-0.13	14-30	3.5-5.5	6.0-8.9	0.5-1.0	.32	.37			
	20-48	12-35	1.60-1.90	0.01-0.42	0.01-0.05	10-16	3.5-5.5	0.1-2.9	0.1-0.5	.24	.43			
	48-60	27-80	1.40-1.60	4.00-14.00	0.02-0.06	18-36	4.5-6.0	6.0-8.9	0.1-0.5	.24	.32			
73100, 73101, 73102:														
Wrengart	0-8	12-27	1.30-1.50	4.00-14.00	0.22-0.24	9.0-23	5.6-7.3	0.1-2.9	1.0-3.0	.37	.37	4	5	56
	8-36	20-35	1.30-1.50	4.00-14.00	0.18-0.19	15-26	4.5-6.5	3.0-5.9	0.1-0.5	.43	.43			
	36-61	18-32	1.50-1.70	1.40-4.00	0.09-0.15	11-22	5.1-7.3	0.1-2.9	0.1-0.5	.43	.43			
	61-80	40-80	1.30-1.50	1.40-4.00	0.08-0.12	24-40	5.1-7.8	6.0-8.9	0.1-0.5	.17	.28			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity (Ksat)	Available water capacity	Cation-exchange capacity	Soil reaction	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	g/cc	um/sec	In/in	meq/100g	pH	Pct	Pct					
73103, 73104:														
Wrengart	0-5	12-27	1.30-1.50	4.00-14.00	0.22-0.24	9.0-23	5.6-7.3	0.1-2.9	1.0-3.0	.37	.37	4	5	56
	5-30	27-35	1.30-1.50	4.00-14.00	0.18-0.19	15-26	4.5-6.5	3.0-5.9	0.1-0.5	.43	.43			
	30-62	18-32	1.50-1.70	1.40-4.00	0.09-0.15	11-22	5.1-7.3	0.1-2.9	0.1-0.5	.43	.43			
	62-80	40-80	1.30-1.50	1.40-4.00	0.08-0.12	25-40	5.1-7.8	6.0-8.9	0.1-0.5	.17	.28			
73105:														
Wrengart	0-5	12-27	1.30-1.50	4.00-14.00	0.22-0.24	9.0-23	5.6-7.3	0.1-2.9	1.0-3.0	.37	.37	4	5	56
	5-30	27-35	1.30-1.50	4.00-14.00	0.18-0.19	15-26	4.5-6.5	3.0-5.9	0.1-0.5	.43	.43			
	30-62	18-32	1.50-1.70	1.40-4.00	0.09-0.15	11-22	5.1-7.3	0.1-2.9	0.1-0.5	.43	.43			
	62-80	40-80	1.30-1.50	1.40-4.00	0.08-0.12	25-40	5.1-7.8	6.0-8.9	0.1-0.5	.17	.28			
Gatewood	0-2	12-27	1.10-1.40	4.00-14.00	0.14-0.16	10-30	5.1-7.3	0.1-2.9	0.5-3.0	.28	.43	2	8	0
	2-10	12-27	1.10-1.30	4.00-14.00	0.12-0.14	10-18	5.1-7.3	0.1-2.9	0.5-1.0	.28	.43			
	10-28	40-80	1.35-1.60	0.42-1.40	0.08-0.14	30-44	5.1-7.8	6.0-8.9	0.5-1.0	.20	.28			
	28-60	---	---	0.07-0.40	---	---	---	---	---	---	---			
73106:														
Mariosa	0-7	12-27	1.25-1.45	4.00-14.00	0.22-0.24	8.0-16	4.5-7.3	0.1-2.9	1.0-3.0	.43	.43	5	6	48
	7-11	12-27	1.30-1.50	0.42-1.40	0.15-0.20	5.0-13	4.5-7.3	0.1-2.9	0.5-1.0	.43	.43			
	11-38	35-60	1.30-1.50	0.01-0.42	0.09-0.20	18-34	4.5-6.5	6.0-8.9	0.5-1.0	.43	.43			
	38-80	18-40	1.50-1.70	0.01-0.42	0.08-0.16	9.0-26	4.5-6.5	3.0-5.9	0.1-0.5	.43	.43			
73107:														
Wrengart	0-8	12-27	1.30-1.50	4.00-14.00	0.22-0.24	9.0-23	5.6-7.3	0.1-2.9	1.0-3.0	.37	.37	4	5	56
	8-36	20-35	1.30-1.50	4.00-14.00	0.18-0.19	15-26	4.5-6.5	3.0-5.9	0.1-0.5	.43	.43			
	36-61	18-32	1.50-1.70	1.40-4.00	0.09-0.15	11-22	5.1-7.3	0.1-2.9	0.1-0.5	.43	.43			
	61-80	40-80	1.30-1.50	1.40-4.00	0.08-0.12	24-40	5.1-7.8	6.0-8.9	0.1-0.5	.17	.28			
Swiss	0-3	8-27	1.10-1.40	14.00-42.00	0.10-0.19	15-22	4.5-6.5	0.1-2.9	2.5-4.5	.32	.37	3	8	0
	3-9	7-27	1.10-1.45	14.00-42.00	0.10-0.19	5.0-12	4.5-6.5	0.1-2.9	0.5-1.2	.32	.37			
	9-40	40-65	1.40-1.55	0.01-0.42	0.08-0.10	20-26	3.5-7.0	6.0-8.9	0.2-0.8	.24	.32			
	40-80	27-65	1.50-1.90	0.01-0.42	0.05-0.10	6.0-12	5.0-6.5	3.0-5.9	0.1-0.2	.20	.32			
73108:														
Gravois	0-6	12-27	1.20-1.50	4.00-14.00	0.20-0.22	8.0-15	5.1-6.5	0.1-2.9	1.0-2.5	.37	.37	4	5	56
	6-25	20-35	1.30-1.50	1.40-4.20	0.12-0.18	10-24	4.5-6.5	3.0-5.9	0.3-1.0	.43	.43			
	25-35	15-35	1.50-1.70	0.42-1.40	0.08-0.12	10-18	4.0-6.5	0.1-2.9	0.1-0.5	.32	.43			
	35-50	15-35	1.45-1.65	1.40-4.20	0.10-0.13	10-18	4.0-6.5	3.0-5.9	0.1-0.5	.32	.43			
	50-80	40-80	1.30-1.50	1.40-4.20	0.04-0.10	25-36	6.5-8.0	6.0-8.9	0.1-0.5	.28	.32			
Gatewood	0-2	12-27	1.10-1.40	4.00-14.00	0.14-0.16	10-30	5.1-7.3	0.1-2.9	0.5-3.0	.28	.43	2	8	0
	2-10	12-27	1.10-1.30	4.00-14.00	0.12-0.14	10-18	5.1-7.3	0.1-2.9	0.5-1.0	.28	.43			
	10-28	40-80	1.35-1.60	0.42-1.40	0.08-0.14	30-44	5.1-7.8	6.0-8.9	0.5-1.0	.20	.28			
	28-60	---	---	0.07-0.40	---	---	---	---	---	---	---			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity (Ksat)	Available water capacity	Cation-exchange capacity	Soil reaction	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	g/cc	um/sec	In/in	meq/100g	pH	Pct	Pct					
73109:														
Alred	0-7	10-22	1.30-1.50	4.00-14.00	0.08-0.12	5.5-12	4.5-6.5	0.1-2.9	1.0-2.0	.10	.32	4	8	0
	7-15	10-22	1.40-1.60	4.00-14.00	0.06-0.10	4.0-12	4.5-6.5	0.1-2.9	0.5-1.0	.10	.32			
	15-21	12-35	1.30-1.50	4.00-14.00	0.07-0.12	7.5-13	4.5-6.0	0.1-2.9	0.3-0.5	.20	.28			
	21-80	42-80	1.40-1.60	0.42-1.40	0.08-0.11	14-27	4.0-5.0	6.0-8.9	0.1-0.5	.10	.28			
73110:														
Gravois	0-6	12-27	1.20-1.50	4.00-14.00	0.20-0.22	8.0-15	5.1-6.5	0.1-2.9	1.0-2.5	.37	.37	4	5	56
	6-25	20-35	1.30-1.50	1.40-4.20	0.12-0.18	10-24	4.5-6.5	3.0-5.9	0.3-1.0	.43	.43			
	25-35	15-35	1.50-1.70	0.42-1.40	0.08-0.12	10-18	4.0-6.5	0.1-2.9	0.1-0.5	.32	.43			
	35-50	15-35	1.45-1.65	1.40-4.20	0.10-0.13	10-18	4.0-6.5	3.0-5.9	0.1-0.5	.32	.43			
	50-80	40-80	1.30-1.50	1.40-4.20	0.04-0.10	25-36	6.5-8.0	6.0-8.9	0.1-0.5	.28	.32			
Gatewood	0-2	12-27	1.10-1.40	4.00-14.00	0.14-0.16	10-30	5.1-7.3	0.1-2.9	0.5-3.0	.28	.43	2	8	0
	2-10	12-27	1.10-1.30	4.00-14.00	0.12-0.14	10-18	5.1-7.3	0.1-2.9	0.5-1.0	.28	.43			
	10-28	40-80	1.35-1.60	0.42-1.40	0.08-0.14	30-44	5.1-7.8	6.0-8.9	0.5-1.0	.20	.28			
	28-60	---	---	0.07-0.40	---	---	---	---	---	---	---			
73112:														
Gunlock	0-5	15-27	1.20-1.50	4.00-14.00	0.20-0.22	8.0-15	5.1-7.3	0.1-2.9	1.0-2.0	.37	.37	4	5	56
	5-25	27-45	1.30-1.50	1.40-4.00	0.12-0.18	18-24	4.5-6.5	3.0-5.9	0.5-1.0	.37	.43			
	25-43	20-35	1.50-1.70	0.42-1.40	0.08-0.14	10-18	5.1-6.5	0.1-2.9	0.1-0.5	.37	.43			
	43-55	35-60	1.30-1.50	1.40-4.00	0.06-0.13	18-34	4.5-6.5	6.0-8.9	0.1-0.5	.37	.43			
	55-80	40-80	1.30-1.50	1.40-4.00	0.06-0.18	20-40	4.5-6.5	6.0-8.9	0.1-0.5	.37	.37			
73135:														
Union	0-9	10-27	1.35-1.45	4.00-14.00	0.18-0.22	6.0-16	5.6-6.5	0.1-2.9	0.5-2.0	.43	.43	4	5	56
	9-30	27-50	1.30-1.40	4.00-14.00	0.14-0.19	14-24	4.5-5.5	3.0-5.9	0.5-1.0	.43	.43			
	30-53	15-27	1.60-1.90	0.42-1.40	0.01-0.05	8.0-18	3.6-5.0	0.1-2.9	0.1-0.5	.43	.43			
	53-80	40-80	1.30-1.45	1.40-4.00	0.02-0.06	20-40	4.5-6.0	6.0-8.9	0.1-0.5	.43	.43			
74633, 74634:														
Hartville	0-7	12-27	1.10-1.30	4.00-14.00	0.22-0.24	10-16	4.5-7.3	0.1-2.9	1.0-3.0	.43	.43	5	6	48
	7-12	12-27	1.20-1.40	0.42-1.40	0.20-0.22	9.0-20	4.5-6.5	3.0-5.9	0.5-1.5	.43	.43			
	12-48	35-45	1.20-1.50	0.42-1.40	0.15-0.20	18-25	4.5-6.5	6.0-8.9	0.2-0.8	.32	.32			
	48-80	30-40	1.20-1.50	0.42-1.40	0.18-0.20	16-25	6.1-7.3	6.0-8.9	0.2-0.8	.32	.32			
74635:														
Tanglenook	0-6	40-60	1.30-1.40	1.40-4.00	0.12-0.14	23-35	6.0-7.5	6.0-8.9	2.0-4.0	.28	.28	5	4	86
	6-17	40-60	1.40-1.45	0.42-1.40	0.12-0.14	25-35	5.6-7.3	6.0-8.9	2.0-4.0	.32	.32			
	17-56	40-60	1.40-1.45	0.42-1.40	0.11-0.13	25-40	5.6-7.3	6.0-8.9	1.0-2.0	.32	.32			
	56-60	40-60	1.40-1.50	0.42-1.40	0.10-0.12	25-42	5.6-7.3	6.0-8.9	0.5-1.0	.32	.32			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Saturated hydraulic conductivity (Ksat)	Available water capacity	Cation-exchange capacity	Soil reaction	Shrink-swell potential	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	Pct	g/cc	um/sec	In/in	meq/100g	pH	Pct	Pct					
75376:														
Cedargap	0-9	12-27	1.20-1.45	4.00-14.00	0.16-0.18	7.0-17	5.6-7.3	0.1-2.9	1.0-4.0	.24	.32	5	8	0
	9-49	12-35	1.30-1.50	4.00-14.00	0.08-0.10	10-18	5.6-7.3	0.1-2.9	0.5-1.0	.32	.43			
	49-60	40-80	1.20-1.40	1.40-4.00	0.04-0.10	18-40	5.6-7.3	6.0-8.9	0.5-1.0	.20	.32			
75391:														
Possumtrot	0-9	5-18	1.30-1.50	4.00-14.00	0.16-0.18	4.0-16	4.5-7.0	0.1-2.9	2.0-4.0	.24	.24	4	3	86
	9-40	5-18	1.30-1.60	4.00-14.00	0.09-0.17	4.0-16	4.5-6.5	0.1-2.9	0.1-0.5	.24	.24			
	40-80	1-10	1.20-1.50	42.00-140.00	0.02-0.10	1.0-6.0	4.5-6.5	0.1-2.9	0.1-0.5	.17	.10			
75395:														
Jamesfin	0-10	10-27	1.20-1.40	4.00-14.00	0.22-0.24	6.0-20	5.6-8.0	0.1-2.9	2.0-4.0	.43	.43	5	5	56
	10-60	12-30	1.25-1.50	4.00-14.00	0.18-0.22	6.0-20	5.6-8.0	0.1-2.9	0.5-2.0	.43	.43			
75398:														
Kaintuck	0-6	5-18	1.30-1.50	14.00-42.00	0.09-0.17	4.0-7.0	5.6-7.3	0.1-2.9	0.5-2.0	.24	.24	5	3	86
	6-80	5-18	1.20-1.50	14.00-42.00	0.06-0.20	5.0-8.0	5.6-7.3	0.1-2.9	0.1-1.0	.28	.28			
75399:														
Jamesfin	0-10	10-27	1.20-1.40	4.00-14.00	0.22-0.24	6.0-20	5.6-8.0	0.1-2.9	2.0-4.0	.43	.43	5	5	56
	10-60	12-30	1.25-1.50	4.00-14.00	0.18-0.22	6.0-20	5.6-8.0	0.1-2.9	0.5-2.0	.43	.43			
75400:														
Gladden	0-6	8-27	1.25-1.45	4.00-14.00	0.22-0.24	10-25	4.5-6.7	0.1-2.9	2.0-4.0	.32	.32	4	5	56
	6-38	10-18	1.25-1.45	4.00-14.00	0.17-0.20	8.0-20	4.5-6.7	0.1-2.9	0.1-1.0	.32	.32			
	38-60	5-18	1.20-1.50	14.00-42.00	0.02-0.05	3.0-12	4.5-6.7	0.1-2.9	0.1-1.0	.24	.32			
75407:														
Gabriel	0-14	12-27	1.25-1.30	4.00-14.00	0.22-0.24	15-25	5.6-7.3	0.1-2.9	2.0-4.0	.32	.32	5	6	48
	14-46	25-35	1.25-1.40	1.40-4.00	0.18-0.20	15-25	5.1-6.5	3.0-5.9	1.0-2.0	.37	.37			
	46-81	25-35	1.35-1.45	1.40-4.00	0.18-0.20	15-25	5.1-6.5	3.0-5.9	0.1-1.0	.43	.43			
99000. Pits, quarries														
99001. Water														
99003. Miscellaneous water														

Table 17.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
15002:							
McGirk	---	---	---	---	High	High	High
60001, 60002, 60003, 60004, 60005:							
Menfro	---	---	---	---	High	Low	Moderate
60006:							
Marion	---	---	---	---	Moderate	High	High
60007:							
Menfro	---	---	---	---	High	Low	Moderate
Gatewood	Bedrock (lithic)	20-40	---	Indurated	Moderate	High	Moderate
64000:							
Racoon	---	---	---	---	High	High	High
64001, 64002, 64003:							
Freeburg	---	---	---	---	High	High	High
66003:							
Jemerson	---	---	---	---	High	Moderate	Moderate
66004:							
Dockery	---	---	---	---	High	Moderate	Low
66005:							
Deible	Abrupt textural change	9-22	14-22	Noncemented	Moderate	High	High
66006:							
Waldron	---	---	---	---	High	High	Low
66007, 66008:							
Leta	Strongly contrasting textural stratification	20-38	42-60	Noncemented	High	High	Low
66009:							
Haynie	---	---	---	---	High	Low	Low
66010:							
Sarpy	---	---	---	---	Low	Low	Low
66011:							
Moville	Strongly contrasting textural stratification	18-32	48-62	Noncemented	High	High	Low
66012:							
Blake	---	---	---	---	High	High	Low
66013:							
Waldron	---	---	---	---	High	High	Low

Table 17.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
70028, 70029:							
Moko	Bedrock (lithic)	4-20	---	Indurated	None	Low	Low
Rock outcrop.							
73035:							
Gravois	Dense material	18-40	10-35	Noncemented	Moderate	Moderate	High
73088, 73089:							
Rueter	---	---	---	---	Moderate	Low	High
73090, 73091:							
Useful	Bedrock (lithic)	40-60	---	Indurated	Moderate	Moderate	Moderate
73092, 73093, 73094:							
Gatewood	Bedrock (lithic)	20-40	---	Indurated	Moderate	High	Moderate
73095:							
Gravois	Dense material	18-40	10-35	Noncemented	Moderate	Moderate	High
73096, 73097:							
Swiss	---	---	---	---	Moderate	High	High
73098, 73099:							
Plato	Fragipan	20-36	8-28	Noncemented	Moderate	High	High
73100, 73101, 73102, 73104:							
Wrengart	Dense material	20-40	5-35	Noncemented	Moderate	Moderate	Moderate
73105:							
Wrengart	Dense material	20-40	5-35	Noncemented	Moderate	Moderate	Moderate
Gatewood	Bedrock (lithic)	20-40	---	Indurated	Moderate	High	Moderate
73106:							
Mariosa	Abrupt textural change	4-13	25-30	Noncemented	High	High	High
	Dense material	20-40	40-60	Noncemented			
73107:							
Wrengart	Dense material	20-40	5-35	Noncemented	Moderate	Moderate	Moderate
Swiss	---	---	---	---	Moderate	High	High
73108:							
Gravois	Dense material	18-40	10-35	Noncemented	Moderate	Moderate	High
Gatewood	Bedrock (lithic)	20-40	---	Indurated	Moderate	High	Moderate
73109:							
Alred	Strongly contrasting textural stratification	15-39	41-65	Noncemented	Moderate	Moderate	Moderate
73110:							
Gravois	Dense material	18-40	10-35	Noncemented	Moderate	Moderate	High
Gatewood	Bedrock (lithic)	20-40	---	Indurated	Moderate	High	Moderate

Table 17.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated steel	Concrete
		In	In				
73112:							
Gunlock	Dense material	20-34	12-30	Noncemented	Moderate	Moderate	High
73135:							
Union	Fragipan	18-36	9-25	Noncemented	Moderate	High	High
74633, 74634:							
Hartville	---	---	---	---	High	Moderate	Moderate
74635:							
Tanglenook	---	---	---	---	High	High	Moderate
75376:							
Cedargap	---	---	---	---	Moderate	Low	Low
75391:							
Possumtrot	---	---	---	---	Moderate	Moderate	High
75395:							
Jamesfin	---	---	---	---	High	Low	Moderate
75398:							
Kaintuck	---	---	---	---	Moderate	High	Moderate
75399:							
Jamesfin	---	---	---	---	High	Low	Moderate
75400:							
Gladden	---	---	---	---	Moderate	High	High
75407:							
Gabriel	---	---	---	---	High	High	Moderate
99000. Pits, quarries							
99001. Water							
99003. Miscellaneous water							

Table 18.--Water Features

(The symbol > 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	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
15002:							
McGirk	C	None	---	---	0.5-2.0	Apparent	Nov-May
60001, 60002, 60003, 60004, 60005:							
Menfro	B	None	---	---	>6.0	---	---
60006:							
Marion	D	None	---	---	1.0-2.0	Perched	Nov-May
60007:							
Menfro	B	None	---	---	>6.0	---	---
Gatewood	C	None	---	---	1.5-3.0	Perched	Nov-May
64000:							
Racoon	C/D	Rare	Brief	Jan-Dec	0-1.0	Apparent	Nov-Jun
64001:							
Freeburg	C	Rare	Brief	Jan-Dec	1.0-2.5	Perched	Nov-May
64002, 64003:							
Freeburg	C	None	---	---	1.0-2.5	Perched	Nov-May
66003:							
Jemerson	B	Rare	Brief	Jan-Dec	3.5-5.0	Apparent	Nov-Apr
66004:							
Dockery	C	Frequent	Brief	Oct-Jun	1.5-2.5	Apparent	Nov-Jun
66005:							
Deible	D	Rare	Brief	Jan-Dec	0.0-1.0	Perched	Nov-May
66006:							
Waldron	D	Occasional	Long	Jan-Dec	1.0-3.0	Apparent	Nov-May
66007, 66008:							
Leta	C	Occasional	Long	Jan-Dec	1.0-3.0	Apparent	Nov-May
66009:							
Haynie	B	Occasional	Long	Jan-Dec	>6.0	---	---
66010:							
Sarpy	A	Frequent	Long	Oct-Jun	>6.0	---	---
66011:							
Moville	C	Occasional	Long	Jan-Dec	1.5-2.5	Perched	Nov-May
66012:							
Blake	B	Frequent	Long	Oct-Jun	2.0-4.0	Apparent	Nov-June
66013:							
Waldron	D	Rare	Long	Jan-Dec	1.0-3.0	Apparent	Nov-May
70028, 70029:							
Moko	D	None	---	---	>6.0	---	---
Rock outcrop.							

Table 18.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
73035:							
Gravois	C	None	---	---	1.5-3.0	Perched	Nov-May
73088, 73089:							
Ruster	B	None	---	---	>6.0	---	---
73090, 73091:							
Useful	C	None	---	---	2.0-3.5	Perched	Nov-May
73092, 73093, 73094:							
Gatewood	C	None	---	---	1.5-3.0	Perched	Nov-May
73095:							
Gravois	C	None	---	---	1.5-3.0	Perched	Nov-May
73096, 73097:							
Swiss	C	None	---	---	2.0-3.5	Perched	Nov-Apr
73098, 73099:							
Plato	C	None	---	---	1.0-2.0	Perched	Nov-May
73100, 73101, 73102, 73103, 73104:							
Wrengart	C	None	---	---	2.0-3.5	Perched	Nov-Apr
73105:							
Wrengart	C	None	---	---	2.0-3.5	Perched	Nov-Apr
Gatewood	C	None	---	---	1.5-3.0	Perched	Nov-May
73106:							
Mariosa	D	None	---	---	0.0-1.0	Perched	Nov-May
73107:							
Wrengart	C	None	---	---	2.0-3.5	Perched	Nov-Apr
Swiss	C	None	---	---	2.0-3.5	Perched	Nov-Apr
73108:							
Gravois	C	None	---	---	1.5-3.0	Perched	Nov-May
Gatewood	C	None	---	---	1.5-3.0	Perched	Nov-May
73109:							
Alred	C	None	---	---	>6.0	---	---
73110:							
Gravois	C	None	---	---	1.5-3.0	Perched	Nov-May
Gatewood	C	None	---	---	1.5-3.0	Perched	Nov-May
73112:							
Gunlock	C	None	---	---	1.5-3.0	Perched	Nov-May
73135:							
Union	C	None	---	---	1.5-3.0	Perched	Nov-May
74633, 74634:							
Hartville	C	None	---	---	1.5-3.0	Perched	Nov-May

Table 18.--Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
74635:							
Tanglenook	D	Rare	Brief	Jan-Dec	0.0-1.5	Apparent	Nov-May
75376:							
Cedargap	B	Frequent	Very brief	Oct-Jun	>6.0	---	---
75391:							
Possumtrot	B	Occasional	Brief	Oct-Jun	>6.0	---	---
75395:							
Jamesfin	B	Occasional	Brief	Oct-Jun	4.0-6.0	Apparent	Nov-Apr
75398:							
Kaintuck	B	Frequent	Brief	Oct-Jun	>6.0	---	---
75399:							
Jamesfin	B	Frequent	Brief	Oct-Jun	4.0-6.0	Apparent	Nov-Apr
75400:							
Gladden	B	Frequent	Very brief	Oct-Jun	>6.0	---	---
75407:							
Gabriel	B/D	Rare	Brief	Jan-Dec	1.0-2.5	Apparent	Nov-May
99000. Pits, quarries							
99001. Water							
99003. Miscellaneous water							

Table 19.--Classification of the Soils

Soil name	Family or higher taxonomic class
Alred	Loamy-skeletal over clayey, siliceous, semiactive, mesic Typic Paleudalfs
Blake	Fine-silty, mixed, superactive, calcareous, mesic Aquic Udifluvents
Cedargap	Loamy-skeletal, mixed, superactive, mesic Cumulic Hapludolls
Deible	Fine, mixed, active, mesic Typic Albaqualfs
Dockery	Fine-silty, mixed, superactive, nonacid, mesic Aquic Udifluvents
Freeburg	Fine-silty, mixed, superactive, mesic Aquic Hapludalfs
Gabriel	Fine-silty, mixed, superactive, mesic Typic Argiaquolls
Gatewood	Very-fine, mixed, active, mesic Oxyaquic Hapludalfs
Gladdan	Coarse-loamy, siliceous, superactive, mesic Dystric Fluventic Eutrudepts
Gravois	Fine-silty, mixed, active, mesic Aquic Paleudalfs
Gunlock	Fine, mixed, active, mesic Fragic Oxyaquic Hapludalfs
Hartville	Fine, mixed, active, mesic Aquic Hapludalfs
Haynie	Coarse-silty, mixed, superactive, calcareous, mesic Mollic Udifluvents
Jamesfin	Fine-silty, mixed, active, mesic Dystric Fluventic Eutrudepts
Jemerson	Fine-silty, mixed, superactive, mesic Typic Hapludalfs
Kaintuck	Coarse-loamy, siliceous, superactive, nonacid, mesic Typic Udifluvents
Leta	Clayey over loamy, smectitic, mesic Fluvaquentic Hapludolls
Marion	Fine, smectitic, mesic Aquertic Chromic Hapludalfs
Mariosa	Fine, smectitic, mesic Chromic Vertic Albaqualfs
McGirk	Fine, smectitic, mesic Chromic Vertic Endoaqualfs
Menfro	Fine-silty, mixed, superactive, mesic Typic Hapludalfs
Moko	Loamy-skeletal, mixed, superactive, mesic Lithic Hapludolls
Moville	Coarse-silty over clayey, mixed, superactive, calcareous, mesic Aquic Udifluvents
Plato	Fine, mixed, active, mesic Aquic Fragiudalfs
Possumtrot	Coarse-loamy, siliceous, superactive, mesic Fluventic Dystrudepts
Racoon	Fine-silty, mixed, superactive, mesic Typic Endoaqualfs
Rueter	Loamy-skeletal, siliceous, active, mesic Typic Paleudalfs
Sarpy	Mixed, mesic Typic Udipsamments
Swiss	Fine, mixed, semiactive, mesic Oxyaquic Hapludalfs
Tanglenook	Fine, mixed, superactive, mesic Typic Argiaquolls
Union	Fine, mixed, active, mesic Oxyaquic Fragiudalfs
Useful	Fine, mixed, active, mesic Oxyaquic Hapludalfs
Waldron	Fine, smectitic, calcareous, mesic Aeric Fluvaquents
Wrengart	Fine-silty, mixed, active, mesic Fragic Oxyaquic Hapludalfs

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