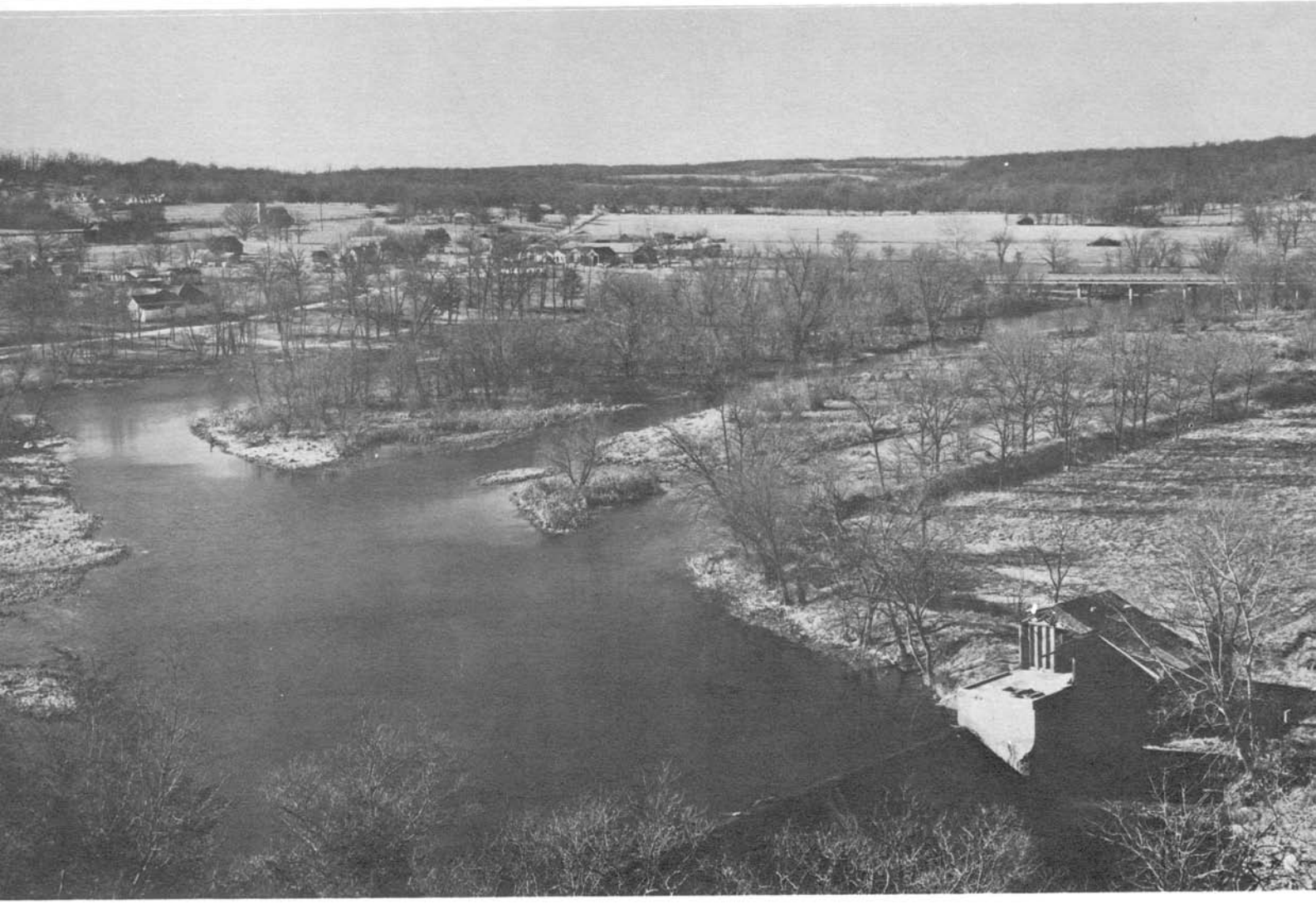
Soil survey of Wright County Missouri



United States Department of Agriculture
Soil Conservation Service and Forest Service
in cooperation with Missouri Agricultural Experiment Station

How To Use This Soil Survey

General Soil Map

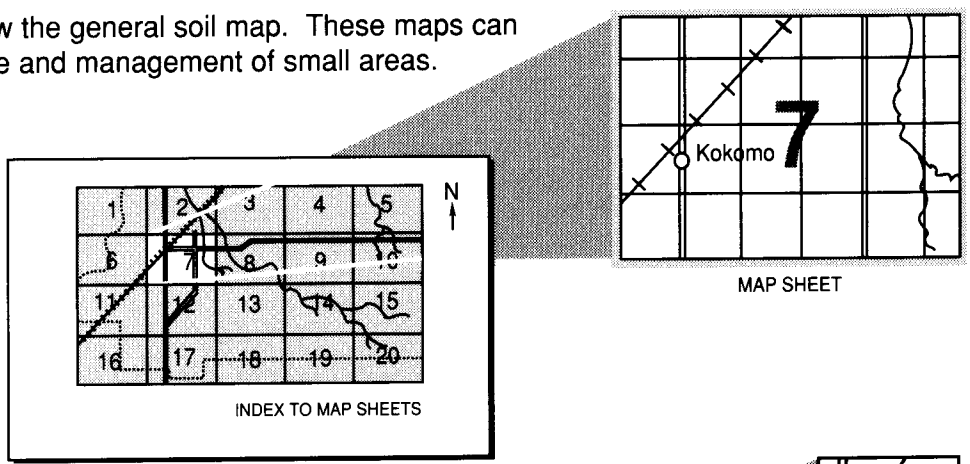
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

Detailed Soil Maps

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

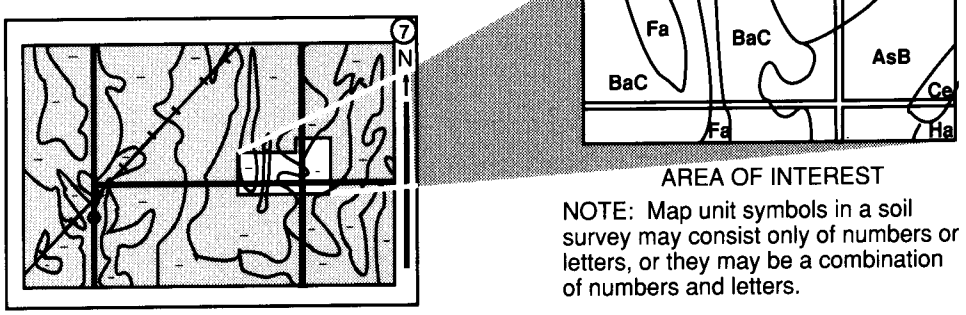
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

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



MAP SHEET

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.

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the United States Department of Agriculture, Soil Conservation Service and Forest Service, and the Missouri Agricultural Experiment Station. The Missouri Department of Natural Resources contributed funds to assist in map finishing. The survey is part of the technical assistance furnished to the Wright County Soil and Water Conservation District. Major fieldwork was performed in the period 1968-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978.

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

Cover: Old mill site along the Gasconade River at Hartville. Nevin soils are in the right foreground. Hartville and Doniphan soils are under urban development in the background.

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soil series

Issued June 1981

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foreword

This soil survey contains information that can be used in land-planning programs in Wright County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, 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 insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

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

Kenneth G. McManus

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State Conservationist
Soil Conservation Service

soil survey of
Wright County, Missouri

By George D. Robertson, Soil Conservation Service

Soil surveyed by George D. Robertson, party leader, and by John Baker, Frederick L. Gilbert, Robert J. Held, Raleigh Redman, Bob Tiede, and Jack Warkenton, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service and Forest Service, in cooperation with Missouri Agricultural Experiment Station

WRIGHT COUNTY is in the south-central part of Missouri (fig. 1), along the northern edge of the Ozark mountains. It has a population of 13,667. The population of Hartville, the county seat, is 587. That of Mountain Grove, the largest town, is 3,176. Other towns are Grovespring, Manes, Mansfield, and Norwood. The county has a total area of 437,760 acres, or 684 square miles. It was established on January 29, 1841. It was named in honor of Silas Wright, a prominent Democrat from New York.

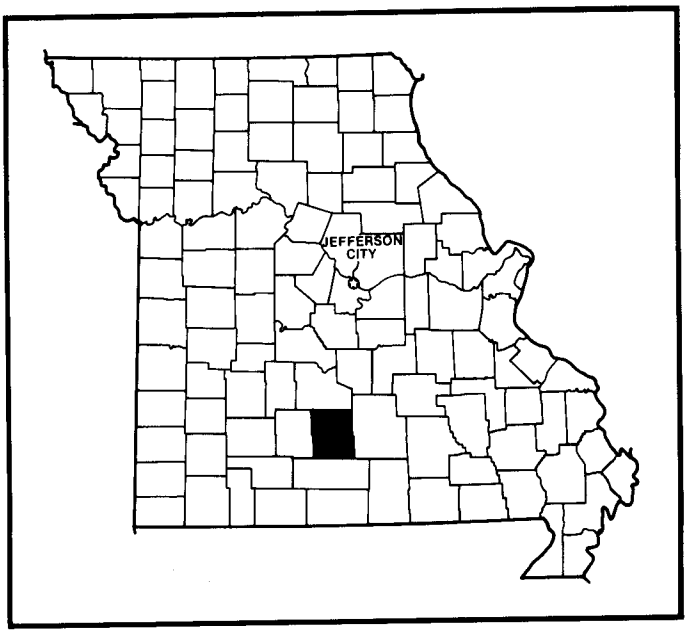

Figure 1.—Location of Wright County in Missouri.

Farm and wood products are the main local sources of income. Also important are the factory products manufactured in or near Hartville, Mansfield, and Mountain Grove. Beef cattle and milk are the major sources of farm income. Lumber and special wood products are manufactured in sawmills throughout the county.

general nature of the county

The paragraphs that follow describe the climate, relief and drainage, and transportation facilities in the county.

climate

Wright County is hot in summer, especially at low elevations, and moderately cool in winter, especially on mountains and high hills. Rainfall is fairly heavy and is well distributed throughout the year. Snow falls nearly every winter, but covers the ground for only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Mountain Grove, Missouri, in the period 1951 to 1976. 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 36 degrees F, and the average daily minimum temperature is 26 degrees. The lowest temperature on record, which occurred at Mountain Grove on January 24, 1963, is -11 degrees. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred at Mountain Grove on July 13, 1964, is 108 degrees.

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

The total annual precipitation is about 40 inches. Of this, 24 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.92 inches at Mountain Grove on December 17, 1957. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is about 14 inches. The greatest snow depth at any one time during the period of record was 16 inches. On an average of 10 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 14 miles per hour, in March.

relief and drainage

Wright County is characterized by three major physiographic features. These are the flood plain of the Gasconade River, which divides the county diagonally

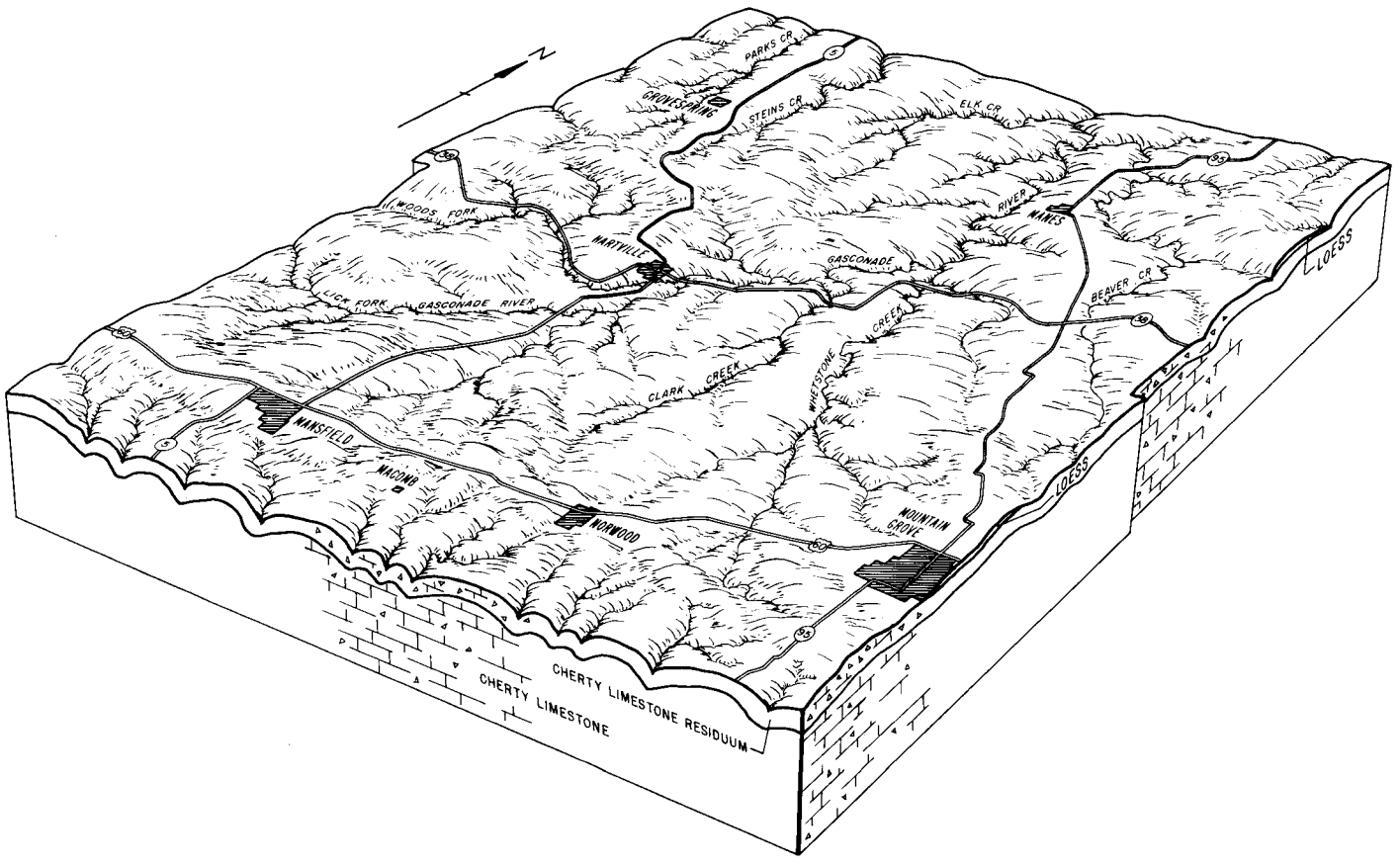

Figure 2.—Drainage pattern in Wright County.

from southwest to northeast; the deeply dissected areas adjacent to the larger drainageways; and the loess-covered broad ridges in the northern and central parts of the county. Elevation ranges from about 1,000 feet above sea level on the flood plain of the Gasconade River to 1,744 feet on the highest ridges.

The relief in these areas affected soil formation. The very old microrelief controlled early runoff and determined the modern drainage pattern. Many nearly level and depressional soils formed on the upland ridges and in the broad river valleys. Examples are the poorly drained Bado soils on the broad upland ridges and the poorly drained Melvin soils in depressional areas along the major streams. Runoff is rapid on the soils that formed in the steeper convex areas. These soils generally have weakly expressed profiles. The somewhat excessively drained Clarksville soils formed in the very old cherty limestone residuum in deeply dissected areas.

The Gasconade River and its tributaries drain about 75 percent of the county (fig. 2). This river is joined by Lick Fork and Spring Creek south of Hartville, by Whetstone Creek near the center of the county, and by Beaver Creek in the northeastern part of the county. Whetstone Creek is more than 25 miles long, and Beaver Creek is about 35 miles long.

transportation facilities

The southern part of Wright County is crossed from east to west by State Highway 60. The central part is crossed from east to west by State Highway 38. The western part is crossed from north to south by State Highway 5, which connects with Interstate Highway 44 in Laclede County. The eastern part is crossed from north to south by State Highway 95. Many farm-to-market roads are throughout the county. The volume of highway traffic is high during the tourist season.

A railroad carries freight across the southern part of the county. It formerly carried both passengers and freight. The county also is served by two airports, one at Mansfield and the other at Mountain Grove.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

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

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

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

soil descriptions

1. Clarksville-Wilderness-Doniphan association

Moderately sloping to very steep, somewhat excessively drained to moderately well drained soils on uplands

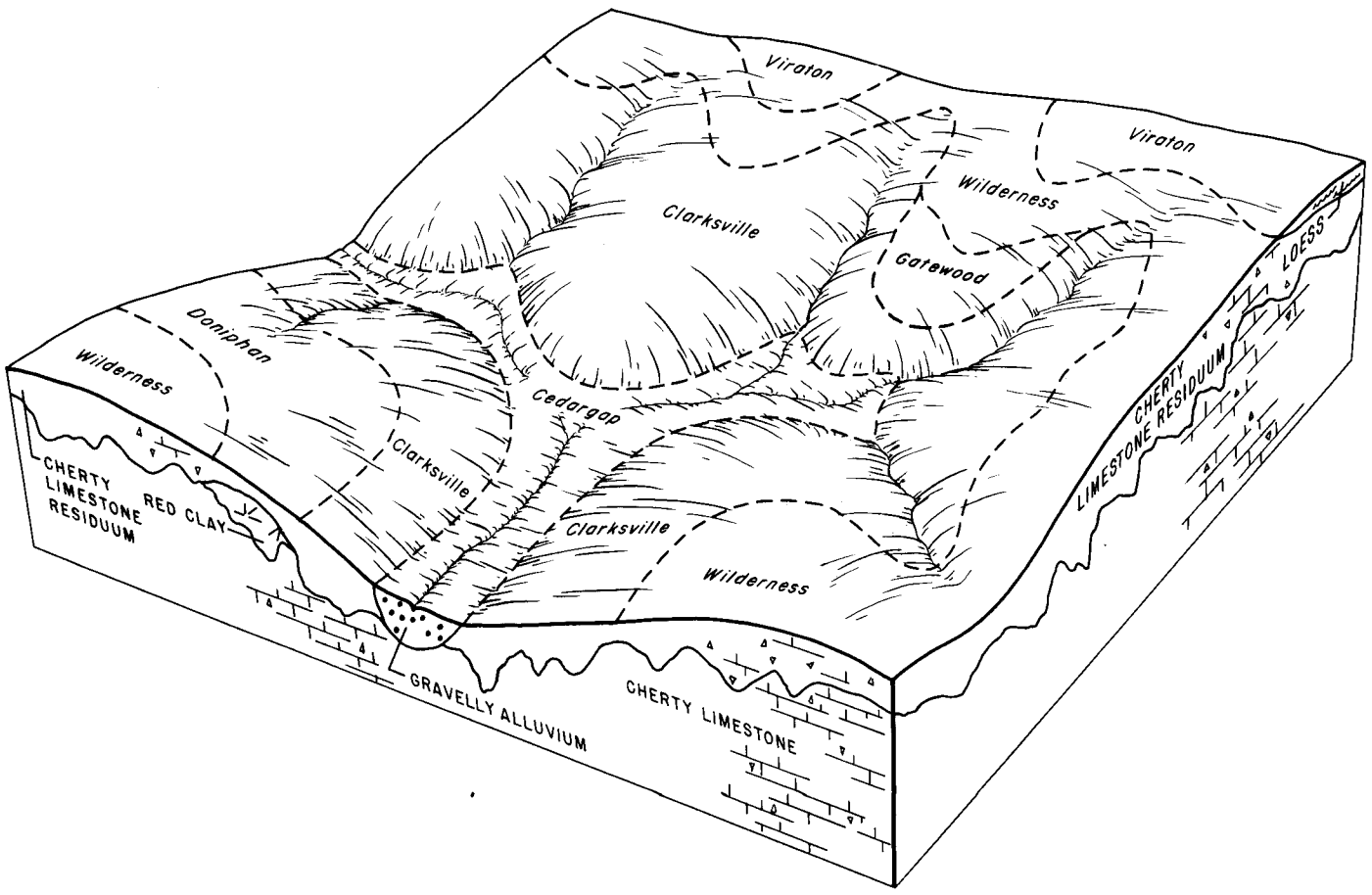

Figure 3.—Typical pattern of soils and parent material in the Clarksville-Wilderness-Doniphan association.

The landscape of this association is one of continuous narrow ridges and long, complex side slopes. The moderate slopes generally are short. The steeper slopes are dissected by small drainageways and are adjacent to narrow flood plains.

This association makes up about 54 percent of the county. It is about 51 percent Clarksville soils, 18 percent Wilderness soils, 15 percent Doniphan soils, and 16 percent minor soils (fig. 3).

Clarksville soils are on long, complex side slopes. They are strongly sloping to very steep and are somewhat excessively drained. Typically, they have a surface layer of dark brown cherty silt loam and a subsurface layer of pale brown cherty silt loam. The subsoil is strong brown very cherty silt loam and very cherty silty clay loam in the upper part, yellowish red cherty silty clay loam in the next part, and red very cherty clay in the lower part.

Wilderness soils are on convex ridgetops and side slopes. They are moderately sloping and moderately well drained. Typically, they have a surface layer of dark grayish brown cherty silt loam and a subsurface layer of pale brown very cherty silt loam. The upper part of the subsoil is yellowish brown cherty and very cherty silt loam. The next part, at a depth of about 23 inches, is a fragipan of multicolored, brittle very cherty silty clay loam. The lower part is dark red, mottled cherty silty clay.

Doniphan soils are on narrow ridges and long side slopes. They are moderately sloping to steep and are well drained. Typically, they have a surface layer of dark grayish brown very cherty silt loam and a subsurface layer of light yellowish brown very cherty silt loam. The subsoil is multicolored clay.

The minor soils in this association are the somewhat excessively drained, nearly level Cedargap soils on

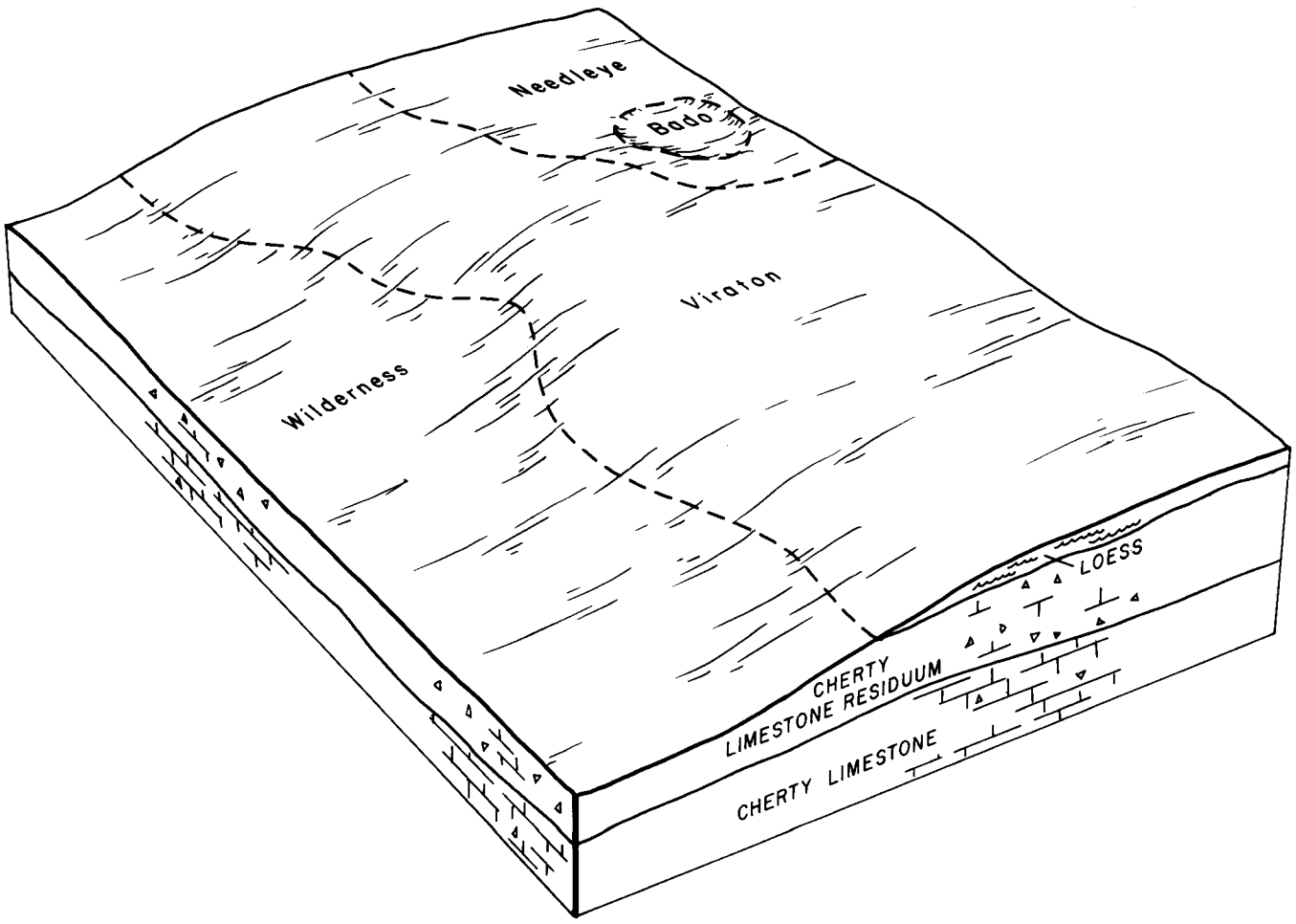

Figure 4.—Typical pattern of soils and parent material in the Viraton-Wilderness association.

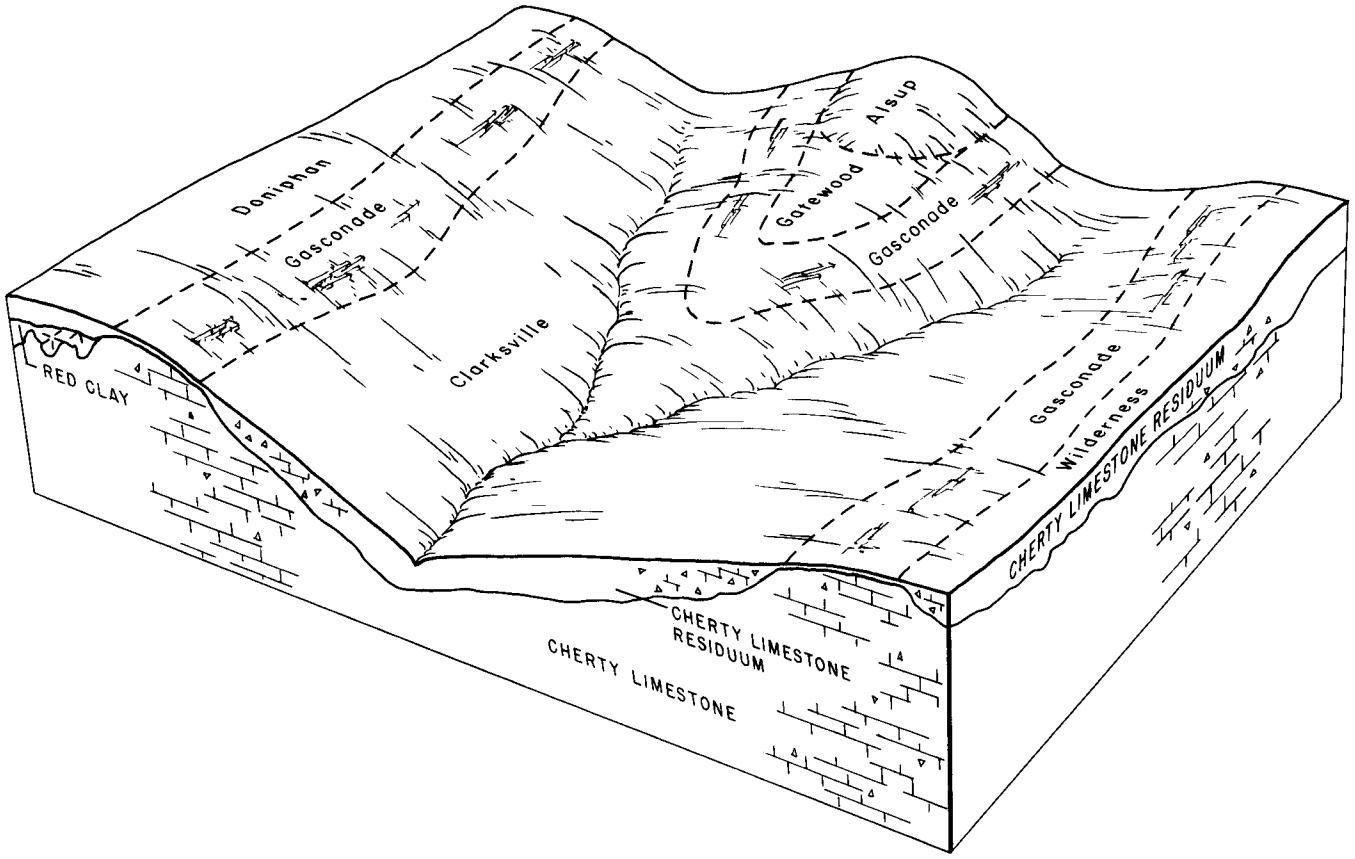

Figure 5.—Typical pattern of soils and parent material in the Clarksville-Gasconade-Doniphan association.

narrow bottom land; the moderately well drained Gatewood soils on the tops and sides of short, narrow ridges; and the moderately well drained, gently sloping Viraton soils on narrow ridges.

Most of this association is used as pasture or woodland. The steeper, stony areas generally are used as woodland or wildlife habitat. The main enterprises are raising feeder calves, dairying, and logging.

The less sloping, nonstony areas are suited to grasses and legumes for pasture and hay. A low available water capacity, summer droughtiness, the surface rocks, and the slope are the main hazards and limitations.

This association is suitable for trees. The steep and very steep slopes, however, restrict the use of logging equipment in some areas. Seedling mortality is moderate. Erosion is a hazard along logging trails and roads.

This association is suitable as a site for sanitary facilities and buildings. The slope of all the major soils, the wetness of Wilderness soils, and the moderate shrink-swell potential of Doniphan soils, however, are moderate or severe limitations affecting one or both of those uses.

2. Viraton-Wilderness association

Gently sloping and moderately sloping, moderately well drained soils on uplands

The landscape of this association is one of broad ridges dotted with sinkholes. Slopes are steeper around the sinkholes. The bottom of the very old sinkholes is nearly level or concave.

This association makes up about 27 percent of the county. It is about 61 percent Viraton soils, 28 percent Wilderness soils, and 11 percent minor soils (fig. 4).

Viraton soils are on ridgetops, side slopes, and knolls. They are gently sloping and moderately sloping. Typically, they have a surface layer and subsurface layer of yellowish brown silt loam. The upper part of the subsoil is brownish yellow and yellowish brown silty clay loam. The next part, at a depth of about 20 inches, is a

fragipan of mottled gray and strong brown very cherty silt loam. The lower part is multicolored cherty clay.

Wilderness soils are on ridgetops and side slopes. They are moderately sloping. Typically, they have a surface layer of dark grayish brown cherty silt loam and a subsurface layer of pale brown very cherty silt loam. The upper part of the subsoil is yellowish brown cherty and very cherty silt loam. The next part, at a depth of about 23 inches, is a fragipan of multicolored, brittle very cherty silty clay loam. The lower part is dark red, mottled cherty silty clay.

The minor soils in this association are the moderately well drained, nearly level and gently sloping Needleye soils on ridges; the poorly drained Bado soils in depressional areas; and the well drained, strongly sloping to steep Doniphan soils on side slopes.

Most of this association is used for pasture and hay. Some of the nearly level areas on broad ridges are used for small grain. The main enterprises are raising feeder calves and dairying.

This association is suited to grasses and legumes for pasture and hay. In the nearly level areas on broad ridges, it also is suited to row crops and small grain. It is suitable for grapes. A low available water capacity, the surface rocks, and the fragipan are the main limitations.

This association is suitable as a site for sanitary facilities and buildings. The wetness and the slope of both of the major soils, however, are moderate or severe limitations affecting one or both of those uses. If waste disposal facilities are installed in the limestone sinkholes, the effluent can pollute ground water.

3. Clarksville-Gasconade-Doniphan association

Gently sloping to very steep, somewhat excessively drained and well drained soils on uplands

The landscape of this association is one of narrow ridges, very steep side slopes, and exposures of limestone. High benches are on some of the side slopes.

This association makes up about 9 percent of the

Figure 6.—Typical area of Clarksville soils in the Clarksville-Gasconade-Doniphan association.

Figure 7.—Typical area of the Nolin-Claiborne-Ashton association. Ashton soils are in the immediate foreground; Nolin soils are on the bottom land; Claiborne soils are in the background.

county. It is about 44 percent Clarksville soils, 19 percent Gasconade soils, 18 percent Doniphan soils, and 19 percent minor soils (fig. 5).

Clarksville soils are on side slopes and foot slopes (fig. 6). They are strongly sloping to very steep, are deep, and are somewhat excessively drained. Typically, they have a surface layer of dark brown cherty silt loam and a subsurface layer of pale brown cherty silt loam. The subsoil is strong brown very cherty silt loam and very cherty silty clay loam in the upper part, yellowish red cherty silty clay loam in the next part, and red very cherty clay in the lower part.

Gasconade soils are on the upper slopes. They are gently sloping to moderately steep, are shallow to limestone, and are somewhat excessively drained. Typically, they have a surface layer of black extremely flaggy silty clay loam and extremely flaggy silty clay. The subsoil is very dark grayish brown extremely flaggy clay. Limestone bedrock is at a depth of about 19 inches.

Doniphan soils are on narrow ridges and on side slopes. They are moderately sloping to steep, are deep, and are well drained. Typically, they have a surface layer of dark grayish brown very cherty silt loam and a subsurface layer of light yellowish brown very cherty silt loam. The subsoil is multicolored clay.

The minor soils in this association are the moderately well drained Gatewood soils on the tops of short, narrow ridges; the moderately well drained, cherty Wilderness soils on narrow ridges; and the moderately well drained, cherty Alsup soils on prominent peaks.

Most of this association is used for wooded pasture or for wildlife habitat. The main enterprises are raising feeder calves and feeder pigs and growing the trees used for wood products.

This association is suitable for pasture and trees. Pasture plants and trees grow fairly well on some of the soils. Natural fertility is low in all of the major soils, and the content of organic matter is moderately low in the Clarksville soils, moderate in the Gasconade soils, and low or moderately low in the Doniphan soils. A low or very low available water capacity, droughtiness, shallowness to bedrock, the rock outcrop, and the slope

are the main limitations in the pastured areas. Seedling mortality and the windthrow hazard are the major management concerns in the areas used for trees.

This association is suitable as a site for sanitary facilities and buildings. The slope of all the major soils, the moderate shrink-swell potential of Doniphan soils, and the shallowness of Gasconade soils, however, are moderate or severe limitations affecting one or both of those uses.

4. Nolin-Claiborne-Ashton association

Nearly level to moderately sloping, well drained soils on flood plains, terraces, and foot slopes

The landscape of this association is one of bottom land, upland foot slopes, and terraces along the major streams in the county (fig. 7). The steeper slopes generally are very short.

This association makes up about 6 percent of the county. It is about 23 percent Nolin soils, 22 percent Claiborne soils, 15 percent Ashton soils, and 40 percent minor soils (fig. 8).

Nolin soils are on flood plains. They are nearly level. Typically, they have a surface layer of very dark grayish brown silt loam. The subsoil to a depth of about 60 inches is dark brown silt loam.

Claiborne soils are on high terraces and foot slopes. They are gently sloping and moderately sloping. Typically, they have a surface layer of dark brown silt loam. The subsoil to a depth of about 60 inches is multicolored silty clay loam.

Ashton soils are on low terraces. They are nearly level and gently sloping. Typically, they have a surface layer of dark brown silt loam. The subsoil extends to a depth of 60 inches or more. It is dark brown silt loam in the upper part, strong brown silty clay loam in the next part, and dark yellowish brown silt loam in the lower part.

The minor soils in this association are the poorly drained Hartville soils in slightly convex areas on terraces, the poorly drained Melvin soils on flood plains along the major streams, the somewhat poorly drained Nevin soils on low stream terraces, and the somewhat excessively drained Cedargap and Elsah soils on flood plains along the smaller streams.

In most areas this association is suitable for all of the cultivated crops commonly grown in the county. Corn, soybeans, and small grain and grasses and legumes for hay grow well. Natural fertility is medium in the Ashton

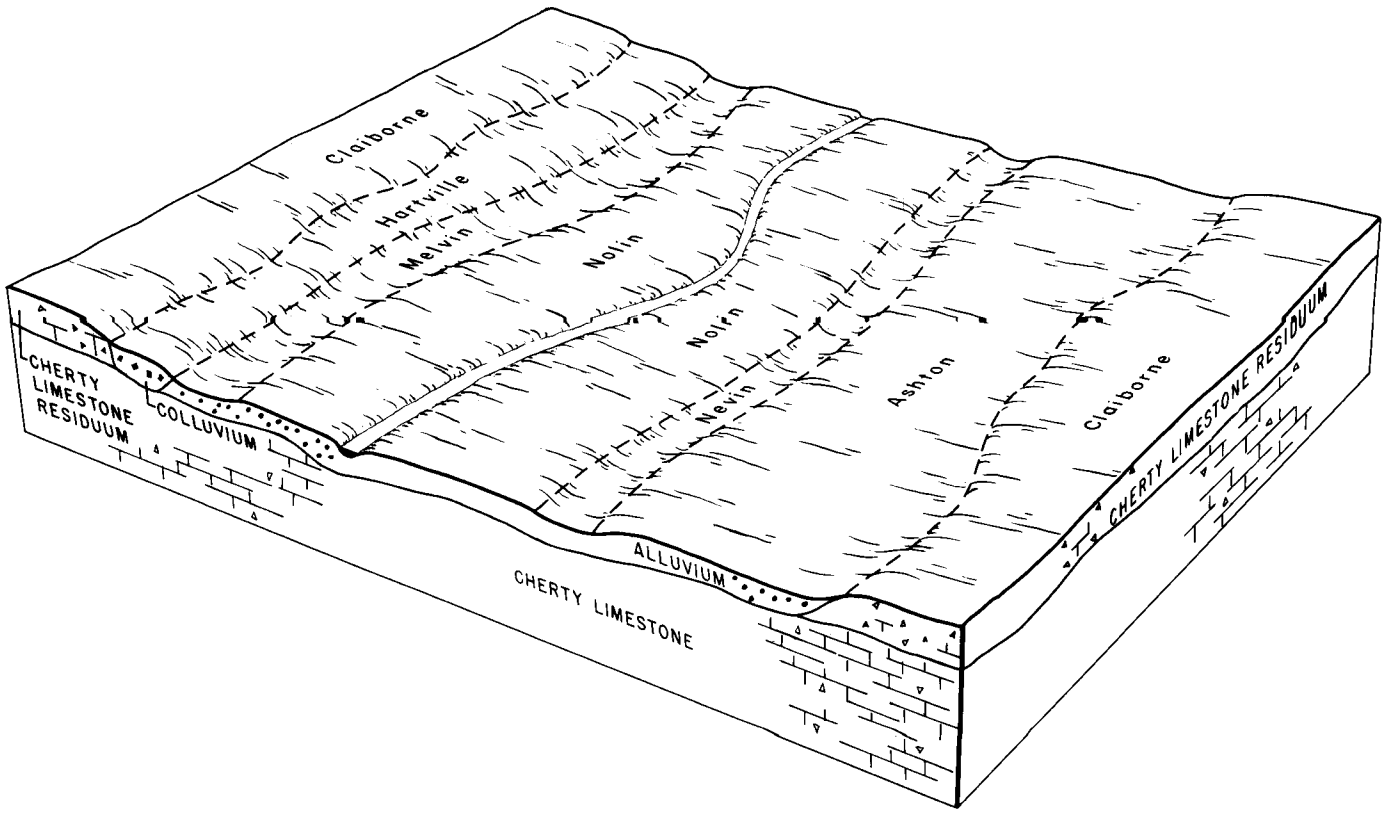

Figure 8.—Typical pattern of soils and parent material in the Nolin-Claiborne-Ashton association.

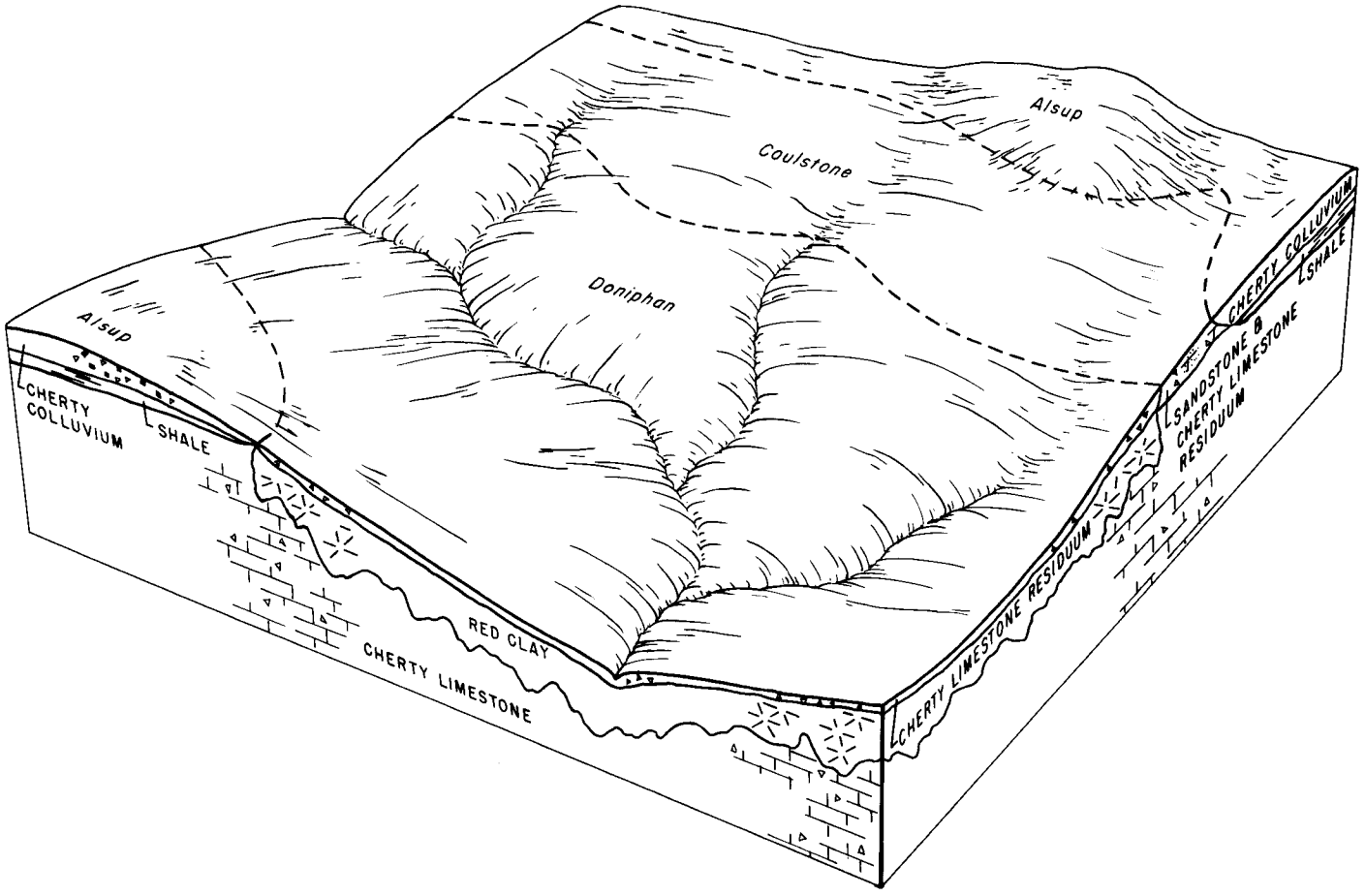

Figure 9.—Typical pattern of soils and parent material in the Doniphan-Coulstone-Alsup association.

and Nolin soils and low in the Claiborne soils. Available water capacity is high in all of the major soils. The main management needs are measures that control flooding and erosion and improve fertility. The main enterprises are growing grain crops, dairying, and raising feeder calves.

The Ashton and Nolin soils generally are not suitable as sites for sanitary facilities or buildings because they are subject to flooding. The Claiborne soils are suitable, but the slope, the moderate permeability, and the moderate shrink-swell potential are moderate or severe limitations that affect one or both of those uses.

5. Doniphan-Coulstone-Alsup association

Moderately sloping to steep, somewhat excessively drained to moderately well drained soils on uplands

The landscape of this association is one of continuous narrow ridges, long, complex side slopes, and prominent peaks. The moderate slopes generally are short. The steeper slopes are dissected by small drainageways adjacent to narrow flood plains.

This association makes up about 4 percent of the county. It is about 51 percent Doniphan soils, 35 percent Coulstone soils, 10 percent Alsup soils, and 4 percent minor soils (fig. 9).

Doniphan soils are on side slopes. They are moderately sloping to steep and are well drained. Typically, they have a surface layer of dark grayish brown very cherty silt loam and a subsurface layer of light yellowish brown very cherty silt loam. The subsoil is multicolored clay.

Coulstone soils are on side slopes. They are moderately sloping to steep and are somewhat excessively drained. Typically, they have a surface layer of brown cherty loam and a subsurface layer of pale brown cherty loam. The subsoil to a depth of 60 inches is yellowish brown and pale brown very cherty sandy loam.

Alsup soils are on prominent peaks and side slopes. They are moderately sloping and strongly sloping and are moderately well drained. Typically, they have a surface layer of very dark grayish brown coarse cherty silt loam and a subsurface layer of pale brown silt loam. The subsoil is yellowish brown silty clay loam in the upper part, strong brown silty clay in the next part, and yellowish brown silty clay in the lower part. The substratum is mottled olive gray and brownish yellow clay. Pale olive, weathered silty shale is at a depth of about 45 inches.

The minor soils in this association are the somewhat excessively drained Clarksville soils on the lower parts of the landscape.

Most of this association is used for pasture, but the steep areas are used as woodland or wildlife habitat. The main enterprise is raising feeder calves.

Pasture grasses and legumes and trees grow fairly well on most of the soils in this association. The content of organic matter is low or moderately low in all of the major soils. Natural fertility is low in the Doniphan and Coulstone soils and medium in the Alsup soils. Available water capacity is low in the Coulstone soils and low or moderate in the Alsup and Doniphan soils. The main concerns in managing pasture are droughtiness, surface rocks, and slope. The main concern in managing the areas used for trees is a moderate seedling mortality rate on the Coulstone soils and in some areas of the Doniphan soils.

This association is suitable as a site for sanitary facilities and buildings. The slope and permeability of all the major soils, the moderate shrink-swell potential of Alsup and Doniphan soils, and the wetness of Alsup soils, however, are moderate or severe limitations that affect one or both of those uses.

detailed soil map units

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and identifies 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 substratum, 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 substratum. They also can differ in slope, stoniness, 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, Gatewood cherty silt loam, 9 to 14 percent slopes, is one of several phases in the Gatewood series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils or of a soil and a miscellaneous area. The components occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Gasconade-Rock outcrop complex, 2 to 20 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. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

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

soil descriptions

10C—Alsup silt loam, 4 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on convex ridgetops and on hillside benches in the uplands. Areas generally are irregular in shape and range from 10 to 40 acres in size.

Typically, the surface layer is grayish brown silt loam about 5 inches thick. The subsoil is about 31 inches thick. The upper part is strong brown silty clay. The next part is strong brown and light gray, mottled silty clay. The lower part is light gray, mottled clay. The substratum is light yellowish brown and pale olive silty clay loam about 13 inches thick. Gray shale is at a depth of about 49 inches.

Included with this soil in mapping are small areas of the moderately deep Gatewood and shallow Gasconade soils. These soils are on the sides and tops of ridges. They make up 2 to 10 percent of the unit.

Permeability is moderately slow in the Alsup soil. Runoff is medium. Available water capacity is moderate. A seasonal high water table is perched at a depth of 2.5 to 4.0 feet. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is high.

Most areas support grasses and legumes. This soil is suited to small grain and to grasses and legumes for hay. Erosion is a severe hazard, however, if cultivated crops are grown. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. In a few areas slopes are long enough and smooth enough for terracing and contour farming. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate.

Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds. 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 in good condition.

Some small areas support native hardwoods. This soil is suited to trees. No hazards or limitations affect planting or harvesting.

This soil is suitable as a site for dwellings, small commercial buildings, or sewage lagoons. The high shrink-swell potential is a severe limitation, however, on sites for buildings. Properly designing and reinforcing foundations and footings helps to prevent the damage caused by shrinking and swelling. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. The wetness is a severe limitation on sites for sewage lagoons, but sealing the bottom of the lagoon helps to prevent contamination of ground water.

The shrink-swell potential and low strength are severe limitations if this soil is used as a site for local roads and streets. Strengthening the base with crushed rock or other suitable material, however, helps to prevent the damage resulting from low strength or from shrinking and swelling. Also, measures that reduce wetness help to prevent the damage caused by shrinking and swelling.

The capability subclass is IIIe; woodland suitability subclass 4o.

10D—Alsup coarse cherty silt loam, 9 to 14 percent slopes. This deep, strongly sloping, moderately well drained soil is on side slopes on strongly dissected uplands. Areas generally are irregular in shape and range from 30 to 100 acres in size.

Typically, the surface layer is very dark grayish brown coarse cherty silt loam about 2 inches thick. The subsurface layer is pale brown silt loam about 4 inches thick. The subsoil is about 19 inches thick. The upper part is yellowish brown silty clay loam. The next part is strong brown silty clay. The lower part is yellowish brown, mottled silty clay. The substratum is mottled olive gray and brownish yellow clay about 20 inches thick. Pale olive, weathered silty shale is at a depth of about 45 inches.

Included with this soil in mapping are small areas of the moderately deep Gatewood and shallow Gasconade soils. These soils are on the sides and tops of ridges below the Alsup soil. They make up 2 to 10 percent of the unit.

Permeability is moderately slow in the Alsup soil. Runoff is rapid. Available water capacity is low or moderate. A seasonal high water table is perched at a depth of 2.5 to 4.0 feet. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface soil as a result of local liming practices. Natural fertility is medium. The surface soil is very friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is high.

Most areas are used for timber. This soil is suited to trees. The equipment limitation is severe, however, because of the coarse chert in the surface layer. In some areas seedlings cannot be planted by machine.

This soil generally is unsuited to cultivated crops because it is strongly sloping and cherty. It is suited, however, to grasses and legumes for pasture. Minimum tillage during the initial seeding helps to prevent excessive soil loss and increases the infiltration rate. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suitable as a site for dwellings and small commercial buildings. The high shrink-swell potential, however, is a severe limitation. Also, the slope is a severe limitation on sites for small commercial buildings. Properly designing and reinforcing foundations and footings helps to prevent the damage caused by shrinking and swelling. Installing drainage tile around footings helps to prevent the damage caused by excessive wetness. Small commercial buildings should be designed so that they conform to the natural slope of the land. In some areas land shaping is needed.

The wetness and the slope are severe limitations if this soil is used as a site for sewage lagoons. Sealing the bottom of the lagoon helps to prevent contamination of ground water, and grading lessens the slope. If these measures are not feasible, the sewage should be piped to the adjacent areas where the soils are suitable sites for the lagoons.

The shrink-swell potential and low strength are severe limitations if this soil is used as a site for local roads and streets. Strengthening the base with crushed rock or other suitable material, however, helps to prevent the damage resulting from low strength or from shrinking and swelling. Also, measures that reduce wetness help to prevent the damage caused by shrinking and swelling.

The capability subclass is VIe; woodland suitability subclass 4f.

11A—Ashton silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on terraces along the major streams in the county. It is subject to rare flooding. Areas generally are long and narrow or irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches. The upper part is dark brown silt loam. The next part is strong brown silty clay loam. The lower part is dark yellowish brown silt loam.

Included with this soil in mapping are areas of the somewhat excessively drained Elsah soils on flood plains and the somewhat poorly drained Nevin soils on low stream terraces. These soils make up about 15 percent of the unit. The Elsah soils have a high content of chert.

Permeability is moderate in the Ashton soil. Runoff is slow. Available water capacity is high. Reaction ranges from neutral to medium acid in the subsoil and varies widely in the surface layer as a result of local liming

practices. Natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains.

Most areas support grasses and legumes. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, minimum tillage and winter cover crops are needed to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate.

Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Seedlings survive and grow well if competing plants are controlled or removed. Plant competition can be controlled by site preparation, by prescribed burning, or by spraying or cutting. No hazards or limitations affect planting or harvesting.

This soil generally is unsuitable for building site development and most kinds of onsite waste disposal because it is subject to rare flooding.

The capability class is I; woodland suitability subclass 1o.

11B—Ashton silt loam, 2 to 5 percent slopes. This deep, gently sloping, well drained soil is on terraces along the major streams in the county. It is subject to rare flooding. Areas generally are long and narrow or irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 48 inches thick. The upper part is brown silt loam, and the lower part is brown silty clay loam. The substratum to a depth of 60 inches or more is dark yellowish brown silt loam.

Included with this soil in mapping are areas of the somewhat excessively drained Elsah and somewhat poorly drained Hartville soils. The level and nearly level Elsah soils are on flood plains. They have a high content of chert. The Hartville soils are in shallow depressions. Included soils make up about 10 percent of the unit.

Permeability is moderate in the Ashton soil. Runoff is medium. Available water capacity is high. Reaction ranges from neutral to medium acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains.

Most areas support grasses and legumes. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Erosion is a hazard if cultivated crops are grown. Minimum tillage and winter cover crops, however, help to prevent excessive soil loss. In a few areas slopes are long enough and smooth enough for terracing and contour farming. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate.

Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Seedlings survive and grow well if competing plants are controlled or removed. Plant competition can be controlled by site preparation, by prescribed burning, or by spraying or cutting. No hazards or limitations affect planting or harvesting.

This soil generally is unsuited to building site development and most kinds of onsite waste disposal because it is subject to rare flooding.

The capability subclass is IIe; woodland suitability subclass 1o.

12A—Bado silt loam, 0 to 3 percent slopes. This deep, slightly depressional, poorly drained soil is on broad ridgetops. Areas generally are irregular in shape and are 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown and grayish brown, mottled silt loam about 13 inches thick. The subsoil is about 19 inches thick. The upper part is gray, mottled silty clay loam, and the lower part is dark gray, light gray, and gray, mottled clay. Below this is a fragipan about 33 inches thick. The upper part of the pan is multicolored silt loam, and the lower part is gray, mottled silty clay loam.

Included with this soil in mapping are areas of the moderately well drained Viraton and Needleye soils. These soils are at the outer edge of the mapped areas. They make up about 5 percent of the unit.

Permeability is slow above the fragipan of the Bado soil and very slow in the pan. Runoff is very slow. Available water capacity is moderate. A seasonal high water table is perched within a depth of 2 feet. Reaction is extremely acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low, and the content of organic matter is moderately low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains. Root penetration is restricted because of the high content of clay at a depth of about 17 inches and the fragipan at a depth of about 32 inches. The shrink-swell potential is high.

Most areas support grasses and legumes. This soil is suited to pasture and hay. If deep rooted legumes are grown, however, the wetness is a limitation. Seeding a mixture of grass and clover helps to keep production at an acceptable level. Overgrazing thins out the stand of pasture plants and may cause surface compaction. Pasture rotation and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to cultivated crops. A drainage system is needed, however, because wetness is a limitation in the spring. The system should be carefully controlled because droughtiness is a limitation late in summer. Tilling late in the fall, rotating crops, and regularly returning organic matter to the soil improve aeration and root growth.

This soil is suited to building site development, but the wetness and the high shrink-swell potential are severe limitations. Properly designing and reinforcing foundations and footings helps to prevent the damage caused by shrinking and swelling. Installing drainage tile around footings and foundations helps to prevent the damage caused by excessive wetness and swelling. The soil is suitable as a site for properly constructed sewage lagoons.

Low strength, wetness, and frost action are severe limitations if this soil is used as a site for local roads and streets. Grading the roads and streets so that they shed water and constructing side ditches that lower the water table help to prevent the damage caused by wetness and frost action. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength.

The capability subclass is IIIw; woodland suitability subclass 5w.

13A—Cedargap cherty silt loam, 0 to 3 percent slopes. This deep, nearly level, somewhat excessively drained soil is on flood plains next to stream channels. It is occasionally flooded for very brief periods. Areas are linear and range from 5 to 40 acres in size.

Typically, the surface layer is very dark brown cherty silt loam about 8 inches thick. The subsurface layer is black very cherty silt loam about 17 inches thick. The upper part of the substratum is very dark grayish brown very cherty silt loam. The next part is brown very cherty silty clay loam. The lower part to a depth of about 60 inches is brown and grayish brown very cherty clay loam.

Included with this soil are areas of the well drained Nolin soils and areas of Elsah soils. These soils make up 2 to 10 percent of the unit. Their position on the landscape is similar to that of the Cedargap soil. Elsah soils are lighter colored and less cherty than the Cedargap soil.

Permeability is moderately rapid in the Cedargap soil. Runoff is slow. Available water capacity is low. Natural fertility also is low, and the content of organic matter is moderate. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The root zone is deep.

Most areas are used for pasture and hay. This soil is suited to grasses and legumes for hay and pasture. A cover of these plants is effective in controlling the erosion caused by floodwater. Overgrazing thins out the stand of pasture plants. Restricted grazing during dry periods helps to keep the pasture in good condition.

If this soil is used for cultivated crops, the chert on the surface is a limitation. Also, measures that conserve moisture are needed. Examples are minimizing tillage and returning crop residue to the soil.

A few small areas support native trees. This soil is suited to trees. Seedlings survive and grow well if competing plants are removed or controlled. Plant competition can be controlled by site preparation or by spraying or cutting. No hazards or limitations affect harvesting.

This soil generally is unsuited to building site development and onsite waste disposal because it is occasionally flooded.

The capability subclass is IIIs; woodland suitability subclass 3f.

14B—Claiborne silt loam, 2 to 5 percent slopes. This deep, gently sloping, well drained soil is in low areas at the base of the steeper slopes and at the edge of the valleys along the major streams. Areas generally are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil to a depth of 60 inches is silty clay loam. The upper part is reddish brown and yellowish red, the next part is red and dark red, and the lower part is mottled dark red and yellowish red.

Included with this soil in mapping are areas of the moderately well drained Viraton soils on uplands and the somewhat poorly drained Hartville soils on terraces along the streams. These soils make up about 10 percent of the unit.

Permeability is moderate in the Claiborne soil. Runoff is medium. Available water capacity is high. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility and the content of organic matter are low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains, especially in areas where plowing has mixed part of the subsoil with the surface layer. The shrink-swell potential is moderate.

Most areas support grasses and legumes. This soil is suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a hazard. Minimum tillage, winter cover crops, and grassed waterways, however, help to prevent excessive soil loss. In a few areas slopes are long enough and smooth enough for terracing and contour farming. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate.

Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. Tree seeds, cuttings, and seedlings

survive and grow well if competing plants are controlled or removed. Plant competition can be controlled by site preparation, by prescribed burning, or by spraying or cutting. No hazards or limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal, but the shrink-swell potential is a moderate limitation on building sites and the moderate permeability a moderate limitation in septic tank absorption fields. Properly designing and reinforcing foundations and footings helps to prevent the damage caused by shrinking and swelling. Enlarging septic tank absorption fields helps to overcome the slow absorption of liquid waste. Low strength is a severe limitation if the soil is used as a site for local roads and streets. It can be overcome, however, by strengthening the base with crushed rock or other suitable material.

The capability subclass is IIe; woodland suitability subclass 3o.

14C—Claiborne silt loam, 5 to 9 percent slopes. This deep, moderately sloping, well drained soil is in low areas at the base of the steeper slopes and on foot slopes at the edge of stream valleys. Areas generally are irregular in shape and range from 5 to 15 acres in size.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is about 13 inches thick. The upper part is reddish brown and yellowish brown silty clay loam, and the lower part is yellowish red to dark red cherty silty clay loam. The substratum to a depth of about 60 inches is multicolored cherty silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Viraton, somewhat excessively drained Clarksville, and somewhat poorly drained Hartville soils. The Viraton and Clarksville soils are on uplands, and the Hartville soil is on stream terraces. Included soils make up about 10 percent of the unit.

Permeability is moderate in the Claiborne soil. Runoff is medium. Available water capacity is high. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility and the content of organic matter are low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains, especially in areas where plowing has mixed part of the subsoil with the surface layer. The shrink-swell potential is moderate.

Most areas support grasses and legumes. This soil is suited to small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, erosion is a severe hazard. Gullying, which has occurred in several areas, restricts cultivation. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. In a few areas slopes are long enough and smooth enough for terracing and contour farming. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the infiltration rate.

Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing plants are controlled or removed. Plant competition can be controlled by site preparation, by prescribed burning, or by spraying or cutting. No hazards or limitations affect planting or harvesting.

This soil is suited to building site development and onsite waste disposal. The shrink-swell potential, however, is a moderate limitation on building sites and the moderate permeability a moderate limitation in septic tank absorption fields. Properly designing and reinforcing foundations and footings helps to prevent the damage caused by shrinking and swelling. Enlarging septic tank absorption fields helps to overcome the slow absorption of liquid waste. Low strength is a severe limitation if the soil is used as a site for local roads and streets. It can be overcome, however, by strengthening the base with crushed rock or other suitable material. Erosion is a severe hazard on excavated sites. The plant cover should be restored by seeding and mulching as soon after construction as possible.

The capability subclass is IIIe; woodland suitability subclass 3o.

15D—Clarksville cherty silt loam, 9 to 14 percent slopes. This deep, strongly sloping, somewhat excessively drained soil is on narrow ridgetops and side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 125 acres in size.

Typically, the surface layer is dark brown cherty silt loam about 4 inches thick. The subsurface layer is pale brown cherty silt loam about 3 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is strong brown very cherty silt loam and very cherty silty clay loam. The next part is yellowish red cherty silty clay loam. The lower part is red very cherty clay. In some areas the subsoil is brown and contains less clay and more chert.

Included with this soil in mapping are areas where stones are on the surface and areas of the well drained Doniphan soils. Included areas are on small knolls and on the lower parts of the landscape. They make up about 10 percent of the unit.

Permeability is moderately rapid in the Clarksville soil. Runoff is rapid. Available water capacity is low. Reaction ranges from strongly acid to extremely acid in the subsoil and varies widely in the surface soil as a result of local liming practices. Natural fertility is low. The surface soil is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for timber or pasture. This soil is suited to grasses and legumes for hay and pasture. Minimum tillage during the initial seeding helps to prevent excessive soil loss and increases the infiltration rate. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A large acreage supports native hardwoods. This soil is suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing plants are controlled or removed. Plant competition can be controlled by site preparation, by prescribed burning, or by spraying or cutting. The equipment limitation is moderate because the soil is cherty. In some areas seedlings cannot be planted by machine.

The slope is a moderate limitation if this soil is used as a site for dwellings, local roads and streets, or septic tank absorption fields. Also, frost action is a moderate hazard on sites for local roads and streets. Buildings should be designed to conform to the natural slope of the land. In some areas land shaping is needed. Land shaping and installing the distribution lines on the contour help to prevent downhill seepage from septic tank absorption fields and improve the efficiency of the absorption system. Local roads and streets should be built on the contour. Grading the roads and streets so that they shed water and constructing adequate side ditches help to prevent excessive wetness and thus also prevent the damage caused by frost action. Erosion is a severe hazard on excavated sites. The plant cover should be restored by seeding and mulching as soon after construction as possible.

The capability subclass is VIs; woodland suitability subclass 4f.

15F—Clarksville cherty silt loam, 14 to 50 percent slopes. This deep, moderately steep to very steep, somewhat excessively drained soil is on convex side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 75 acres in size.

Typically, the surface layer is brown cherty silt loam about 7 inches thick. The subsurface layer is pale brown cherty silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is strong brown very cherty silt loam and very cherty silty clay loam, and the lower part is strong brown very cherty silty clay.

Included with this soil in mapping are areas where stones are on the surface and areas of the well drained Doniphan soils. Included areas are on small knolls and on the lower parts of the landscape. They make up about 10 percent of the unit.

Permeability is moderately rapid in the Clarksville soil. Runoff is rapid. Available water capacity is low. Reaction ranges from strongly acid to extremely acid in the subsoil. Natural fertility is low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for timber or pasture. This soil is suited to grasses and legumes for pasture. Minimum tillage during the initial seeding helps to prevent excessive soil loss and increases the infiltration rate. Overgrazing reduces yields of grasses and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

Many areas support native hardwoods. This soil is suited to trees. The equipment limitation and seedling mortality are moderate because of the slope. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. In many areas seedlings cannot be planted by machine because of the slope and the chert. Logging roads and skid trails should be built on the contour. In the steepest areas the logs should be yarded uphill to logging roads or skid trails.

This soil generally is unsuited to onsite waste disposal and building site development because it is moderately steep to very steep.

The capability subclass is VIIs; woodland suitability subclass 4f.

17C—Coulstone cherty loam, 5 to 9 percent slopes. This deep, moderately sloping, somewhat excessively drained soil is on convex ridgetops and long, complex side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is pale brown cherty loam about 14 inches thick. The subsurface layer is pale brown cherty loam about 10 inches thick. The subsoil is very cherty sandy loam about 49 inches thick. The upper part is yellowish brown, and the lower part is pale brown.

Included with this soil in mapping are areas where the surface layer is not cherty and areas of the moderately well drained Wilderness soils, which have a fragipan. Included areas make up about 5 percent of the unit.

Permeability is moderately rapid in the Coulstone soil. Runoff is medium. Available water capacity is low. Reaction ranges from strongly acid to extremely acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The surface layer is very friable throughout a fairly wide range in moisture content. It cannot be easily tilled, however, because of the high content of chert. The root zone is deep.

Most areas are used for timber or pasture. This soil is suited to grasses and legumes for hay and pasture. Overgrazing reduces yields of grasses and legumes, however, and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

If cultivated crops are grown on this soil, droughtiness is a limitation in the middle of the growing season. Also, the chert is a limitation in some areas. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. Returning crop residue to

the soil or regularly adding other organic material improves fertility and increases the infiltration rate.

A large acreage supports native hardwoods. This soil is suited to trees. Seedling mortality is moderate. Because the soil is cherty, the equipment limitation also is moderate. In some areas seedlings cannot be planted by machine. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. No hazards or limitations affect harvesting.

This soil is suited to building site development and to properly designed and installed septic tank absorption fields. It generally is unsuitable, however, as a site for sewage lagoons because seepage is a severe hazard. Frost action is a moderate hazard if the soil is used as a site for local roads and streets. Grading the roads and streets so that they shed water and constructing adequate side ditches help to prevent excessive wetness and thus also prevent the damage caused by frost action.

The capability subclass is IVs; woodland suitability subclass 4f.

17D—Coulstone cherty loam, 9 to 14 percent slopes. This deep, strongly sloping, somewhat excessively drained soil is on convex ridgetops and long, complex side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is pale brown cherty loam about 4 inches thick. The subsurface layer is pale brown cherty sandy loam about 10 inches thick. The subsoil is about 46 inches thick. The upper part is brownish yellow very cherty sandy loam, and the lower part is pale brown very cherty clay loam.

Included with this soil in mapping are areas where the surface layer is not cherty and areas of the moderately well drained Wilderness soils, which have a fragipan. Also included are scattered areas where sandstone crops out. Included areas make up 2 to 5 percent of the unit.

Permeability is moderately rapid in the Coulstone soil. Runoff is rapid. Available water capacity is low. Reaction ranges from strongly acid to extremely acid in the subsoil and varies widely in the surface layer as a result of local liming practices.

Most areas are used for timber or pasture. This soil is suited to grasses and legumes for pasture, but midsummer droughtiness is a limitation. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A large acreage supports native hardwoods. This soil is suited to trees. Seedling mortality is moderate. Because the soil is cherty, the equipment limitation also is moderate. In some areas seedlings cannot be planted by machine. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. No hazards or limitations affect harvesting.

This soil is suited to building site development and to septic tank absorption fields. It generally is unsuitable, however, as a site for sewage lagoons because seepage is a severe hazard. The slope is a moderate limitation on sites for septic tank absorption fields and dwellings. Buildings should be designed so that they conform to the natural slope of the land. In some areas land shaping is needed. Land shaping and installing the distribution lines on the contour help to prevent downhill seepage from septic tank absorption fields and improve the efficiency of the absorption system.

Frost action is a moderate hazard and the slope a moderate limitation if this soil is used as a site for local roads and streets. Grading the roads and streets so that they shed water and constructing adequate side ditches help to prevent excessive wetness and thus also prevent the damage caused by frost action. Building on the contour helps to overcome the slope.

The capability subclass is VIs; woodland suitability subclass 4f.

17F—Coulstone cherty loam, 14 to 30 percent slopes. This deep, moderately steep and steep, somewhat excessively drained soil is on convex, uneven side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is brown cherty loam about 4 inches thick. The subsurface layer is pale brown cherty loam about 10 inches thick. The subsoil is very cherty sandy loam about 49 inches thick. The upper part is yellowish brown, and the lower part is pale brown. In places the surface layer, subsurface layer, and subsoil do not have coarse fragments of sandstone.

Included with this soil in mapping are scattered areas of the well drained Doniphan soils. Also included are low lying areas where sandstone crops out. Included areas make up 2 to 10 percent of the unit.

Permeability is moderately rapid in the Coulstone soil. Runoff is rapid. Available water capacity is low. Reaction ranges from strongly acid to extremely acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The root zone is deep.

Most areas are used for timber or pasture. This soil is suited to grasses for pasture. The slope is a limitation if an area is cleared of trees and seeded to pasture. Because of ground clearing, aerial spraying, and seeding, however, satisfactory stands of selected grasses have been established. If seeding is delayed after an area is cleared of trees, erosion is a hazard. Midsummer droughtiness is a limitation. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A large acreage supports native hardwoods. This soil is suited to trees. Seedling mortality and the equipment

limitation are moderate. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. In some areas seedlings cannot be planted by hand. Because of the slope, roads and skid trails should be built on the contour.

This soil generally is unsuited to onsite waste disposal and building site development because it is moderately steep and steep.

The capability subclass is VIIs; woodland suitability subclass 4f.

18C—Doniphan cherty silt loam, 5 to 9 percent slopes. This deep, moderately sloping, well drained soil is on convex ridgetops and short, uneven side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is light yellowish brown very cherty silt loam about 8 inches thick. The next 4 inches is mixed yellowish red silty clay loam and light brownish yellow silt loam. The subsoil to a depth of 60 inches is multicolored clay.

Included with this soil in mapping are low lying areas of the somewhat excessively drained Clarksville and Coulstone soils. These soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Doniphan soil. Runoff is medium. Available water capacity is low or moderate. Reaction ranges from strongly acid to extremely acid in the subsoil and varies widely in the surface soil as a result of local liming practices. The depth to which the roots of some plants can penetrate is restricted because the root zone is very strongly acid. Natural fertility is low. The surface soil is very friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for pasture or timber. This soil is suited to small grain and to grasses and legumes for hay and pasture. It is not suited to annual tillage, however, because it is cherty. Minimum tillage, winter cover crops, and contour farming help to prevent excessive soil loss. Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. No hazards or limitations affect planting or harvesting.

This soil is suited to onsite waste disposal and building site development. The moderate permeability is a moderate limitation in septic tank absorption fields, but it can be overcome by enlarging the absorption area. The shrink-swell potential is a moderate limitation on sites for buildings, but properly designing and reinforcing footings and foundations helps to prevent the damage caused by shrinking and swelling. Low strength is a severe limitation if the soil is used as a site for local roads and streets. It can be overcome, however, by strengthening the base with crushed rock or other suitable material.

The capability subclass is IIIs; woodland suitability subclass 4o.

18D—Doniphan cherty silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is on convex ridgetops and short, uneven side slopes in the uplands. Areas generally are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is dark brown very cherty silt loam about 2 inches thick. The subsurface layer is light yellowish brown very cherty silt loam about 12 inches thick. The subsoil to a depth of 60 inches is multicolored clay.

Included with this soil in mapping are low lying areas of the somewhat excessively drained Clarksville and Coulstone soils. These soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Doniphan soil. Runoff is rapid. Available water capacity is moderate. Reaction ranges from strongly acid to extremely acid in the subsoil and varies widely in the surface soil as a result of local liming practices. The depth to which the roots of some plants can penetrate is restricted because the root zone is very strongly acid. Natural fertility is low. The surface soil is very friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for pasture or timber. This soil is suited to grasses and legumes for hay and pasture. Minimum tillage during the initial seeding helps to prevent excessive soil loss and increases the infiltration rate. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. No hazards or limitations affect planting or harvesting.

This soil is suited to onsite waste disposal and building site development. The moderate permeability and the slope are moderate limitations in septic tank absorption fields. Enlarging the absorption area, however, helps to overcome the moderate permeability, and land shaping and installing the distribution lines on the contour help to prevent downhill seepage and improve the efficiency of the absorption system. The shrink-swell potential is a moderate limitation on sites for dwellings. Properly designing and reinforcing footings and foundations, however, helps to prevent the damage caused by shrinking and swelling. The slope is a limitation on sites for buildings. It can be overcome, however, by designing the buildings so that they conform to the natural slope of the land and by land shaping.

Low strength is a severe limitation if this soil is used as a site for local roads and streets. It can be overcome, however, by strengthening the base with crushed rock or other suitable material.

The capability subclass is IVs; woodland suitability subclass 4o.

18F—Doniphan cherty silt loam, 14 to 30 percent slopes. This deep, moderately steep and steep, well drained soil is in convex areas and on long, uneven side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 180 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 3 inches thick. The subsurface layer is pale brown very cherty silt loam about 10 inches thick. The subsoil to a depth of 60 inches is red clay.

Included with this soil in mapping are low lying areas of the somewhat excessively drained Clarksville and Coulstone soils. These soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Doniphan soil. Runoff is rapid. Available water capacity is low or moderate. Reaction ranges from strongly acid to extremely acid in the subsoil and varies widely in the surface soil as a result of local liming practices. The depth to which the roots of some plants can penetrate is restricted because the root zone is very strongly acid. Natural fertility is low.

Most areas support native hardwoods. This soil is suited to trees. The hazard of erosion, seedling mortality, and the equipment limitation are moderate. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. Because of the hazard of erosion, logging roads and skid trails should be built on the contour. The design should minimize the gradient and length of slopes and prevent the concentration of water. Also, seeding is needed in some areas after harvesting. Because of the slope, seedlings cannot be planted by machine in many areas. In the steepest areas the logs should be yarded uphill to logging roads and skid trails.

This soil is suited to grasses for pasture. The slope is a limitation if an area is cleared of trees and planted to pasture grasses. Because of ground clearing, aerial spraying, and seeding, however, satisfactory stands of selected grasses have been established. If seeding is delayed after the area is cleared of trees, erosion is a hazard.

This soil generally is unsuited to onsite waste disposal and building site development because it is moderately steep and steep.

The capability subclass is VIs; woodland suitability subclass 4r.

19—Elsah silt loam. This deep, level and nearly level, somewhat excessively drained soil is on flood plains along most of the major streams in the county. It is frequently flooded for brief periods. Areas are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsurface layer is brown cherty silt loam about 10 inches thick. The substratum to a depth of 60 inches is brown cherty and very cherty silt loam.

Included with this soil in mapping are small areas of the somewhat excessively drained Cedargap soils in similar positions on the landscape and concave areas of the somewhat poorly drained Nevin soils next to the uplands. These soils make up 2 to 10 percent of the unit.

Permeability is moderately rapid in the Elsah soil. Runoff is slow. Because of the high content of chert in the subsurface layer, available water capacity is low. Reaction ranges from neutral to medium acid in the substratum and varies widely in the surface layer as a result of local liming practices. Natural fertility is low, and the content of organic matter is moderately low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The root zone is deep.

Most areas are used for pasture or hay. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, early spring flooding and summer drought are hazards. Small levees can protect some areas. Minimum tillage, winter cover crops, and perennial seeding of the areas subject to flooding help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the infiltration rate.

Growing grasses and legumes for pasture and hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. Seedling mortality and plant competition are moderate. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. Tree seeds and seedlings survive and grow moderately well only if competing plants are controlled or removed. Plant competition can be controlled by site preparation, by prescribed burning, or by spraying or cutting.

This soil generally is unsuited to building site development and onsite waste disposal because it is frequently flooded.

The capability subclass is IIs; woodland suitability subclass 3f.

20D—Gasconade-Rock outcrop complex, 2 to 20 percent slopes. This map unit occurs as gently sloping to moderately steep areas of Rock outcrop and a shallow, somewhat excessively drained Gasconade soil. It is on ridgetops and hillside benches in glade areas. Areas are irregular in shape and are 5 to 10 acres in size. They are 55 to 60 percent Gasconade soil and 30 to 35 percent Rock outcrop. The Gasconade soil and the Rock outcrop occur as areas so intricately intermingled that mapping them separately is not practical.

Typically, the Gasconade soil has a surface layer of black extremely flaggy silty clay loam about 5 inches thick. The subsurface layer is black extremely flaggy silty clay about 10 inches thick. The subsoil is very dark grayish brown extremely flaggy clay about 4 inches thick. Limestone bedrock is at a depth of about 19 inches.

The Rock outcrop consists of thin ledges of exposed cherty limestone.

Included with the Gasconade soil and the Rock outcrop in mapping are small areas of the deep, somewhat excessively drained Clarksville soils on the lower parts of the landscape and small areas of the moderately deep, moderately well drained Gatewood soils at midslope. These soils make up about 10 percent of the unit.

Permeability is moderately slow in the Gasconade soil. Runoff is rapid. Available water capacity is very low. Reaction is neutral or mildly alkaline. Natural fertility is low. The surface layer is friable. It cannot be easily tilled, however, because it is extremely flaggy. Root penetration is restricted by the hard bedrock at a depth of about 19 inches.

Most areas of the Gasconade soil support native pasture plants and redcedar. Growing trees for timber or grasses in wooded pastures is effective in controlling erosion. Because of the slope, the equipment limitation is moderate. Seedling mortality and the windthrow hazard also are moderate. In many areas seedlings cannot be planted by machine. Logging roads and skid trails should be built on the contour. In the steepest areas the logs should be yarded uphill to logging roads and skid trails. Selecting a planting stock that is larger than is typical helps to achieve a better survival rate. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight.

This map unit generally is unsuitable for building site development and onsite waste disposal because of the large stones and the shallowness to bedrock.

The Gasconade soil is assigned to capability subclass VIs and woodland suitability subclass 5d; the Rock outcrop is not assigned to a capability class or subclass or to a woodland suitability subclass.

22C—Gatewood cherty silt loam, 2 to 9 percent slopes. This moderately deep, gently sloping and moderately sloping, moderately well drained soil is on convex ridgetops and on side slopes. Areas generally are linear and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown cherty silt loam about 4 inches thick. The subsurface layer is pale brown cherty silt loam about 5 inches thick. The subsoil is yellowish brown silty clay about 26 inches thick. Dolomitic limestone is at a depth of about 35 inches.

Included with this soil in mapping are small areas of the deep, somewhat excessively drained Clarksville soils, the deep, well drained Doniphan soils, and the shallow, somewhat excessively drained Gasconade soils. These soils are at the outer edge of the mapped areas. They make up about 10 percent of the unit.

Permeability is slow in the Gatewood soil. Runoff is medium or rapid. Available water capacity is low. Reaction ranges from medium acid to neutral in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains. Root penetration is restricted by the limestone bedrock at a depth of about 35 inches. The shrink-swell potential is high.

Most areas are used for timber or pasture. This soil is suited to grasses and legumes for pasture or hay. The growth of deep rooted plants is limited, however, because of the clayey subsoil and the moderate depth to bedrock. In a few areas slopes are long enough and smooth enough for contour farming. The chert on the surface hinders the movement of farm machinery. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A few small areas support native oak and cedar. This soil is suited to trees, but production is low because the windthrow hazard and seedling mortality are severe. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate.

The high shrink-swell potential is a severe limitation if this soil is used as a site for buildings. Also, the moderate depth to bedrock is a severe limitation on sites for dwellings with basements. As a result, the soil is better suited to buildings without basements. Properly designing and reinforcing footings and foundations helps to prevent the damage caused by shrinking and swelling.

The depth to bedrock is a severe limitation if this soil is used for onsite waste disposal. Also, the slow permeability is a severe limitation in septic tank absorption fields and the slope a severe limitation on sites for sewage lagoons. Sewage should be piped to adjacent areas where the soils are better suited to onsite waste disposal.

The shrink-swell potential and low strength are severe limitations if this soil is used as a site for local roads and streets. Strengthening the base with crushed rock or other suitable material, however, helps to prevent the damage resulting from low strength or from shrinking and swelling. Also, measures that reduce wetness help to prevent the damage caused by shrinking and swelling.

The capability subclass is IVs; woodland suitability subclass 5c.

22D—Gatewood cherty silt loam, 9 to 14 percent slopes. This moderately deep, strongly sloping, moderately well drained soil is on convex ridgetops and on side slopes. Areas generally are linear and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown cherty silt loam about 4 inches thick. The subsurface layer is pale brown very cherty silt loam about 5 inches thick. The subsoil is about 15 inches thick. The upper part is yellowish brown silty clay, and the lower part is yellowish brown, yellowish red, and strong brown, mottled clay. Dolomitic limestone is at a depth of about 24 inches.

Included with this soil in mapping are small areas of the deep, somewhat excessively drained Clarksville soils, the deep, well drained Doniphan soils, and the shallow, somewhat excessively drained Gasconade soils. These soils are at the outer edge of the mapped areas. They make up about 10 percent of the unit.

Permeability is slow in the Gatewood soil. Runoff is rapid. Available water capacity is low. Reaction ranges from medium acid to neutral in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains. Root penetration is restricted by the limestone bedrock at a depth of about 24 inches. The shrink-swell potential is high.

Most areas are used for timber or pasture. This soil is suited to grasses and legumes for pasture and hay. The growth of deep rooted plants, however, is limited because of the clayey subsoil and the moderate depth to bedrock. In a few areas slopes are long enough and smooth enough for contour farming. The chert on the surface hinders the movement of farm machinery. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A few small areas support native oak and cedar. This soil is suited to trees, but production is low because the windthrow hazard and seedling mortality are severe. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate.

The high shrink-swell potential is a severe limitation if this soil is used as a site for buildings. Also, the moderate depth to bedrock is a severe limitation on sites for dwellings with basements. As a result, the soil is better suited to buildings without basements. Properly designing and reinforcing footings and foundations helps to prevent the damage caused by shrinking and swelling.

The depth to bedrock is a severe limitation if this soil is used for onsite waste disposal. Also, the slow permeability is a severe limitation in septic tank absorption fields and the slope a severe limitation on sites for sewage lagoons. Sewage should be piped to adjacent areas where the soils are better suited to onsite waste disposal.

The shrink-swell potential and low strength are severe limitations if this soil is used as a site for local roads and streets. Strengthening the base with crushed rock or other suitable material, however, helps to prevent the damage resulting from low strength or from shrinking and swelling. Also, measures that reduce wetness help to prevent the damage caused by shrinking and swelling.

The capability subclass is VIs; woodland suitability subclass 5c.

22E—Gatewood cherty silt loam, 14 to 30 percent slopes. This moderately deep, moderately steep and steep, moderately well drained soil is on convex ridgetops and on side slopes. Areas generally are linear and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown cherty silt loam about 2 inches thick. The subsurface layer is pale brown cherty silt loam about 5 inches thick. The subsoil is about 15 inches thick. The upper part is strong brown silty clay, and the lower part is yellowish red clay. Dolomitic limestone is at a depth of about 22 inches.

Included with this soil in mapping are small areas of the deep, somewhat excessively drained Clarksville soils, the deep, well drained Doniphan soils, and the shallow, somewhat excessively drained Gasconade soils. These soils are at the outer edge of the mapped areas. They make up about 10 percent of the unit.

Permeability is slow in the Gatewood soil. Runoff is rapid. Available water capacity is low. Reaction ranges from medium acid to neutral in the subsoil and varies widely in the surface soil as a result of local liming practices. Natural fertility is low. The surface soil is friable and can be easily tilled throughout a fairly wide range in moisture content. Root penetration is restricted by the limestone bedrock at a depth of about 22 inches.

Most areas are used for timber or pasture. This soil is suited to grasses for pasture. The growth of deep rooted plants, however, is limited because of the clayey subsoil and the moderate depth to bedrock. Minimum tillage during the initial seeding helps to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate. Overgrazing reduces yields of grasses and increases the extent of weeds and the runoff rate. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

A few small areas support native oak and cedar. This soil is suited to trees, but production is low because the windthrow hazard and seedling mortality are severe. The

stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. The equipment limitation is moderate. Seedlings cannot be planted by machine in some areas. Logging roads and skid trails should be built on the contour. In the steepest areas the logs should be yarded uphill to logging roads and skid trails.

This soil generally is unsuited to building site development and onsite waste disposal, mainly because it is moderately steep and steep.

The capability subclass is VIs; woodland suitability subclass 5c.

23A—Hartville silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on terraces along the major streams in the county. Areas generally are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 55 inches thick. The upper part is yellowish brown silt loam. The next part is multicolored silty clay loam and silty clay. The lower part is multicolored clay. The substratum to a depth of about 78 inches is mottled yellowish brown and light gray very cherty clay.

Included with this soil in mapping are areas of the poorly drained Bado soils in shallow depressions and the moderately well drained Viraton soils on convex slopes. These soils have a fragipan. They make up 5 to 10 percent of the unit.

Permeability is slow in the Hartville soil. Runoff also is slow. Available water capacity is high. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. Reaction is strongly acid or very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains. Root penetration is restricted because of the high content of clay below a depth about 40 inches. The shrink-swell potential is high.

Most areas are used for pasture or timber. This soil is suited to grasses and legumes for hay and pasture. The wetness, however, limits the growth of deep rooted legumes. Diversion terraces are effective in controlling the runoff from the upslope adjacent soils. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to corn, soybeans, and small grain. If cultivated crops are grown, however, the wetness caused by runoff from the upslope adjacent soils is a limitation. It can be controlled by diversion terraces. Minimizing tillage and returning crop residue to the soil or regularly adding other organic material improve tilth and help to prevent crusting.

A few small areas support black walnut. This soil is suited to trees. The windthrow hazard and seedling mortality, however, are severe. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. The trees should be harvested during periods when the surface is firm enough to support vehicles.

The high shrink-swell potential is a severe limitation if this soil is used as a site for buildings. Also, the wetness is a severe limitation on sites for dwellings with basements. Properly designing and reinforcing footings and foundations helps to prevent the damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. The soil is suitable as a site for properly designed sewage lagoons.

Low strength and frost action are severe limitations if this soil is used as a site for local roads and streets. Strengthening the base with crushed rock or other suitable material, however, helps to prevent the damage resulting from low strength. Grading the roads and streets so that they shed water and constructing adequate side ditches help to prevent excessive wetness and thus also prevent the damage caused by frost action.

The capability subclass is IIw; woodland suitability subclass 5c.

23B—Hartville silt loam, 2 to 5 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on terraces along the major streams in the county. Areas generally are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 10 inches thick. The subsoil is about 55 inches thick. The upper part is yellowish brown silty clay loam, and the lower part is gray clay. The substratum to a depth of about 78 inches is gray and yellowish brown clay.

Included with this soil in mapping are areas of the well drained Claiborne and poorly drained Bado soils. These soils are in low lying areas and shallow depressions. They make up about 10 percent of the unit.

Permeability is slow in the Hartville soil. Runoff is medium. Available water capacity is high. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. Reaction is strongly acid or very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It

tends to crust or puddle, however, after hard rains. Root penetration is restricted because of the high content of clay below a depth of about 40 inches. The shrink-swell potential is high.

Most areas are used for pasture or timber. This soil is suited to grasses and legumes for pasture or hay. The wetness, however, limits the growth of deep rooted legumes. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to corn, soybeans, and small grain. If cultivated crops are grown, however, the wetness caused by runoff from the upslope adjacent soils is a limitation. It can be controlled by diversion terraces. Minimum tillage helps to control erosion. Returning crop residue to the soil or regularly adding other organic material improves tilth and helps to prevent crusting.

A few small areas support black walnut. This soil is suited to some trees. The windthrow hazard and seedling mortality, however, are severe. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. The trees should be harvested during periods when the surface is firm enough to support vehicles.

The high shrink-swell potential is a severe limitation if this soil is used as a site for buildings. Also, the wetness is a severe limitation on sites for dwellings with basements. Properly designing and reinforcing footings and foundations helps to prevent the damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. The soil is suitable as a site for sewage lagoons. The slope is a moderate limitation, but it can be overcome by grading.

Low strength and frost action are severe limitations if this soil is used as a site for local roads and streets. Strengthening the base with crushed rock or other suitable material, however, helps to prevent the damage resulting from low strength. Grading the roads and streets so that they shed water and constructing adequate side ditches help to prevent excessive wetness and thus also prevent the damage caused by frost action.

The capability subclass is IIw; woodland suitability subclass 5c.

25—Melvin silt loam. This deep, nearly level to depressional, poorly drained soil is on flood plains along stream channels. It is frequently flooded for brief periods. Areas are linear and range from 5 to 36 acres in size.

Typically, the surface layer is dark gray silt loam about 10 inches thick. The subsoil is gray, mottled, very friable silt loam about 10 inches thick. The substratum to a depth of 60 inches is dark gray, mottled silt loam.

Included with this soil in mapping are small areas of the well drained Nolin soils on the slightly higher parts of the landscape. These soils make up 2 to 10 percent of the unit.

Permeability is moderate in the Melvin soil. Runoff is slow. Available water capacity is high. A seasonal high water table is within a depth of 1 foot. It restricts the depth to which the roots of some plants can penetrate. Reaction is slightly acid or neutral in the subsoil and substratum and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and the content of organic matter is moderately low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains.

Most areas support grasses and legumes. This soil is suited to corn and soybeans and to grasses and some legumes for hay and pasture. Cultivated crops can be grown, however, only if the soil is drained and protected from floodwater. Minimum tillage and winter cover crops help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate.

Growing grasses and legumes for pasture or hay helps to prevent scouring during periods of flooding. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. The equipment limitation and seedling mortality, however, are severe. The trees should be planted and harvested during dry periods, when the surface is firm enough to support vehicular traffic. The survival rate can be increased by ridging the soil and then planting on the ridges.

This soil generally is unsuited to building site development and onsite waste disposal because it is frequently flooded.

The capability subclass is IIIw; woodland suitability subclass 2w.

26A—Needleye silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on broad ridgetops. Areas generally are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is grayish brown silt loam about 3 inches thick. The upper 20 inches of the subsoil is yellowish brown or mottled gray, yellowish brown, and strong brown silty clay loam. The next 15 inches is a very dense fragipan of pale brown, mottled very cherty silt loam. The lower part to a depth of 60 inches is red very cherty silty clay loam. In areas where plowing has mixed part of the subsoil with the surface soil, the surface layer is yellowish brown.

Included with this soil in mapping are areas of the poorly drained Bado soils in shallow depressions. These soils make up 5 to 10 percent of the unit.

Permeability is moderately slow above the fragipan of the Needleye soil and slow in the pan. Runoff is slow. Available water capacity is low. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. Reaction is strongly acid or very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. Root penetration is restricted by the compact fragipan at a depth of about 27 inches.

Most areas support grasses and legumes. This soil is suited to corn, soybeans, and small grain and to grasses and clover for hay and pasture. If cultivated crops are grown, however, the seasonal high water table is a limitation early in the growing season and droughtiness, a result of the restricted root zone, a limitation in the middle of the growing season. Minimizing tillage and returning crop residue to the soil or regularly adding other organic material improve fertility and tilth. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. Seedling mortality and the windthrow hazard are moderate. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight.

The wetness is a severe limitation if this soil is used as a site for dwellings with basements. It is a moderate limitation on sites for buildings without basements. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. The soil is suitable as a site for properly designed sewage lagoons. Low strength is a severe limitation on sites for local roads and streets. It can be overcome, however, by strengthening the base with crushed rock or other suitable material.

The capability subclass is IIs; woodland suitability subclass 4d.

26B—Needleye silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on broad, convex ridgetops. Areas generally are irregular in shape and range from 5 to 150 acres in size.

Typically, the surface layer is brown silt loam about 4 inches thick. The upper 22 inches of the subsoil is strong brown or mottled gray and yellowish brown silty clay loam. The lower 15 inches is a very dense fragipan of pale brown and brownish gray cherty silt loam and very cherty silty clay loam. The substratum to a depth of 60 inches is red very cherty clay and very cherty silty clay loam. In areas where plowing has mixed part of the subsoil with the surface soil, the surface layer is yellowish brown.

Included with this soil in mapping are areas of Wilderness soils. These soils are steeper than the Needleye soil. They make up 2 to 10 percent of the unit.

Permeability is moderately slow above the fragipan of the Needleye soil and slow in the pan. Runoff is medium. Available water capacity is low. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. Reaction is strongly acid or very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. Root penetration is restricted by the compact fragipan at a depth of about 26 inches.

Most areas support grasses and legumes. This soil is suited to corn, soybeans, and small grain and to grasses and clover for hay and pasture. If cultivated crops are grown, however, erosion is a hazard. Also, the seasonal high water table is a limitation early in the growing season and droughtiness, a result of the restricted root zone, a limitation in the middle of the growing season. Minimizing tillage and returning crop residue to the soil or regularly adding other organic material help to control erosion and improve fertility and tilth. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to trees. Seedling mortality and the windthrow hazard are moderate. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight.

The wetness is a severe limitation if this soil is used as a site for dwellings with basements. It is a moderate limitation on sites for buildings without basements. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. The soil is suitable as a site for properly designed sewage lagoons. The slope is a moderate limitation, but it can be overcome by grading. Low strength is a severe limitation on sites for local roads and streets. It can be overcome, however, by strengthing the base with crushed rock or other suitable material.

The capability subclass is IIe; woodland suitability subclass 4d.

27—Nevin silt loam. This deep, nearly level, somewhat poorly drained soil is on low terraces along streams. It is subject to rare flooding. Areas are linear and are 5 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is

about 18 inches of very dark gray silt loam and silty clay loam. The subsoil is dark grayish brown silty clay loam about 14 inches thick. The substratum to a depth of 60 inches is dark grayish brown silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Melvin soils in shallow depressions on flood plains and the poorly drained, clayey Sampsel soils on the higher lying terraces. These soils make up 2 to 10 percent of the unit.

Permeability is moderate in the Nevin soil. Runoff is slow. Available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet. Reaction is slightly acid to mildly alkaline throughout the soil. Natural fertility is medium, and the content of organic matter is moderate. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains.

Most areas support grasses and legumes. This soil is suited to corn, soybeans, and small grain and to grasses for hay and pasture. If cultivated crops are grown, however, the seasonal high water table is a limitation in the spring. Minimizing tillage and returning crop residue to the soil improve tilth.

Overgrazing pasture or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil generally is unsuited to building site development and onsite waste disposal because it is subject to rare flooding and has a seasonal high water table.

The capability class is I; no woodland suitability subclass is assigned.

28—Nolin silt loam. This deep, nearly level, well drained soil is on flood plains along the Gasconade River and its major tributaries. It is occasionally flooded in the spring. Areas are roughly linear and range from 5 to 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 5 inches thick. The subsoil to a depth of 60 inches is dark brown silt loam.

Included with this soil in mapping are areas of the poorly drained Melvin soils in shallow depressions in old flood plains adjacent to the uplands. Also included are frequently flooded bars of sand and gravel along the stream channels. Included areas make up about 5 percent of the unit.

Permeability is moderate in the Nolin soil. Runoff is slow. Available water capacity is high. A seasonal high water table is at a depth of 3 to 6 feet. Natural fertility is medium, and the content of organic matter is moderate. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for row crops, small grain, or pasture and hay. This soil is suited to corn, soybeans, small grain, and grasses and legumes. If cultivated crops are grown, however, the occasional flooding in the spring is a hazard. If alfalfa is grown, the wet spots should be seeded to clover. Diversion terraces help to control the runoff from adjacent upslope soils. Plants respond well to applications of fertilizer and lime. Overgrazing or grazing when soil is too wet causes surface compaction. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

Only a few very small areas are used as woodland. This soil is suited to trees, but plant competition is severe. Tree seeds and seedlings survive and grow well only if competing plants are controlled by site preparation, by prescribed burning, or by spraying or cutting.

This soil generally is unsuited to building site development and onsite waste disposal because it is occasionally flooded.

The capability class is I; woodland suitability subclass 3o.

29—Nolin silt loam, frequently flooded. This deep, nearly level, well drained soil is on flood plains along the Gasconade River and its major tributaries. Areas are linear and range from 5 to 70 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is dark brown silt loam about 57 inches thick. Below this is stratified gravel.

Included with this soil in mapping are small areas of sand and gravel. These inclusions are in old stream channels and in areas of deposition. They make up about 5 percent of the unit.

Permeability is moderate in the Nolin soil. Runoff is slow. Available water capacity is high. A seasonal high water table is at a depth of 3 to 6 feet. Reaction ranges from medium acid to mildly alkaline. Natural fertility is medium, and the content of organic matter is moderate. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for pasture and hay. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. The frequent flooding in the spring, however, is a hazard. Plants respond well to applications of fertilizer and lime. A cover of grasses and legumes is effective in controlling the soil loss caused by scouring. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition. If alfalfa is grown, the wet spots should be seeded to clover.

Only a few very small areas are used as woodland. This soil is suited to trees, but plant competition is severe. Tree seeds, cuttings, and seedlings survive and grow well only if competing plants are controlled by site preparation, by prescribed burning, or by spraying or cutting. The flooding early in spring can delay harvesting. The trees should be harvested during periods when the surface is dry and firm.

This soil generally is unsuited to building site development and onsite waste disposal because it is frequently flooded.

The capability subclass is IIw; woodland suitability subclass 3o.

30G—Rock outcrop-Gasconade complex, 30 to 50 percent slopes. This map unit occurs as very steep areas of Rock outcrop and a shallow, somewhat excessively drained Gasconade soil. It is on side slopes and cliffs along the major streams in the county. Areas generally are irregular in shape and are 5 to 10 acres in size. They are about 70 percent Rock outcrop and 20 percent Gasconade soil. The Rock outcrop and Gasconade soil occur as areas so intricately intermingled that mapping them separately is not practical.

The Rock outcrop is dolomitic limestone, sandstone, cherty limestone, or a mixture of the three. Lenses of shale are common.

Typically, the Gasconade soil has a surface layer of black flaggy silty clay loam about 5 inches thick. The subsoil is about 14 inches thick. The upper part is black flaggy silty clay, and the lower part is dark grayish brown flaggy clay. Limestone bedrock is at a depth of about 19 inches.

Included with the Rock outcrop and Gasconade soil in mapping are areas of the deep Clarksville soils and the moderately deep, moderately well drained Gatewood soils. These soils are in low lying areas and at midslope. They make up about 10 percent of the unit.

Permeability is moderately slow in the Gasconade soil. Runoff is rapid. Available water capacity is very low. Natural fertility is low. The surface layer is friable. It cannot be easily tilled, however, because it is flaggy. Root penetration is restricted by the hard bedrock at a depth of about 19 inches.

Most areas support native pasture plants or redcedar. Growing trees for timber or grasses in wooded pastures is effective in controlling erosion. Because of the very steep slope and the Rock outcrop, the equipment limitation is severe. In many areas seedlings cannot be planted by machine. Because of the shallowness to bedrock, seedling mortality is severe and the windthrow hazard moderate on the Gasconade soil. Logging roads and skid trails should be built on the contour. In the steepest areas the logs should be yarded uphill to logging roads or skid trails. Selecting a planting stock that is larger than is typical helps to achieve a better survival rate. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight.

This map unit generally is unsuited to building site development and onsite waste disposal because of the very steep slope, the large stones, and the shallowness to bedrock.

The Gasconade soil is assigned to capability subclass VIIs and to woodland suitability subclass 5d; the Rock outcrop is not assigned to a capability class or subclass or to a woodland suitability subclass.

31B—Sampsel silty clay loam, 2 to 5 percent slopes. This deep, gently sloping, poorly drained soil is on terraces and toe slopes. Areas generally are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is black silty clay loam about 15 inches thick. The subsoil is about 21 inches thick. The upper part is dark gray, mottled silty clay loam. The next part is gray, mottled silty clay. The lower part is mottled yellowish brown, light gray, and yellowish red silty clay loam. The substratum to a depth of 60 inches is mottled gray, light gray, and yellowish brown silty clay.

Included with this soil in mapping are areas of Bado soils, which have a fragipan, and Hartville and Nevin soils, which are somewhat poorly drained. These soils are on the upper and lower slopes at the edge of the mapped areas. Also included are cherty areas where gravel or bedrock is 20 to 40 inches from the surface. Included areas make up 5 to 10 percent of the unit.

Permeability is slow in the Sampsel soil. Runoff is medium. Available water capacity is moderate. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. Natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains. The shrink-swell potential is high.

Most areas support grasses and legumes. This soil is suited to corn, soybeans, and small grain and to grasses and clover for hay and pasture. If cultivated crops are grown, however, erosion is a hazard and the wetness caused by upslope runoff a limitation. Minimum tillage, diversion terraces, and grassed waterways help to control erosion and reduce the wetness. In a few areas where slopes are suitable, contour farming can help to control erosion. Returning crop residue to the soil or regularly adding other organic material improves fertility and tilth and helps to prevent crusting.

Although this soil is suited to grasses and clover, the growth of deep rooted legumes is limited by the poor natural drainage. Diversion terraces are effective in controlling the runoff from the soils higher on the landscape. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth, increases the extent of weeds, and thins out the stand of grasses and legumes. Proper stocking rates and restricted use during wet periods help to keep the pasture in good condition.

A few small areas support native hardwoods. This soil is suited to some trees. Tree seeds and seedlings survive and grow well if competing plants are controlled or removed. Plant competition can be controlled by site preparation or by spraying or cutting. The wetness limits planting and harvesting. The trees should be harvested when the surface is dry and is firm enough to support logging vehicles.

This soil is suited to building site development. The high shrink-swell potential, however, is a severe limitation. Also, the wetness is a severe limitation on

sites for dwellings with basements. Properly designing and reinforcing footings and foundations helps to prevent the damage caused by shrinking and swelling. Installing tile drains around footings helps to prevent the damage caused by excessive wetness. The soil is suitable as a site for sewage lagoons. The slope is a moderate limitation, but it can be overcome by grading.

Low strength, the high shrink-swell potential, and frost action are severe limitations if this soil is used as a site for local roads and streets. Grading the roads and streets so that they shed water and constructing adequate side ditches reduce wetness and thus help to prevent the damage caused by frost action or by shrinking and swelling. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength or from shrinking and swelling.

The capability subclass is IIe; no woodland suitability subclass is assigned.

32B—Viraton silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on broad, convex ridgetops and on knolls in the uplands. Areas generally are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is yellowish brown silt loam about 10 inches thick. The upper 10 inches of the subsoil is brownish yellow and yellowish brown silty clay loam. The next 17 inches is a very dense fragipan of gray and brown cherty silt loam and cherty silty clay loam. The lower part to a depth of 60 inches is red and gray cherty clay.

Included with this soil in mapping are areas of Needleye and Bado soils in shallow depressions. Needleye soils are more silty than the Viraton soil. Bado soils are poorly drained. Also included, in the more gently sloping areas, are soils that have a lower content of chert and a higher content of clay than the Viraton soil. Included soils make up 2 to 10 percent of the unit.

Permeability is moderate above the fragipan of the Viraton soil and slow in the pan. Runoff is medium. Available water capacity is low. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains. Root penetration is restricted by the compact fragipan at a depth of about 20 inches.

Most areas support grasses and legumes. This soil is suited to small grain and to grasses and clover for hay and pasture. If cultivated crops are grown, however, erosion is a hazard and midsummer droughtiness a limitation. The growth of deep rooted legumes is limited by the fragipan. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. In a few areas slopes are long enough and smooth enough for terracing and contour farming. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate.

Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds. 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 in good condition.

A few small areas support native hardwoods. This soil is suited to trees. Seedling mortality and the windthrow hazard are moderate. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight.

This soil is suitable as a site for buildings and sewage lagoons. The wetness is a severe limitation, however, on sites for dwellings with basements or for sewage lagoons and a moderate limitation on sites for buildings without basements. On sites for buildings it can be overcome by installing drainage tile around the foundation. Sealing the bottom of sewage lagoons helps to prevent the contamination of ground water.

Wetness and frost action are moderate limitations if this soil is used as a site for local roads and streets. Grading the roads and streets so that they shed water, constructing adequate side ditches, and providing crushed rock or other suitable base material help to prevent the damage caused by wetness or frost action.

The capability subclass is IIIe; woodland suitability subclass 4d.

32C—Viraton silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on knolls and uneven side slopes in the uplands. Areas generally are irregular in shape and are 5 to 15 acres in size.

Typically, the surface layer is yellowish brown silt loam about 7 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The upper 10 inches of the subsoil is brownish yellow and yellowish brown silty clay loam. The next 17 inches is a very dense fragipan of mottled gray and strong brown very cherty silt loam. The lower part to a depth of 60 inches is multicolored cherty clay.

Included with this soil in mapping are areas of Bado, Needleye, and Wilderness soils. These soils are in shallow depressions or at the outer edge of the mapped areas. Bado soils are poorly drained. Needleye soils are more silty than the Viraton soil. Wilderness soils are cherty throughout. Included soils make up 2 to 10 percent of the unit.

Permeability is moderate above the fragipan of the Viraton soil and slow in the pan. Runoff is medium.

Available water capacity is low. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. Reaction dominantly ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content. It tends to crust or puddle, however, after hard rains. Root penetration is restricted by the compact fragipan at a depth of about 20 inches.

Most areas support grasses and legumes. This soil is suited to small grain and to grasses and some legumes for hay and pasture. If cultivated crops are grown, however, erosion is a hazard and droughtiness a limitation. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. In a few areas slopes are long enough and smooth enough for terracing and contour farming. Returning crop residue to the soil or regularly adding other organic material improves fertility, helps to prevent crusting, and increases the infiltration rate.

Overgrazing pasture reduces yields of grasses and legumes and increases the extent of weeds. 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 in good condition.

A few small areas support native hardwoods. This soil is suited to trees. Seedling mortality and the windthrow hazard are moderate. Selecting a planting stock that is larger than is typical or planting container-grown stock helps to achieve a better survival rate. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight.

This soil is suitable as a site for buildings and sewage lagoons. The wetness is a severe limitation, however, on sites for dwellings with basements or for sewage lagoons and a moderate limitation on sites for buildings without basements. Also, the slope is a severe limitation on sites for sewage lagoons. Installing drainage tile around the foundations of buildings helps to prevent the damage caused by excessive wetness. Sealing the bottom of sewage lagoons helps to prevent the contamination of ground water. Grading helps to overcome the slope.

Wetness and frost action are moderate limitations if this soil is used as a site for local roads and streets. Grading the roads and streets so that they shed water, constructing adequate side ditches, and providing crushed rock or other suitable base material help to prevent the damage caused by wetness or frost action.

The capability subclass is IIIe; woodland suitability subclass 4d.

33C—Wilderness cherty silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on convex ridgetops and short, uneven side slopes in the uplands. Areas generally are irregular in shape and range from 5 to 65 acres in size.

Typically, the surface layer is dark grayish brown cherty silt loam about 2 inches thick. The subsurface layer is pale brown very cherty silt loam about 5 inches thick. The upper 16 inches of the subsoil is yellowish brown cherty silt loam and yellowish brown, mottled very cherty silt loam. The next 6 inches is a very dense fragipan of multicolored very cherty silty clay loam. The lower part to a depth of 60 inches is dark red, mottled, firm cherty silty clay.

Included with this soil in mapping are areas of Clarksville and Viraton soils. The somewhat excessively drained Clarksville soils are at the outer edge of the mapped areas. The Viraton soils contain less chert than the Wilderness soil. They are in the center of broad ridges. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate above the fragipan of the Wilderness soil and slow in the pan. Runoff is medium. Available water capacity is low. A seasonal high water table is perched at a depth of 1 to 2 feet. Reaction is strongly acid or very strongly acid in the subsoil and varies widely in the surface soil as a result of local liming practices. Natural fertility is low. The surface soil is very friable throughout a fairly wide range in moisture content. It cannot be tilled easily, however, because of the high content of chert. Root penetration is restricted by the compact fragipan at a depth of about 23 inches.

Most areas are used for pasture or hay (fig. 10). This soil is suited to grasses and some legumes for hay and pasture. If the soil is used for improved pasture, the chert on the surface hinders tillage. Because of seasonal droughtiness, timely planting is needed to ensure an adequate stand. Minimizing tillage and returning crop residue to the soil help to prevent excessive soil loss and increase the infiltration rate. Overgrazing reduces yields of grasses and legumes and increases the extent of weeds. 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 in good condition.

A few areas support native hardwoods. This soil is suited to trees. Seedling mortality and the windthrow hazard are moderate. Selecting a planting stock that is larger than is typical helps to achieve a better survival rate. The stand should be thinned less intensively and more frequently than the stands in areas where the windthrow hazard is slight. No hazards or limitations affect harvesting.

This soil is suitable as a site for buildings and sewage lagoons. The wetness, however, is a severe limitation. Also, the slope is a severe limitation on sites for sewage lagoons. Installing drainage tile around the foundations of buildings helps to prevent the damage caused by excessive wetness. Sealing the bottom of sewage lagoons helps to prevent the contamination of ground water. Grading helps to overcome the slope.

Figure 10.—Dairy cattle grazing improved pasture on Wilderness cherty silt loam, 5 to 9 percent slopes.

Wetness and frost action are moderate limitations if this soil is used as a site for local roads and streets. Grading the roads and streets so that they shed water, constructing adequate side ditches, and providing crushed rock or other suitable base material help to prevent the damage caused by wetness or frost action.

The capability subclass is IVs; woodland suitability subclass 4d.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing 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. The loss of prime farmland to urban and other uses puts pressure on marginal lands, which generally are less productive.

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

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil

Conservation Service or the Cooperative Extension Service.

About 74,000 acres in Wright County, or about 17 percent of the total acreage, meets the requirements for prime farmland. On an additional 8,000 acres, the soil meets the requirements only in areas where it is drained or protected from flooding, or both. More than 50,000 acres of the prime farmland occurs as areas of Viraton silt loam, 2 to 5 percent slopes. The rest occurs as scattered areas of other soils. Most of the prime farmland is used for pasture and hay.

The map units 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."

If a soil meets the requirements for prime farmland only in areas where it is drained or is not frequently flooded during the growing season, a footnote is added after the soil name in table 5. Onsite investigation is needed to determine whether or not a specific area of the soil is adequately drained or is frequently flooded during the growing season. In Wright County the naturally wet soils generally have been adequately drained because of the application of drainage measures or because of the incidental drainage that results from farming, roadbuilding, 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 avoid soil-related failures in land uses.

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

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

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

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

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

crops and pasture

Dan Devine, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

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

About 299,457 acres in Wright County is farmland. Of this acreage, 211,940 acres is pasture, hayland, or rangeland, less than 10,000 acres is tilled cropland, and 77,517 acres is woodland. In 1980, Wright County ranked first in the state in numbers of dairy cows and twenty-fourth in numbers of cattle. Hay is harvested on about 47,900 acres annually, and the average yield of hay is 1.8 tons per acre. Row crops and small grain, mainly wheat, corn, and sorghum for silage, are regularly grown only on a few hundred acres. On many of these acres, they are grown to renovate or establish grass or alfalfa stands.

The potential of the soils in Wright County for increased production of forage is good. The soils generally are unsuited to row crops but are suitable as grazing land for beef cattle and dairy cows. This soil survey can greatly facilitate the production of grasses and the selection of species that are suited to the various soils in the county.

Good management of improved pasture and hayland has increased the number of beef cattle and dairy cows. Most of the pasture and hayland is seeded to fescue or orchardgrass and to ladino clover or red clover. Caucasian bluestem, native grasses, and alfalfa are grown on an increasing acreage.

The Ashton, Cedargap, Claiborne, Elsah, and Nolin soils on bottom land and terraces are well suited to alfalfa. Applications of lime and fertilizer help to keep the level of forage production high. Flooding is a hazard on the Ashton, Cedargap, Elsah, and Nolin soils.

Native, warm-season grasses grow well throughout the survey area. Little bluestem, big bluestem, and indiangrass are the chief examples. If brush is controlled and the pasture is otherwise well managed, the droughty Clarksville, Coulstone, Doniphan, Viraton, and Wilderness are especially well suited to these native grasses. These droughty soils and Ashton, Cedargap, Claiborne, Elsah, and Nolin soils are well suited to Caucasian bluestem. Higher yields of this bluestem can be expected from the bottom land soils because the

amount of available moisture is greater. Native bluestems and Caucasian bluestem provide good quality forage during the summer, when cool-season plants are dormant.

Good pasture management results in the maximum production of forage, a good seasonal distribution of plant growth, and stands that are productive for long periods. It includes rotation grazing and other measures that prevent overgrazing, selection of forage species according to the kind of soil and the kind of livestock, measures that control brush and weeds, and applications of lime and fertilizer. The kinds and amounts of lime and fertilizer should be determined by soil tests, by plant needs, and by the desired level of production.

The growth rate is slowed if pasture plants are grazed to the ground. In areas where the pasture is damaged by overgrazing, rotation grazing is needed. If grazing is rotated, crossfencing and an adequate supply of water in each field are needed. Fields of warm-season grasses should be separated from fields of cool-season grasses.

Brush and weeds compete with grasses and legumes for moisture, sunlight, and plant nutrients. As a result, they reduce the amount of available forage. They can be controlled by mowing or cutting and by spraying with chemicals.

Legumes seeded with grasses increase the amount, palatability, and nutritional value of the forage. Generally, they are established (1) by seeding at the same time that the grass is being established, (2) by broadcasting legume seeds during winter, after the grass is established, or (3) by planting with no-till seeders. Because of a high content of chert and rocks, broadcasting generally is the best method of seeding grasses and legumes on soils in the uplands. No-till seeders work well on Viraton soils.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The 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 insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops (*7*). Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

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 grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*11*). Only class and subclass are used in this survey.

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

Class I soils have slight 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.

There are no class V or class VIII soils in Wright County.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w,* or *s,*

to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony. In class I there are no subclasses because the soils of this class have few limitations.

The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Jim Robinson, forester, Soil Conservation Service, helped prepare this section.

In 1972, about 37 percent of the land in Wright County was used for commercial timber (*6*). This is a decrease of 71,600 acres since 1959, or a reduction of 31 percent. Much of this loss is attributed to a conversion from woodland to pasture.

Wright County is located within the oak-hickory hardwood forest (*8*). White oak, northern red oak, black oak, and hickory are dominant in the uplands of the Clarksville-Wilderness-Doniphan, Viraton-Wilderness, Clarksville-Gasconade-Doniphan, and Doniphan-Coulstone-Alsup associations, which are described under the heading "General soil map units." Many combinations of other hardwoods are common in the forest stands. Typical species associated with the dominant trees are pin oak, post oak, blackjack oak, eastern redcedar, scarlet oak, bur oak, ash, sugar maple, red maple, elm, basswood, black cherry, and black walnut. Flowering dogwood is common in the understory.

The composition of the stands on the shallow, droughty Gasconade soils is unique. These stands are most commonly made up entirely of eastern redcedar or of eastern redcedar, blackjack oak, and post oak. Hardwoods generally grow slowly on the major soils in the Viraton-Wilderness association. These soils have a fragipan. Shortleaf pine generally can be grown on these soils and on the south- and west-facing slopes of the other upland associations where the quality of the hardwoods is low.

Northern red oak, mockernut hickory, white oak, silver maple, green ash, sugar maple, black walnut, and black cherry are common on the better drained soils in the Nolin-Claiborne-Ashton association. River birch, sycamore, red maple, black willow, and pin oak are common on the more poorly drained minor soils in this association.

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 (woodland suitability) 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 important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on the soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This 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.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

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, keep snow from blowing off 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 insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, or the Missouri Department of Conservation or from a nursery.

recreation

Edward A. Gaskins, biologist, Soil Conservation Service, helped prepare this section.

According to the Statewide Comprehensive Outdoor Recreation Plan (SCORP), a total of 6,908 acres in Wright County is developed for recreation uses (*9*). This acreage includes 1 acre of public fishing water, 11,200 square feet for swimming, 6,766 acres for hunting, 23 acres of campgrounds, and 13 acres for picnicking. Further development for recreation uses is needed if the county is to meet the needs created by a projected increase in population to 17,300 by 1990 (*4*). At least 31 additional miles of bike paths, 20 acres of playfields, 235 acres of fishing waters, and 3 miles of foot trails are needed.

None of the land in the county is owned by the state. About 7,079 acres of the Mark Twain National Forest is in the northeast corner of the county. This area is open to the public and is used primarily for hunting forest game. About 89 miles of permanent streams add to the recreation resources in the county.

The NACD Nationwide Outdoor Recreation Inventory lists 13 private and semiprivate recreation enterprises in the county (*3*). Of these, three are operated as commercial enterprises that are open to the public for a fee. One of these three is a fishing lake, and the other two are transient campgrounds. According to the county committee responsible for preparing the inventory, the first priority need was for additional campgrounds and the second was for a shooting preserve.

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

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

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

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

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

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

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

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

wildlife habitat

Edward A. Gaskins, biologist, Soil Conservation Service, helped prepare this section.

Wright County is one of 24 counties in Missouri that make up the Ozark Plateau Zoogeographic Region (*5*). Originally, all of the county was wooded. Farming, timbering, and light urban growth, however, have changed the original plant cover. About 39 percent of the acreage is wooded, 60 percent is grassland, and 1 percent is cultivated land or other land. More than 260,000 acres is used for pasture and hay. Tall fescue is the major introduced grass.

During the past 20 years, much of the oak-hickory hardwood forest has been converted to pasture by aerial spraying and by bulldozing. Most of the aerial spraying has stopped, and the rate of mechanical clearing has been reduced. The large size of fields, the lack of transitional zones between one type of plant cover and another, grazing of woodlands, and the limited amount of cropland have restricted the growth of the population of wildlife game species.

Almost all of the wildlife habitat in the county is privately owned. There are no state-owned public hunting or fishing areas. The only area open to the public for hunting is 7,079 acres of the Mark Twain National Forest. This area is in the northeast corner of the county.

Good songbird and fair furbearer populations are throughout the county. The principal furbearers trapped are raccoon, coyote, muskrat, beaver, and a few mink.

The Clarksville-Gasconade-Doniphan and Doniphan-Coulstone-Alsup associations, which are described under the heading "General soil map units," are the only ones where woody vegetation covers 50 percent or more of the land area. These associations and the wooded acreage of the Clarksville-Wilderness-Doniphan and Viraton-Wilderness associations provide the primary habitat for woodland wildlife (fig. 11). The deer (fig. 12) and turkey (fig. 13) populations are fair to good, and squirrel (dominantly grey) populations are good. A few woodcock inhabit some parts of the county, but overall the population is poor. During the 1977 season, a total of 181 deer were harvested, giving Wright County a ranking of 68th of the 114 counties in Missouri. During the same year, 61 turkeys were harvested. Rising beef prices may cause the conversion of more woodland to grassland.

About 265,000 acres in the county is openland. The Clarksville-Wilderness-Doniphan, Viraton-Wilderness, and Nolin-Claiborne-Ashton associations furnish most of the openland wildlife habitat. Almost all of the openland is grassland. An estimate of less than 1 percent is cropland, most of which occurs as areas of the Nolin-Claiborne-Ashton association. Row crops are grown mainly for silage rather than grain. Because of the scarcity of small grain food supplies, migrating mourning doves generally are not attracted to the county. Populations of quail and dove are poor to fair, whereas populations of rabbit are good.

The extent of wetland wildlife habitat is extremely limited in the county. Waterfowl populations are poor at best. A limited number of wood ducks inhabit selected areas along certain streams, for example, along some parts of the Gasconade River and Whetstone Creek. Casador and Cedargap Lakes and numerous ponds are used to some extent as resting areas during migratory flights. Two great blue heron rookeries have been identified in the county.

The county has about 89 miles of permanent streams. The primary fishing waters are the Gasconade River, Whetstone, Parks, and Beaver Creeks, and Elk, Lick, and Wood Forks. The principal stream fishes are largemouth and smallmouth bass, goggle-eye, crappie, carp, sucker, bullhead, and various panfish.

The two largest lakes in the county are Cedargap Lake, which is 12 acres in size, and Casador Lake, which is 10 acres in size. Many of the 2,370 private ponds have been stocked with fish, generally with largemouth bass, channel catfish, and bluegill, either alone or in combination. The waters in one fishing area in the county are fished on the basis of a commercial fee.

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

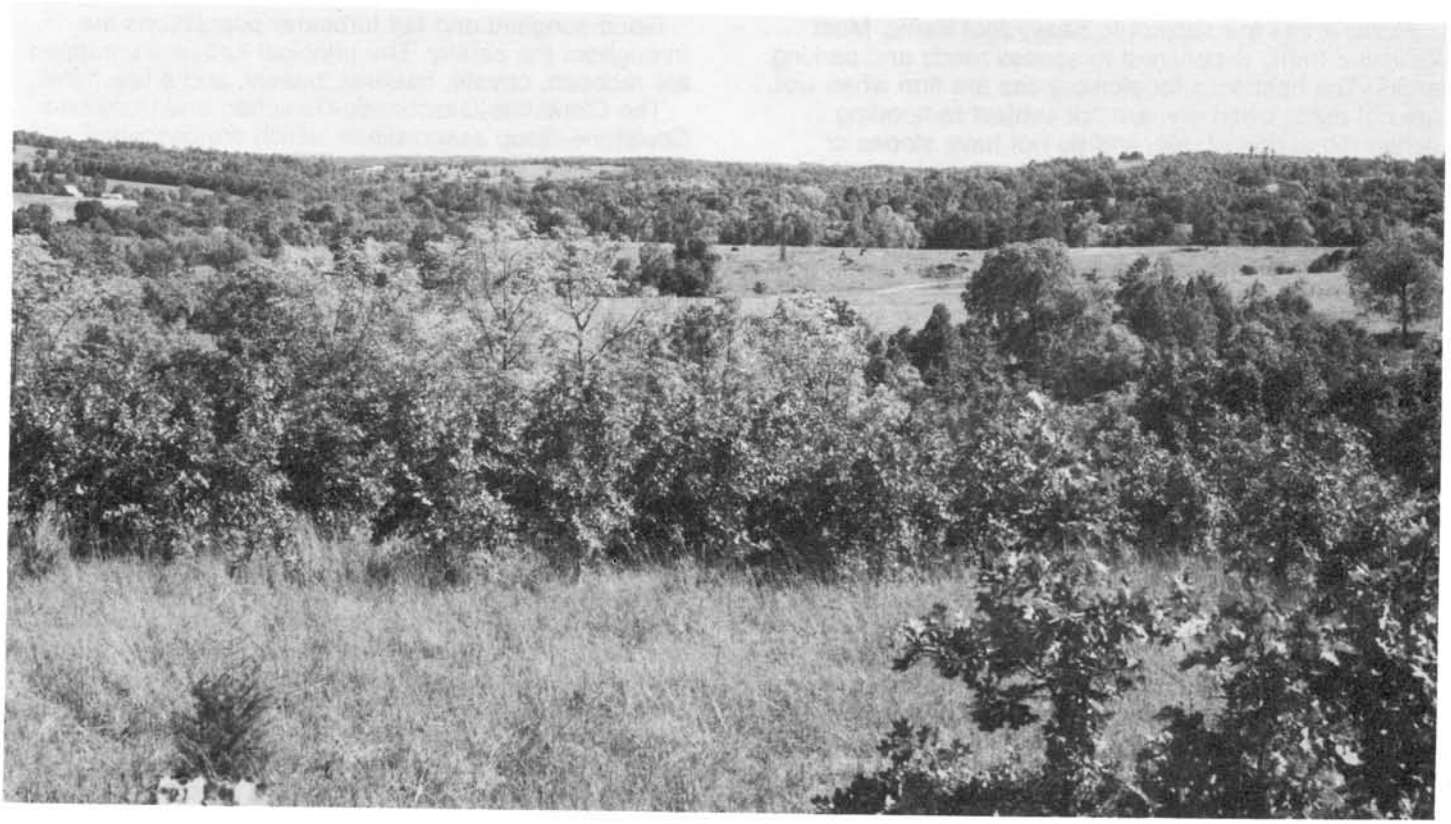

Figure 11.—Upland wildlife habitat on Doniphan soils.

distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

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

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

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are

bluegrass, switchgrass, orchardgrass, indiangrass, clover, trefoil, alfalfa, and crownvetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, pokeweed, foxtail, croton, and partridgepea.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, wild plum, sumac, persimmon, and sassafras. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, crabapple, Amur honeysuckle, and hazelnut.

Coniferous plants furnish winter cover, browse, seeds, and cones. 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

Figure 12.—An area of Clarksville soils used as habitat by deer. Many of the deer in the county inhabit areas of these soils.

Figure 13.—A wooded area of Doniphan soils used as habitat by turkeys.

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, cutgrass, cattail, rushes, sedges, and buttonbush.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

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

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

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, and deer.

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

engineering

This section provides information for planning land uses related to urban development and to water

management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

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

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

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

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

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

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

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

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high

water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

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

sanitary facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

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

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

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth

of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

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

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

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

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

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an

appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

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

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

water management

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

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

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

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

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

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

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

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

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

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

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

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

engineering index properties

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

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 or 20 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, SM-SC.

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

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

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 measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

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

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

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

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

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

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

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

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

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is,

perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17. Only saturated zones within a depth of about 6 feet are indicated.

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

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally 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 excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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 from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is 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 Aqualf (*Aqu*, meaning water, 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; 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 Fragiaqualfs (*Fragi*, meaning fragipan, plus *aqualf*, the suborder of the Alfisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fragiaqualfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, mesic Typic Fragiaqualfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*10*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*12*). 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."

Alsup series

The Alsup series consists of deep, moderately well drained, moderately slowly permeable soils formed in a thin mantle of colluvium and in the underlying residuum of shale. These soils are on convex ridgetops, side slopes, and foot slopes in the uplands. Slopes range from 4 to 14 percent.

Alsup soils are commonly adjacent to Clarksville, Doniphan, Gasconade, and Gatewood soils. Clarksville, Doniphan, and Gatewood soils are on side slopes below the Alsup soils. Clarksville soils are somewhat excessively drained, Doniphan soils are well drained, and

Gatewood soils are moderately deep. Gasconade soils are shallow to bedrock.

Typical pedon of Alsup coarse cherty silt loam, 9 to 14 percent slopes, about 720 feet west and 400 feet south of the northeast corner of sec. 21, T. 28 N., R. 14 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) coarse cherty silt loam; weak very fine granular structure; very friable; many fine roots; about 30 percent coarse chert fragments; neutral; abrupt smooth boundary.

A2—2 to 6 inches; pale brown (10YR 6/3) silt loam; weak very fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

IIB1t—6 to 9 inches; yellowish brown (10YR 5/6) silty clay loam; weak very fine angular blocky structure; friable; reddish yellow (7.5YR 6/6) stains; common fine roots; thin patchy clay films on faces of peds; medium acid; clear smooth boundary.

IIB21t—9 to 18 inches; strong brown (7.5YR 5/6) silty clay; moderate fine subangular blocky structure; friable; common fine roots; thin patchy clay films on faces of peds; very strongly acid; clear smooth boundary.

IIB22t—18 to 25 inches; yellowish brown (10YR 5/6) silty clay; few fine prominent yellowish red (5YR 4/6) and reddish brown (2.5YR 5/4) mottles; moderate fine subangular blocky structure; firm; thin discontinuous clay films on faces of peds; few fine roots; very strongly acid; clear smooth boundary.

IIC—25 to 45 inches; mottled olive gray (5Y 5/2) and brownish yellow (10YR 6/6) clay; moderate medium subangular and angular blocky structure; firm; very strongly acid; clear smooth boundary.

IICr—45 to 60 inches; pale olive (5Y 6/3) weathered silty shale.

The solum ranges from 23 to more than 50 inches in thickness. The depth to weathered shale ranges from more than 40 to more than 60 inches. In some pedons the content of chert fragments is as much as 30 percent in the solum, but the part of the solum below the A horizon commonly is free of coarse fragments.

The A horizon has hue of 10YR, value of 3 to 6, and chroma of 2 or 3. The B horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 4 to 8. It ranges from silty clay loam to clay. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 to 7. It ranges from silty clay loam to clay or from shaly silty clay loam to shaly clay.

Ashton series

The Ashton series consists of deep, well drained, moderately permeable soils formed in alluvium. These soils are on terraces along the major streams. Slopes range from 0 to 5 percent.

Ashton soils are similar to Claiborne and Nolin soils and are commonly adjacent to those soils and to Cedargap, Hartville, and Nevin soils. Cedargap and Claiborne soils are coarser textured than the Ashton soils. Cedargap soils are in very low areas on flood plains, and Claiborne soils are on foot slopes and high terraces. Hartville and Nevin soils are somewhat poorly drained. Hartville soils are on slopes above the Ashton soils, and Nevin soils are in nearly level and depressional areas below the Ashton soils. Nolin soils have a B horizon that typically is silt loam throughout.

Typical pedon of Ashton silt loam, 0 to 2 percent slopes, about 340 feet east and 320 feet north of the southwest corner of sec. 24, T. 32 N., R. 14 W.

Ap—0 to 5 inches; dark brown (7.5YR 3/2) silt loam; moderate very fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—5 to 9 inches; dark brown (7.5YR 3/2) silt loam; weak very fine granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

B1—9 to 16 inches; dark brown (7.5YR 4/4) silt loam; moderate very fine subangular blocky structure; very friable; many fine roots; slightly acid; clear smooth boundary.

B21t—16 to 26 inches; strong brown (7.5YR 4/6) silty clay loam; weak medium subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

B22t—26 to 40 inches; strong brown (7.5YR 4/6) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; thin patchy clay films on faces of peds; slightly acid; gradual smooth boundary.

B3—40 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; weak very fine subangular blocky structure; friable; few fine roots; slightly acid.

The solum ranges from 40 to 60 inches in thickness. It ranges from neutral to medium acid. Its content of pebbles is 0 to 5 percent.

The A horizon has hue of 10YR or 7.5YR, value of 3, and chroma of 2 or 3. The B1 horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 2 to 4. The B2t and B3 horizons have hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 3 to 6. They range from loam to silty clay loam.

Bado series

The Bado series consists of deep, poorly drained, very slowly permeable soils that have a fragipan. These soils formed in loess and in dolomite residuum. They are in nearly level and slightly depressional areas on broad ridges. Slopes range from 0 to 3 percent.

Bado soils are adjacent to Needleye and Viraton soils. Needleye soils are moderately well drained and are slightly higher on the landscape than the Bado soils. Viraton soils have a coarser textured argillic horizon than the Bado soils. They are gently sloping and moderately sloping and are on broad ridges below the Bado soils.

Typical pedon of Bado silt loam, 0 to 3 percent slopes, about 1,120 feet east and 1,060 feet north of the southwest corner of sec. 8, T. 29 N., R. 15 W.

A1—0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam; many fine faint grayish brown (10YR 5/2) mottles; moderate fine granular structure; very friable; many fine roots; extremely acid; abrupt smooth boundary.

A2—1 to 13 inches; grayish brown (10YR 5/2) silt loam; many fine distinct yellowish brown (10YR 5/4) and few fine distinct yellowish brown (10YR 5/8) mottles; weak very fine subangular blocky structure; very friable; many fine roots; extremely acid; clear smooth boundary.

B1—13 to 17 inches; gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate very fine and fine subangular blocky structure; firm; common fine roots; extremely acid; clear smooth boundary.

B21t—17 to 24 inches; gray (10YR 5/1) and light gray (10YR 6/1) clay; common medium distinct brownish yellow (10YR 6/8) and few fine faint grayish brown (10YR 5/2) mottles; weak very fine angular and subangular blocky structure; firm; common coarse woody roots; thin continuous clay films on faces of peds; extremely acid; clear smooth boundary.

B22t—24 to 32 inches; dark gray (10YR 4/1) clay; few fine prominent yellowish red (5YR 5/6) and few medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak very fine angular and subangular blocky structure; very firm; few fine root channels filled with dark gray clay flows; extremely acid; abrupt wavy boundary.

A'21x—32 to 37 inches; gray (10YR 6/1) silt loam; few fine prominent yellowish red (5YR 5/8) and yellowish brown (10YR 5/6 and 5/8) mottles; moderate coarse platy structure; slightly brittle; vertical streaks of clayey B22t material 10 centimeters apart; few fine roots in vertical streaks; extremely acid; abrupt wavy boundary.

A'22x—37 to 42 inches; gray (10YR 6/1) silt loam; few fine prominent yellowish red (5YR 5/8) and many coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate coarse platy structure; very firm and brittle; extremely acid; abrupt wavy boundary.

B'21x—42 to 53 inches; mottled gray (10YR 6/1), light brownish gray (10YR 6/2), yellowish brown (10YR 5/6), and dark yellowish brown (10YR 4/4) silt loam; moderate coarse platy structure; extremely firm and brittle; extremely acid; clear wavy boundary.

IIB'22x—53 to 65 inches; gray (10YR 6/1) silty clay loam; few fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak very fine subangular blocky structure; slightly brittle; about 10 percent fine chert fragments; very strongly acid.

The depth to the fragipan ranges from 18 to 40 inches. The A horizon has hue of 10YR, value of 3 to 6, and chroma of 2 or 3. The B horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The A'x horizon has hue of 10YR, value of 3 to 6, and chroma of 1 to 6. The IIBx horizon dominantly has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 to 6. In some pedons it has hue of 2.5YR and value and chroma of 4 to 6. It is silty clay loam or silty clay.

Cedargap series

The Cedargap series consists of deep, somewhat excessively drained, moderately rapidly permeable soils formed in cherty silty alluvium in areas on flood plains where small streams join larger streams. Slopes range from 0 to 3 percent.

Cedargap soils commonly are adjacent to Claiborne soils. Claiborne soils have a B horizon. They are on side slopes above the Cedargap soils.

Typical pedon of Cedargap cherty silt loam, 0 to 3 percent slopes, about 2,540 feet south and 460 feet west of the northeast corner of sec. 35, T. 29 N., R. 15 W.

A11—0 to 8 inches; very dark brown (10YR 2/2) cherty silt loam, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; very friable; many fine roots; about 25 percent chert fragments; slightly acid; clear smooth boundary.

A12—8 to 25 inches; black (10YR 2/1) very cherty silt loam, very dark gray (10YR 3/1) dry; weak fine subangular blocky structure; very friable; many fine roots; about 45 percent chert fragments; slightly acid; clear smooth boundary.

C1—25 to 35 inches; very dark grayish brown (10YR 3/2) very cherty silt loam; weak fine granular structure; very friable; common thin black (10YR 2/1) coatings on faces of some peds and chert fragments; few roots; about 85 percent chert fragments; slightly acid; gradual smooth boundary.

C2—35 to 46 inches; brown (7.5YR 4/4) very cherty silty clay loam; weak fine granular structure; friable; few roots; about 90 percent chert fragments; slightly acid; clear smooth boundary.

C3—46 to 60 inches; brown (7.5YR 4/4) and grayish brown (10YR 5/2) very cherty clay loam; massive; firm; about 75 percent chert fragments; neutral.

The control section averages, by volume, more than 35 percent chert. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The C horizon has hue of 10YR or 7.5YR, value of 2 to 5, and chroma of 1 to 4. It is the very cherty analogs of loam, silt loam, silty clay loam, or clay loam.

Claiborne series

The Claiborne series consists of deep, well drained, moderately permeable soils formed in local alluvium or residuum of cherty limestone. These soils are on foot slopes and high terraces along the major streams. Slopes range from 2 to 9 percent.

Claiborne soils are similar to Ashton soils and are commonly adjacent to those soils and to Hartville and Viraton soils. Ashton soils contain fewer coarse fragments in the solum than the Claiborne soils. Also, they are lower on the landscape. Hartville soils are somewhat poorly drained. Viraton soils have a fragipan.

Typical pedon of Claiborne silt loam, 2 to 5 percent slopes, about 2,300 feet south of the northeast corner of sec. 3, T. 29 N., R. 16 W.

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

B1—6 to 14 inches; reddish brown (5YR 4/4) silty clay loam; weak very fine subangular blocky structure; friable; many fine roots; few fine pores; medium acid; clear smooth boundary.

B21t—14 to 18 inches; yellowish red (5YR 4/6) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; few very fine pores; many black stains (iron and manganese oxide); strongly acid; clear smooth boundary.

B22t—18 to 29 inches; red (2.5YR 4/6) and dark red (2.5YR 3/6) silty clay loam; weak medium subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; few very fine pores; many black stains (iron and manganese oxide); about 5 percent fine chert fragments; strongly acid; clear smooth boundary.

B23t—29 to 41 inches; mottled dark red (2.5YR 3/6) and yellowish red (5YR 5/6) silty clay loam; weak medium subangular blocky structure; firm; few fine roots; few very fine pores; very few black stains (iron and manganese oxide); light gray (10YR 7/2) silt coatings on about 10 percent of the peds; about 5 percent fine chert fragments; strongly acid; clear smooth boundary.

B24t—41 to 60 inches; mottled dark red (2.5YR 3/6) and yellowish red (5YR 5/6) silty clay loam; moderate very fine subangular blocky structure; few fine roots; few fine pores; very few black stains (iron and manganese oxide); light gray (10YR 7/2) silt coatings on about 10 percent of the peds; about 5 percent chert fragments; very strongly acid.

The solum ranges from 60 to 100 inches in thickness. Its content of angular chert fragments ranges, by volume, from 0 to 25 percent.

The A horizon has hue of 10YR, value of 3, and chroma of 2 to 4. The B horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5, and chroma of 4 to 8. It is dominantly silt loam to silty clay but ranges to clay in the lower part.

Clarksville series

The Clarksville series consists of deep, somewhat excessively drained, moderately rapidly permeable soils formed in residuum and colluvial material weathered from cherty limestone. These soils are on narrow ridges and side slopes in highly dissected upland areas. Slopes range from 9 to 50 percent.

Clarksville soils are similar to Coulstone soils and are commonly adjacent to those soils and to Alsup and Doniphan soils. Alsup soils have a fine textured Bt horizon. They are on side slopes above the Clarksville soils. Coulstone soils contain more sand and sandstone fragments throughout than the Clarksville soils. Doniphan soils contain less chert and more clay in the Bt horizon than the Clarksville soils. They are on side slopes and ridges above those soils.

Typical pedon of Clarksville cherty silt loam, 9 to 14 percent slopes, about 1,620 feet north and 1,380 feet east of the southwest corner of sec. 28, T. 30 N., R. 13 W.

A1—0 to 4 inches; dark brown (10YR 3/3) cherty silt loam; weak very fine granular structure; very friable; many fine roots; about 20 percent chert fragments; very strongly acid; clear smooth boundary.

A2—4 to 7 inches; pale brown (10YR 6/3) cherty silt loam; weak fine subangular blocky structure; very friable; many fine roots; about 20 percent chert fragments; very strongly acid; clear smooth boundary.

B1t—7 to 16 inches; strong brown (7.5YR 5/6) very cherty silt loam; weak fine subangular blocky structure; friable; common fine roots; about 40 percent chert fragments; very strongly acid; clear smooth boundary.

B21t—16 to 32 inches; strong brown (7.5YR 5/6) very cherty silty clay loam; moderate fine angular blocky structure; friable; thin patchy clay films on faces of peds; common fine roots; about 85 percent chert fragments; very strongly acid; clear wavy boundary.

IIB22t—32 to 51 inches; yellowish red (5YR 5/6) cherty silty clay loam; few medium prominent reddish brown (2.5YR 4/4) mottles; strong fine angular blocky structure; very firm; thin continuous clay films on faces of peds; few fine roots; about 20 percent chert fragments; very strongly acid; clear wavy boundary.

IIB3t—51 to 60 inches; red (2.5YR 4/6) very cherty clay; moderate very fine subangular blocky structure; firm; thin patchy clay films on faces of peds; about 80 percent chert fragments; very strongly acid.

The A horizon has hue of 10YR, value of 2 to 6, and chroma of 1 to 4. It is cherty silt loam or cherty loam.

The B horizon has hue of 7.5YR, 5YR, or 2.5YR and value and chroma of 4 to 6. It is the cherty or very cherty analogs of silt loam, silty clay loam, silty clay, or clay.

Coulstone series

The Coulstone series consists of deep, somewhat excessively drained, moderately rapidly permeable soils formed in residuum of sandstone having lenses of cherty limestone or cherty dolomite. These soils are on narrow ridgetops and steep side slopes in the uplands. Slopes range from 5 to 30 percent.

Coulstone soils are similar to Clarksville soils and are commonly adjacent to those soils and to Doniphan soils. Clarksville soils contain less sand and have fewer sandstone fragments than the Coulstone soils. They are on the lower slopes. Doniphan soils have a fine textured argillic horizon. They are on side slopes above the Coulstone soils.

Typical pedon of Coulstone cherty loam, 14 to 30 percent slopes, about 500 feet east and 2,500 feet north of the southwest corner of sec. 33, T. 28 N., R. 15 W.

A1—0 to 4 inches; brown (10YR 4/3) cherty loam; moderate very fine granular structure; very friable; about 25 percent chert and sandstone fragments; many fine roots; slightly acid; abrupt smooth boundary.

A2—4 to 14 inches; pale brown (10YR 6/3) cherty loam; weak fine subangular blocky structure; very friable; about 25 percent chert and sandstone fragments; many fine roots; strongly acid; clear wavy boundary.

B2t—14 to 51 inches; yellowish brown (10YR 5/4) very cherty sandy loam; moderate very fine subangular blocky structure; very friable; about 65 percent chert and sandstone fragments (large sandstone rocks in the lower 4 inches); common fine roots; strongly acid; clear irregular boundary.

B3—51 to 63 inches; pale brown (10YR 6/3) very cherty sandy loam; weak very fine subangular blocky structure; friable; about 65 percent chert fragments; common fine roots; strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. The content of chert and round sandstone fragments ranges, by volume, from 25 to 65 percent. Reaction ranges from extremely acid to strongly acid below the surface layer.

The A horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 to 4. It is cherty, very cherty, or very gravelly loam, sandy loam, or silt loam. The upper part of the B horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR and value and chroma of 3 to 6. The lower part has hue of 10YR to 5YR, value of 4 to 6, and chroma of 3 to 8. The B horizon is the very cherty or very gravelly analogs of sandy loam, loam, clay loam, or sandy clay.

Doniphan series

The Doniphan series consists of deep, well drained, moderately permeable soils formed in residuum of shale and cherty dolomite or cherty limestone. These soils are on convex ridgetops and side slopes in dissected upland areas. Slopes range from 5 to 30 percent.

Doniphan soils are adjacent to Clarksville, Coulstone, and Wilderness soils. Clarksville soils contain more chert fragments and less clay in the Bt horizon than the Doniphan soils. They are on the lower slopes. Coulstone soils contain more sand in the control section than the Doniphan soils. They are on the higher slopes. Wilderness soils have a fragipan. They are on slopes above the Doniphan soils.

Typical pedon of Doniphan cherty silt loam, 5 to 9 percent slopes, about 280 feet west and 2,120 feet south of the northeast corner of sec. 5, T. 29 N., R. 14 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) very cherty silt loam; weak very fine granular structure; very friable; common fine roots; few fine hard very dark brown concretions; about 65 percent chert fragments; slightly acid; abrupt smooth boundary.

A2—2 to 10 inches; light yellowish brown (10YR 6/4) very cherty silt loam; weak very fine granular structure; very friable; common very fine roots; many fine pores; few fine hard dark brown concretions; about 65 percent chert fragments; strongly acid; clear wavy boundary.

B&A—10 to 14 inches; yellowish red (5YR 5/8) silty clay loam (B) and light yellowish brown (10YR 6/4) silt loam (A); moderate very fine subangular blocky structure; friable; few fine roots; thin patchy clay films on faces of peds; few firm fine black concretions; about 10 percent chert fragments; strongly acid; clear wavy boundary.

IIB21t—14 to 29 inches; red (2.5YR 4/8) clay; common fine prominent yellowish red (5YR 5/6) and strong brown (7.5YR 5/8) mottles; moderate fine angular blocky structure; friable; thin patchy clay films on faces of peds; few fine manganese concretions; about 5 percent chert fragments; very strongly acid; clear wavy boundary.

IIB22t—29 to 39 inches; yellowish red (5YR 5/6) clay; common fine distinct reddish yellow (5YR 6/6) and red (2.5YR 4/8) mottles; strong fine angular blocky structure; firm; few fine roots; few fine manganese concretions; about 10 percent chert fragments; very strongly acid; clear wavy boundary.

IIB23t—39 to 60 inches; dark red (2.5YR 3/6) clay; common coarse prominent strong brown (7.5YR 4/6) and common fine prominent gray (10YR 6/1) mottles; moderate fine angular blocky structure; friable; few fine black manganese concretions; few chert fragments; very strongly acid.

The solum ranges from 60 to more than 100 inches in thickness. The A horizon has hue of 10YR, value of 2 to 6, and chroma of 1 to 4. It is the cherty or very cherty analogs of loam or silt loam. The B horizon has hue of 2.5YR to 10YR, value of 3 to 7, and chroma of 4 to 8. It ranges from silty clay loam to clay.

Elsah series

The Elsah series consists of deep, somewhat excessively drained, moderately rapidly permeable soils formed in alluvium weathered from cherty limestone and sandstone. These soils are on flood plains along streams, mainly in areas where small streams join the broader flood plains. Slopes range from 0 to 2 percent.

Elsah soils commonly are adjacent to Nevin and Nolin soils. Nevin soils are on terraces and are somewhat poorly drained. Nolin soils do not contain coarse fragments in the control section. Their position on the landscape is similar to that of the Elsah soils.

Typical pedon of Elsah silt loam, about 990 feet south and 2,475 feet west of the northeast corner of sec. 36, T. 29 N., R. 16 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine chert fragments; slightly acid; abrupt smooth boundary.
A12—6 to 16 inches; brown (10YR 4/3) cherty silt loam; weak fine granular structure; friable; about 15 percent fine chert fragments; medium acid; clear wavy boundary.
IIC1—16 to 20 inches; brown (7.5YR 4/4) cherty silt loam; massive; friable; about 25 percent chert fragments; medium acid; clear wavy boundary.
IIC2—20 to 60 inches; brown (7.5YR 4/4) very cherty silt loam; structureless; friable; about 65 percent chert fragments; medium acid.

The content of chert commonly increases with increasing depth. It averages more than 35 percent in the control section. The A horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is silt loam or cherty silt loam. The IIC horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 or 4. It is the cherty or very cherty analogs of silt loam or loam.

Gasconade series

The Gasconade series consists of shallow, somewhat excessively drained, moderately slowly permeable soils formed in clayey material weathered from the underlying limestone bedrock. These soils are on dissected uplands and in glade areas where bedrock is close to the surface. Slopes range from 2 to 20 percent.

Gasconade soils are adjacent to Clarksville, Coulstone, and Gatewood soils. Gatewood soils are moderately deep. They are on side slopes and ridgetops. Clarksville and Coulstone soils are deep. They are downslope from the Gasconade soils.

Typical pedon of Gasconade extremely flaggy silty clay loam, in an area of Gasconade-Rock outcrop complex, 2 to 20 percent slopes, about 1,000 feet west and 2,220 feet north of the southeast corner of sec. 19, T. 30 N., R. 13 W.

A11—0 to 5 inches; black (10YR 2/1) extremely flaggy silty clay loam; moderate fine granular structure; friable; many fine roots; about 65 percent limestone fragments; neutral; clear smooth boundary.
A12—5 to 15 inches; black (10YR 2/1) extremely flaggy silty clay; moderate fine subangular blocky structure; friable; common fine roots; about 70 percent limestone fragments; neutral; clear smooth boundary.
B2—15 to 19 inches; very dark grayish brown (10YR 3/2) extremely flaggy clay; moderate fine subangular blocky structure; few fine roots; about 65 percent limestone fragments; neutral; abrupt smooth boundary.
R—19 inches; limestone bedrock.

The solum ranges from 9 to 20 inches in thickness. The content of coarse fragments ranges, by volume, from 35 to 70 percent.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam, silty clay, or clay loam or the flaggy analogs of these textures. The B horizon has hue of 10YR, 7.5YR, or 2.5YR, value of 3 or 4, and chroma of 2 to 4. It is the flaggy analogs of silty clay, clay, or clay loam.

Gatewood series

The Gatewood series consists of moderately deep, moderately well drained, slowly permeable soils formed in residuum of cherty dolomite and shale. These soils are on side slopes and ridgetops. Slopes are dominantly 9 to 30 percent but range from 2 to 30 percent.

Gatewood soils are adjacent to Clarksville, Doniphan, and Gasconade soils. Clarksville and Gasconade soils are somewhat excessively drained and are downslope from the Gatewood soils. Clarksville soils are deep and Gasconade soils shallow over bedrock. Doniphan soils are deep. They are on slopes above the Gatewood soils.

Typical pedon of Gatewood cherty silt loam, 9 to 14 percent slopes, about 120 feet north and 40 feet east of the southwest corner of sec. 19, T. 32 N., R. 12 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) cherty silt loam; moderate very fine granular structure; friable; many fine roots; about 30 percent chert fragments; medium acid; clear smooth boundary.
A2—4 to 9 inches; pale brown (10YR 6/3) very cherty silt loam; weak fine granular structure; friable; many fine roots; about 65 percent chert fragments; medium acid; clear smooth boundary.

B21t—9 to 12 inches; yellowish brown (10YR 5/6) silty clay; strong very fine angular blocky structure; very firm; common fine roots; few thin patchy clay films on faces of peds; about 5 percent chert fragments; medium acid; abrupt smooth boundary.

B22t—12 to 18 inches; mottled yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and yellowish red (5YR 5/6) clay; weak very fine subangular blocky structure; very firm; common fine roots; thin continuous clay films on faces of peds; about 5 percent chert fragments; medium acid; abrupt wavy boundary.

B3t—18 to 24 inches; yellowish brown (10YR 5/6) clay; many fine prominent yellowish red (5YR 4/6) mottles; weak very fine subangular blocky structure; very firm; common fine roots; about 10 percent chert fragments; neutral; abrupt irregular boundary.

R—24 inches; dolomite.

The depth to bedrock ranges from 20 to 40 inches. The chert content ranges from 15 to 70 percent in the A horizon. In some pedons it is as much as 35 percent in part of the B horizon but averages less than 15 percent.

The A horizon has hue of 10YR, value of 2 to 6, and chroma of 2 or 3. The B horizon has hue of dominantly 10YR or 7.5YR and value and chroma of 5 or 6. It is silty clay or clay.

Hartville series

The Hartville series consists of deep, somewhat poorly drained, slowly permeable soils formed in alluvium on terraces along the major streams. Slopes range from 0 to 5 percent.

Hartville soils are commonly adjacent to Claiborne and Sampsel soils. Claiborne soils are well drained and are on slopes above the Hartville soils. Sampsel soils have a mollic epipedon. They are lower on the landscape than the Hartville soils.

Typical pedon of Hartville silt loam, 0 to 2 percent slopes, about 2,712 feet north and 660 feet west of the southeast corner of sec. 2, T. 29 N., R. 15 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; weak very fine granular structure; very friable; few fine black concretions; very strongly acid; abrupt smooth boundary.

A2—7 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine granular structure; very friable; few fine black concretions (iron and manganese oxide); very strongly acid; abrupt smooth boundary.

B1—11 to 14 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine subangular blocky structure; friable; few fine black concretions (iron and manganese oxide); very strongly acid; clear wavy boundary.

B21t—14 to 20 inches; mottled brown (7.5YR 5/4) and yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; thin patchy clay films on faces of peds; few fine black concretions (iron and manganese oxide); very strongly acid; clear smooth boundary.

B22t—20 to 41 inches; mottled strong brown (7.5YR 5/6), yellowish brown (10YR 5/4), and gray (10YR 5/1) silty clay; weak fine subangular blocky structure; firm; thin patchy clay films on faces of peds; few fine black concretions (iron and manganese oxide); strongly acid; clear smooth boundary.

B23t—41 to 51 inches; mottled dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/4), and gray (10YR 5/1) clay; weak fine angular and subangular blocky structure; very firm; few fine black concretions (iron and manganese oxide); strongly acid; clear smooth boundary.

B24t—51 to 66 inches; mottled gray (10YR 6/1), yellowish brown (10YR 5/4), and pale brown (10YR 6/3) clay; weak fine angular blocky structure; very firm; few fine black concretions (iron and manganese oxide); strongly acid; clear smooth boundary.

C—66 to 78 inches; mottled yellowish brown (10YR 5/8) and light gray (10YR 7/1) very cherty clay; weak very fine angular blocky structure in most of the horizon, but light gray part is massive; very firm; few large black stains; about 60 percent chert fragments; neutral.

The solum ranges from 48 to 72 inches in thickness. The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The upper part of the B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. The lower part has hue of 10YR, value of 5 to 7, and chroma of 1 to 8. This horizon is silt loam to silty clay loam in the upper part and silty clay or clay in the lower part. Some pedons contain coarse fragments in the lower part of the solum and in the C horizon.

Melvin series

The Melvin series consists of deep, poorly drained, moderately permeable soils formed in alluvium on flood plains along the major streams. Slopes range from 0 to 2 percent.

Melvin soils are commonly adjacent to Cedargap, Nevin, and Nolin soils. In the control section of Cedargap soils, the content of chert is more than 35 percent. Nevin soils are somewhat poorly drained and are on low stream terraces. They contain more clay in the Bt horizon than the Melvin soils. Nolin soils are well drained and are higher on the landscape than the Melvin soils.

Typical pedon of Melvin silt loam, about 1,560 feet west and 770 feet north of the southeast corner of sec. 31, T. 32 N., R. 13 W.

Ap—0 to 10 inches; dark gray (10YR 4/1) silt loam; few fine faint brown (10YR 4/3) mottles; weak very fine

subangular blocky structure; very friable; few very fine pores; few very fine concretions (iron and manganese oxide); slightly acid; clear smooth boundary.

B2g—10 to 20 inches; gray (10YR 5/1) silt loam; common medium faint light gray (10YR 7/1) mottles; weak very fine subangular blocky structure; very friable; common very fine pores; common very fine brownish concretions (iron and manganese oxide); neutral; gradual smooth boundary.

Cg—20 to 60 inches; dark gray (10YR 4/1) silt loam; common fine faint dark grayish brown (10YR 4/2) and light gray (10YR 6/1) and few fine distinct yellowish brown (10YR 5/4) mottles; massive; firm; many fine pores; many fine and medium soft brown and black accumulations (iron and manganese oxide); slightly acid.

The solum is 20 to 40 inches thick. The depth to bedrock ranges from 5 to more than 20 feet. The content of coarse fragments is, by volume, 0 to 5 percent to a depth of 30 inches and ranges to as much as 20 percent below this depth.

The A horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 7, and chroma of 1 to 3. The B horizon has hue of N, 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1 or 2. It is silt loam or silty clay loam. The C horizon has hue of N or 10YR, value of 4 to 7, and chroma of 0 to 2. It is silt loam or silty clay loam.

Needleye series

The Needleye series consists of deep, moderately well drained, slowly permeable soils that have a fragipan. These soils formed in a thin mantle of wind-deposited silty material and in the underlying residuum of cherty limestone. They are on broad ridgetops. Slopes range from 0 to 5 percent.

Needleye soils commonly are adjacent to Bado, Viraton, and Wilderness soils. Bado soils are poorly drained and are in depressions. Viraton soils contain more sand in the control section than the Needleye soils. Also, they are higher on the landscape. In the control section of Wilderness soils, the content of chert is more than 35 percent.

Typical pedon of Needleye silt loam, 0 to 2 percent slopes, about 700 feet east and 2,200 feet south of the northwest corner of sec. 9, T. 29 N., R. 15 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam; moderate very fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

A2—4 to 7 inches; grayish brown (10YR 5/2) silt loam; moderate very fine subangular blocky structure; very friable; common very fine pores; many fine roots; about 5 percent chert fragments; strongly acid; abrupt smooth boundary.

B21t—7 to 15 inches; yellowish brown (10YR 5/6) silty clay loam; moderate very fine angular blocky structure; friable; many fine roots; thin discontinuous clay films on faces of peds; few very fine pores; about 5 percent chert fragments; very strongly acid; clear smooth boundary.

B22t—15 to 20 inches; mottled gray (10YR 6/1) and yellowish brown (10YR 5/4) silty clay loam; weak very fine subangular blocky structure; friable; common fine roots; thin continuous clay films on faces of peds; about 10 percent chert fragments; very strongly acid; clear smooth boundary.

B3—20 to 27 inches; mottled gray (10YR 6/1), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) silty clay loam; weak very fine subangular blocky structure; firm; about 10 percent chert fragments; very strongly acid; abrupt wavy boundary.

IIBx—27 to 42 inches; pale brown (10YR 6/3) very cherty silt loam; common fine faint light brownish gray (10YR 6/2) mottles; massive; very firm; brittle; few fine pores; about 65 percent chert fragments; very strongly acid; clear wavy boundary.

IIB2t—42 to 60 inches; red (2.5YR 4/6) very cherty silty clay loam; moderate fine angular blocky structure; friable; about 50 percent chert fragments; very strongly acid.

The solum is more than 60 inches thick. The content of chert is, by volume, less than 5 percent in the A horizon and in the upper part of the B horizon. It is less than 20 percent in the lower part of the B horizon and ranges from 20 to 70 percent in the fragipan. About 75 percent of the chert fragments in the solum range from 1/4 inch to 3 inches in diameter.

The A horizon has hue of 10YR or 7.5YR, 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 1 to 6. It is silty clay loam or cherty silty clay loam. The IIBx horizon is mottled cherty or very cherty silt loam or silty clay loam. It is strongly acid or very strongly acid.

Nevin series

The Nevin series consists of deep, somewhat poorly drained, moderately permeable soils. These soils formed in alluvium on low terraces along the major streams. Slopes range from 0 to 2 percent.

Nevin soils are commonly adjacent to Melvin and Nolin soils on flood plains. Melvin soils are poorly drained and Nolin soils well drained.

Typical pedon of Nevin silt loam, about 450 feet west and 160 feet north of the southeast corner of sec. 23, T. 32 N., R. 14 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; many fine roots; common very fine pores; slightly acid; abrupt smooth boundary.

A12—7 to 14 inches; very dark gray (10YR 3/1) silt loam, very dark grayish brown (10YR 3/2) crushed, dark gray (10YR 4/1) dry; moderate very fine granular structure; very friable; many fine roots; common fine pores; slightly acid; clear smooth boundary.
A3—14 to 25 inches; very dark gray (10YR 3/1) silty clay loam, very dark grayish brown (10YR 3/2) crushed, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; many fine roots; few fine pores; slightly acid; gradual smooth boundary.
B22t—25 to 39 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; few thin discontinuous clay films; common fine roots; few fine pores; slightly acid; gradual smooth boundary.
C—39 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; few fine roots; many fine pores; slightly acid.

The solum ranges from 36 to 60 inches in thickness. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. The content of clay in this horizon ranges from 32 to 35 percent.

Nolin series

The Nolin series consists of deep, well drained, moderately permeable soils formed in alluvium on flood plains along the major streams. Slopes range from 0 to 2 percent.

Nolin soils are commonly adjacent to Melvin and Nevin soils. Melvin soils are poorly drained and are lower on the landscape than the Nolin soils. Nevin soils are somewhat poorly drained and are on low stream terraces. They have a mollic epipedon that is more than 20 inches thick.

Typical pedon of Nolin silt loam, about 1,920 feet west and 700 feet north of the southeast corner of sec. 19, T. 31 N., R. 12 W.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 3/3) crushed; moderate very fine and fine granular structure; very friable; many fine roots; common fine and very fine pores; neutral; gradual smooth boundary.
B21—5 to 29 inches; dark brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; many fine roots; common fine and very fine pores; dark grayish brown (10YR 4/2) stains on faces of peds; neutral; gradual smooth boundary.
B22—29 to 38 inches; dark brown (10YR 4/3) silt loam; weak very fine subangular blocky structure; friable; common fine roots; many medium and fine pores; dark grayish brown (10YR 4/2) stains on faces of peds; neutral; gradual smooth boundary.
B23—38 to 49 inches; dark brown (10YR 4/3) silt loam; weak coarse platy structure parting to weak very fine and fine subangular blocky; very friable; common fine roots; many medium and fine pores; dark grayish brown (10YR 4/2) stains on faces of peds; neutral; gradual wavy boundary.
B24—49 to 60 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; many fine and very fine pores; dark grayish brown (10YR 4/2) stains on faces of peds; neutral.

The solum is 40 or more inches thick. The clay content in the control section ranges from 18 to 30 percent.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam. The C horizon, if it occurs, has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4.

Sampsel series

The Sampsel series consists of deep, poorly drained, slowly permeable soils formed in alluvium that washed in from adjacent upland areas of cherty limestone. These soils are on terraces along the major streams. Slopes range from 2 to 5 percent.

The Sampsel soils in this county are taxadjuncts to the Sampsel series because they do not have carbonates in the C horizon and have a higher content of coarse fragments than is defined as the range for the series. These differences, however, do not significantly affect the use or behavior of the soils.

Sampsel soils are commonly adjacent to Hartville and Nevin soils. Hartville soils do not have a mollic epipedon. Nevin soils are lower on the landscape than the Sampsel soils. Also, they contain less clay in the control section.

Typical pedon of Sampsel silty clay loam, 2 to 5 percent slopes, about 1,485 feet east and 3,135 feet south of the northwest corner of sec. 34, T. 29 N., R. 13 W.

A1—0 to 15 inches; black (10YR 2/1) silty clay loam; moderate very fine granular structure; very friable; many fine roots; many fine concretions (iron and manganese oxide); medium acid; clear smooth boundary.
B21t—15 to 22 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; firm; common fine roots; many black concretions (iron and manganese oxide); few very fine vesicular pores; medium acid; clear smooth boundary.
B22t—22 to 28 inches; gray (10YR 5/1) silty clay; common fine prominent yellowish brown (10YR 5/6)

and red (2.5YR 4/6) mottles; weak medium subangular blocky structure; firm; few fine roots; thin continuous clay films on faces of peds; many brown concretions (iron and manganese oxide) 2 to 4 millimeters in size; few very fine discontinuous pores; medium acid; clear smooth boundary.

B3t—28 to 36 inches; mottled yellowish brown (10YR 5/6), light gray (10YR 6/1), gray (10YR 5/1), and yellowish red (5YR 5/8) silty clay loam; firm; few fine roots; thin patchy clay films on faces of peds; about 10 percent pebbles; common black concretions (iron and manganese oxide); few fine pores; medium acid; clear smooth boundary.

C—36 to 60 inches; mottled gray (10YR 5/1), light gray (10YR 6/1), and yellowish brown (10YR 5/6) silty clay; massive; very firm; few fine roots; many black concretions (iron and manganese oxide); about 20 percent pebbles; few fine discontinuous pores; medium acid.

The solum ranges from 36 to 70 inches in thickness. The depth to bedrock is more than 6 feet.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The B horizon is silty clay loam or silty clay. It generally has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. Some of the mottles in the lower part, however, have a higher value or chroma. The C horizon is silty clay or clay. It generally has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. Some of the mottles, however, have a higher value or chroma.

Viraton series

The Viraton series consists of deep, moderately well drained, slowly permeable soils that have a fragipan. These soils formed in loess or loamy material and in the underlying cherty limestone residuum. They are on broad ridges and side slopes in the uplands. Slopes range from 2 to 9 percent.

Viraton soils commonly are adjacent to Bado, Needleye, and Wilderness soils. Bado soils are poorly drained and are in shallow depressions. Needleye soils contain less sand in the control section than the Viraton soils. Also, they are slightly lower on the landscape. In the control section of Wilderness soils, the content of chert is more than 35 percent. These soils are on slopes below the Viraton soils.

Typical pedon of Viraton silt loam, 5 to 9 percent slopes, about 530 feet east and 4,950 feet north of the southwest corner of sec. 5, T. 29 N., R. 15 W.

Ap—0 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak very fine granular structure; very friable; common fine roots; less than 5 percent chert fragments by volume; strongly acid; abrupt smooth boundary.

A2—7 to 10 inches; yellowish brown (10YR 5/6) silt loam; weak very fine granular structure; very friable; common fine roots; strongly acid; abrupt smooth boundary.

B21t—10 to 14 inches; brownish yellow (10YR 6/6) silty clay loam; weak very fine subangular blocky structure; friable; common fine roots; thin patchy yellowish brown (10YR 5/4) clay films; very strongly acid; clear smooth boundary.

B22t—14 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; firm; few fine roots; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; very strongly acid; abrupt smooth boundary.

IIBx—20 to 37 inches; mottled gray (10YR 6/1) and strong brown (7.5YR 5/6) very cherty silt loam; massive; brittle when moist; about 65 percent, by volume, chert fragments 2 to 75 millimeters in size and about 5 percent coarse chert fragments; strongly acid; abrupt wavy boundary.

IIB2t—37 to 46 inches; red (2.5YR 4/6) cherty clay; common fine distinct reddish brown (5YR 4/3) and few fine prominent dark gray (10YR 4/1) mottles; massive; firm; about 20 percent, by volume, chert fragments 2 to 75 millimeters in size and about 5 percent coarse chert fragments; very strongly acid; abrupt wavy boundary.

IIB3t—46 to 60 inches; mottled reddish brown (2.5YR 4/4), light gray (N 7/0), and brownish yellow (10YR 6/6) cherty clay; massive; firm; about 15 percent, by volume, chert fragments 2 to 75 millimeters in size; neutral.

The solum is more than 60 inches thick. The depth to the fragipan is 16 to 35 inches. The content of chert ranges, by volume, from 0 to 15 percent in the A horizon and the upper part of the B horizon, from 0 to 35 percent in the lower part of the B horizon, and from 15 to 80 percent in and below the fragipan.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. It is loam or silt loam. The B horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 3 to 6. It is silt loam, silty clay loam, or clay loam. The IIBt horizon generally has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 3 to 8. It is the cherty or very cherty analogs of silt loam, silty clay loam, silty clay, or clay.

Wilderness series

The Wilderness series consists of deep, moderately well drained, slowly permeable soils that have a fragipan. These soils formed in residuum of cherty limestone. They are on convex ridgetops and short, uneven side slopes in the uplands. Slopes range from 5 to 9 percent.

Wilderness soils are adjacent to Bado, Needleye, and Viraton soils. Bado soils are poorly drained and are in depressions. Needleye and Viraton are higher on the landscape than the Wilderness soils. Needleye soils are fine-silty and Viraton soils fine-loamy.

Typical pedon of Wilderness cherty silt loam, 5 to 9 percent slopes, about 1,350 feet east and 1,280 feet south of the northwest corner of sec. 25, T. 32 N., R. 16 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) cherty silt loam; weak very fine granular structure; very friable; many fine roots; about 30 percent chert fragments; strongly acid; abrupt smooth boundary.

A2—2 to 7 inches; pale brown (10YR 6/3) very cherty silt loam; weak very fine granular structure; very friable; many fine roots; about 50 percent chert fragments; strongly acid; gradual smooth boundary.

B1—7 to 18 inches; yellowish brown (10YR 5/4) cherty silt loam; weak very fine angular blocky structure; friable; common fine roots; about 35 percent chert fragments; very strongly acid; clear wavy boundary.

B2t—18 to 23 inches; yellowish brown (10YR 5/4) very cherty silt loam; few fine prominent yellowish red (5YR 4/8) mottles; weak very fine angular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; common fine roots; about 50 percent chert fragments; very strongly acid; abrupt wavy boundary.

IIBx—23 to 29 inches; mottled brownish yellow (10YR 6/6), gray (10YR 6/1), and light brownish gray (10YR 6/2) very cherty silty clay loam; massive; brittle; about 40 percent chert fragments; very strongly acid; clear wavy boundary.

IIB2t—29 to 60 inches; dark red (2.5YR 3/6) cherty silty clay; common coarse prominent grayish brown (10YR 5/2) and gray (10YR 6/1) mottles; moderate very fine subangular blocky structure; firm, plastic; about 15 percent chert fragments; very strongly acid.

The chert content in the solum averages 35 percent or more. The depth to the fragipan ranges from 15 to 29 inches.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The B horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. The clay content in this horizon averages as low as 25 percent in some pedons and as high as 35 percent in others. The IIBx horizon is mottled red, yellowish red, strong brown, pale brown, brownish yellow, light brownish gray, and gray. The IIB2t horizon has hue of 5YR or 2.5YR, value of 3 to 6, and chroma of 4 to 6.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

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.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

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.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

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.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.

Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.

Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.

Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a

slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

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.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

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 up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 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.

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 upper case letter represents the major horizons. Numbers or lower case 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 at the surface of a mineral soil.

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.

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. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

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 A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

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.

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

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones (in tables). Rock fragments 3 inches (7.5 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.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and

biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

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.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

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.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

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-size particles.

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 or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

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 feet.

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 insure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.5 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 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

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 profile below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

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 horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-76 at Mountain Grove, 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----	44.3	23.3	33.8	70	-5	0	1.86	.71	2.78	4	2.2
February---	49.1	27.1	38.1	73	-1	16	2.36	1.05	3.42	5	3.6
March------	56.7	33.8	45.3	82	9	104	3.54	1.64	5.08	7	3.6
April------	69.2	45.3	57.3	87	23	239	4.14	2.27	5.66	7	.5
May--------	76.7	53.8	65.3	88	32	474	4.47	2.14	6.37	8	.0
June-------	84.0	61.8	72.9	95	45	687	4.07	1.39	6.21	6	.0
July-------	88.9	66.0	77.5	101	49	853	3.87	1.57	5.73	6	.0
August-----	88.2	64.2	76.3	100	49	815	3.40	1.23	5.14	5	.0
September--	81.0	57.4	69.2	94	38	576	3.90	1.30	5.97	6	.0
October----	71.1	47.1	59.1	89	25	301	2.91	.80	4.60	5	.0
November---	56.5	35.3	46.0	76	11	59	3.30	1.48	4.78	6	2.1
December---	46.3	27.2	36.8	71	0	9	2.70	1.01	4.04	5	2.2
Yearly:											
Average--	67.7	45.2	56.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	102	-7	---	---	---	---	---	---
Total----	---	---	---	---	---	4,133	40.52	31.51	49.02	70	14.2

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-76 at Mountain Grove, 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 10	April 21	May 5
2 years in 10 later than--	April 4	April 16	April 29
5 years in 10 later than--	March 25	April 5	April 17
First freezing temperature in fall:			
1 year in 10 earlier than--	October 27	October 16	October 11
2 years in 10 earlier than--	November 1	October 22	October 15
5 years in 10 earlier than--	November 10	November 1	October 22

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-76 at Mountain Grove, 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	208	185	167
8 years in 10	216	193	174
5 years in 10	230	209	188
2 years in 10	243	224	201
1 year in 10	251	233	208

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
10C	Alsup silt loam, 4 to 9 percent slopes	1,109	0.3
10D	Alsup coarse cherty silt loam, 9 to 14 percent slopes	1,481	0.3
11A	Ashton silt loam, 0 to 2 percent slopes	2,255	0.5
11B	Ashton silt loam, 2 to 5 percent slopes	1,437	0.3
12A	Bado silt loam, 0 to 3 percent slopes	2,387	0.5
13A	Cedargap cherty silt loam, 0 to 3 percent slopes	24,353	5.6
14B	Claiborne silt loam, 2 to 5 percent slopes	2,177	0.5
14C	Claiborne silt loam, 5 to 9 percent slopes	3,285	0.8
15D	Clarksville cherty silt loam, 9 to 14 percent slopes	44,797	10.2
15F	Clarksville cherty silt loam, 14 to 50 percent slopes	94,584	21.5
17C	Coulstone cherty loam, 5 to 9 percent slopes	1,765	0.4
17D	Coulstone cherty loam, 9 to 14 percent slopes	2,071	0.5
17F	Coulstone cherty loam, 14 to 30 percent slopes	3,035	0.7
18C	Doniphan cherty silt loam, 5 to 9 percent slopes	21,202	4.8
18D	Doniphan cherty silt loam, 9 to 14 percent slopes	17,087	3.9
18F	Doniphan cherty silt loam, 14 to 30 percent slopes	15,423	3.5
19	Elsah silt loam	3,772	0.9
20D	Gasconade-Rock outcrop complex, 2 to 20 percent slopes	3,341	0.8
22C	Gatewood cherty silt loam, 2 to 9 percent slopes	1,648	0.4
22D	Gatewood cherty silt loam, 9 to 14 percent slopes	3,298	0.8
22E	Gatewood cherty silt loam, 14 to 30 percent slopes	2,203	0.5
23A	Hartville silt loam, 0 to 2 percent slopes	627	0.1
23B	Hartville silt loam, 2 to 5 percent slopes	1,590	0.4
25	Melvin silt loam	890	0.2
26A	Needleye silt loam, 0 to 2 percent slopes	1,984	0.5
26B	Needleye silt loam, 2 to 5 percent slopes	2,422	0.6
27	Nevin silt loam	802	0.2
28	Nolin silt loam	4,792	1.1
29	Nolin silt loam, frequently flooded	1,052	0.2
30G	Rock outcrop-Gasconade complex, 30 to 50 percent slopes	3,866	0.9
31B	Sampsel silty clay loam, 2 to 5 percent slopes	1,327	0.3
32B	Viraton silt loam, 2 to 5 percent slopes	56,132	12.8
32C	Viraton silt loam, 5 to 9 percent slopes	34,170	7.8
33C	Wilderness cherty silt loam, 5 to 9 percent slopes	75,396	17.2
	Total	437,760	100.0

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 a footnote]

Map symbol	Soil name
11A	Ashton silt loam, 0 to 2 percent slopes
11B	Ashton silt loam, 2 to 5 percent slopes
12A	Bado silt loam, 0 to 3 percent slopes*
14B	Claiborne silt loam, 2 to 5 percent slopes
19	Elsah silt loam**
23A	Hartville silt loam, 0 to 2 percent slopes
23B	Hartville silt loam, 2 to 5 percent slopes
25	Melvin silt loam*, **
26A	Needleye silt loam, 0 to 2 percent slopes
26B	Needleye silt loam, 2 to 5 percent slopes
27	Nevin silt loam
28	Nolin silt loam
29	Nolin silt loam, frequently flooded**
31B	Sampsel silty clay loam, 2 to 5 percent slopes*
32B	Viraton silt loam, 2 to 5 percent slopes

* Only the areas that are adequately drained are considered prime farmland.
** The only areas considered prime farmland are those that are protected from flooding or are flooded during the growing season once or less in 2 years.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Tall fescue	Alfalfa hay
	Bu	Bu	Bu	Bu	Ton	AUM*	Ton
10C---------- Alsup	45	18	22	45	2.7	5.0	---
10D---------- Alsup	---	---	---	---	---	2.0	---
11A---------- Ashton	105	40	40	90	5.0	8.0	5.0
11B---------- Ashton	95	35	40	75	5.0	8.0	5.0
12A---------- Bado	45	---	25	---	3.0	5.5	---
13A---------- Cedargap	55	35	30	50	3.0	6.0	3.0
14B---------- Claiborne	85	35	35	60	3.5	6.0	3.3
14C---------- Claiborne	80	30	30	50	3.0	6.0	3.3
15D---------- Clarksville	---	---	---	---	1.7	3.4	---
15F---------- Clarksville	---	---	---	---	---	2.5	---
17C---------- Coulstone	---	---	---	---	1.9	3.8	---
17D---------- Coulstone	---	---	---	---	1.7	3.4	---
17F---------- Coulstone	---	---	---	---	---	2.6	---
18C---------- Doniphan	---	---	25	---	2.5	5.0	---
18D---------- Doniphan	---	---	---	---	2.1	4.2	---
18F---------- Doniphan	---	---	---	---	1.7	3.4	---
19---------- Elsah	75	39	52	60	4.6	7.0	4.0
20D---------- Gasconade-Rock outcrop	---	---	---	---	---	---	---
22C---------- Gatewood	---	---	18	---	2.1	4.2	---
22D---------- Gatewood	---	---	---	---	1.8	3.6	---
22E---------- Gatewood	---	---	---	---	---	3.0	---

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Tall fescue	Alfalfa hay
	Bu	Bu	Bu	Bu	Ton	AUM*	Ton
23A---------- Hartville	70	35	25	70	2.5	5.0	3.0
23B---------- Hartville	65	35	25	65	2.7	5.0	3.0
25---------- Melvin	85	35	30	80	3.0	6.0	---
26A---------- Needleye	60	30	35	60	3.2	6.4	3.0
26B---------- Needleye	55	26	30	55	2.8	5.6	3.0
27---------- Nevin	114	43	---	---	4.8	7.0	---
28---------- Nolin	105	45	40	95	4.5	8.0	5.0
29---------- Nolin	90	35	---	75	4.0	8.0	---
30G---------- Rock outcrop-Gasconade	---	---	---	---	---	---	---
31B---------- Sampsel	65	30	30	70	2.5	5.0	---
32B---------- Viraton	48	21	26	48	2.5	5.0	3.0
32C---------- Viraton	34	15	18	34	1.8	3.5	---
33C---------- Wilderness	---	---	17	---	2.0	4.0	---

* 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. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
10C---------- Alsup	4o	Slight	Slight	Slight	Slight	Northern red oak----	60	Northern red oak, white oak, black oak.
						White oak----------	---	
						Black oak----------	---	
10D---------- Alsup	4f	Severe	Slight	Slight	Slight	Northern red oak----	60	Northern red oak, white oak, black oak.
						White oak----------	---	
						Black oak----------	---	
11A, 11B---------- Ashton	1o	Slight	Slight	Slight	Severe	Northern red oak----	85	Eastern white pine, yellow-poplar, black walnut, sweetgum.
						Pin oak----------	103	
						Yellow-poplar-------	95	
						Sweetgum----------	77	
						Shumard oak---------	94	
12A---------- Bado	5w	Severe	Moderate	Moderate	Severe	White oak----------	48	Black oak, sweetgum, pin oak, green ash.
						Black oak----------	52	
						Post oak----------	50	
13A---------- Cedargap	3f	Slight	Moderate	Slight	Moderate	Black oak----------	66	Black oak, shortleaf pine.
14B, 14C---------- Claiborne	3o	Slight	Slight	Slight	Moderate	Yellow-poplar-------	90	Yellow-poplar, black walnut, shortleaf pine, loblolly pine.
						Shortleaf pine------	66	
						White oak----------	70	
						Northern red oak----	70	
						Black oak----------	70	
15D---------- Clarksville	4f	Moderate	Moderate	Slight	Slight	White oak----------	55	White oak, shortleaf pine, sweetgum, yellow-poplar, green ash.
						Shortleaf pine------	---	
15F---------- Clarksville	4f	Moderate	Moderate	Slight	Slight	White oak----------	55	White oak, shortleaf pine, yellow-poplar, green ash.
						Shortleaf pine------	---	
17C, 17D---------- Coulstone	4f	Moderate	Moderate	Slight	Slight	Shortleaf pine------	60	Shortleaf pine, white oak, black oak, scarlet oak.
						White oak----------	55	
						Black oak----------	60	
						Scarlet oak---------	60	
17F---------- Coulstone	4f	Moderate	Moderate	Slight	Slight	Shortleaf pine------	60	Shortleaf pine, white oak, black oak, scarlet oak.
						White oak----------	55	
						Black oak----------	60	
						Scarlet oak---------	60	
18C, 18D---------- Doniphan	4o	Slight	Slight	Slight	Slight	White oak----------	65	Shortleaf pine, white oak, sweetgum, yellow-poplar, green ash, black oak.
						Shortleaf pine------	60	
18F---------- Doniphan	4r	Moderate	Moderate	Slight	Slight	White oak----------	65	Shortleaf pine, white oak, sweetgum, yellow-poplar, green ash, black oak.
						Shortleaf pine------	60	
19---------- Elsah	3f	Slight	Moderate	Slight	Moderate	Eastern cottonwood--	95	Yellow-poplar, green ash, sweetgum.
						American sycamore---	---	
						Sweetgum----------	---	
						Red maple----------	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
20D*:								
Gasconade	5d	Moderate	Moderate	Moderate	Slight	Eastern redcedar	30	Eastern redcedar.
						Chinkapin oak	---	
						Redbud	---	
						Sugar maple	---	
Rock outcrop.								
22C, 22D Gatewood	5c	Slight	Severe	Severe	Slight	White oak	45	Eastern redcedar, shortleaf pine.
						Eastern redcedar	---	
						Post oak	---	
						Black oak	---	
22E Gatewood	5c	Moderate	Severe	Severe	Slight	White oak	45	Eastern redcedar, shortleaf pine.
						Eastern redcedar	---	
						Post oak	---	
						Black oak	---	
23A, 23B Hartville	5c	Slight	Severe	Severe	Slight	White oak	55	Eastern cottonwood, yellow-poplar, white oak, pin oak.
25 Melvin	2w	Severe	Severe	Slight	Slight	Pin oak	88	Pin oak, sweetgum, red maple, eastern cottonwood, pecan.
						Red maple	---	
						Swamp white oak	---	
						Eastern cottonwood	---	
26A, 26B Needleye	4d	Slight	Moderate	Moderate	Slight	White oak	60	White oak, shortleaf pine, black oak.
						Black oak	---	
						Shortleaf pine	---	
28, 29 Nolin	3o	Slight	Slight	Slight	Severe	Sweetgum	85	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak.
30G*:								
Rock outcrop.								
Gasconade	5d	Severe	Severe	Moderate	Slight	Eastern redcedar	30	Eastern redcedar.
						Chinkapin oak	---	
						Redbud	---	
						Sugar maple	---	
31B Sampsel	---	---	---	---	---		---	Green ash, pin oak, American sycamore, eastern cottonwood.
32B, 32C Viraton	4d	Slight	Moderate	Moderate	Slight	White oak	55	White oak, black oak, shortleaf pine.
						Black oak	60	
						Shortleaf pine	56	
33C Wilderness	4d	Slight	Moderate	Moderate	Slight	White oak	55	White oak, shortleaf pine, black oak.
						Black oak	---	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
10C, 10D---------- Alsup	Silky dogwood-----	Autumn-olive, Amur honeysuckle, eastern redbud.	Eastern redcedar, Amur maple, green ash, sugar maple.	European alder, eastern white pine, shortleaf pine, Scotch pine.	---
11A, 11B. Ashton					
12A---------- Bado	Silky dogwood-----	Alternateleaf dogwood, Amur honeysuckle, autumn-olive.	Amur maple, jack pine, eastern redcedar, green ash, common hackberry.	Pin oak, shortleaf pine, eastern white pine.	---
13A---------- Cedargap	Silky dogwood-----	Flowering dogwood, eastern redbud, Amur honeysuckle, autumn-olive.	Eastern redcedar, jack pine, green ash, Amur maple.	Eastern white pine, pin oak.	Silver maple.
14B, 14C. Claiborne					
15D, 15F---------- Clarksville	Silky dogwood-----	Eastern redbud, Amur honeysuckle, autumn-olive.	Eastern redcedar, jack pine, green ash.	---	---
17C, 17D, 17F----- Coulstone	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar.	Eastern white pine, green ash, shortleaf pine, Scotch pine.	Pin oak, silver maple.
18C, 18D, 18F----- Doniphan	Silky dogwood-----	Flowering dogwood, eastern redbud, Amur honeysuckle, autumn-olive, American hazel, American plum, eastern hophornbeam, Tatarian honeysuckle.	Eastern redcedar, jack pine.	Shadblow serviceberry.	---
19---------- Elsah	Gray dogwood, redosier dogwood.	Autumn-olive, silky dogwood.	Amur maple, Russian-olive, baldcypress.	Eastern white pine, Norway spruce.	Eastern cottonwood, red maple, American sycamore.
20D*: Gasconade-------- Rock outcrop.	Mockorange, winged euonymus.	American plum, Amur honeysuckle, autumn-olive, lilac, Tatarian honeysuckle.	Eastern redcedar, jack pine, Siberian elm, Amur maple.	Green ash---------	---
22C, 22D, 22E----- Gatewood	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar, jack pine.	Green ash, pin oak, eastern white pine, Scotch pine.	Silver maple.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
23A, 23B---------- Hartville	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, oriental arborvitae, eastern redcedar.	Eastern white pine, green ash, Norway spruce.	Eastern cottonwood, silver maple.
25. Melvin					
26A, 26B---------- Needleye	Silky dogwood-----	Alternateleaf dogwood, autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, common hackberry, jack pine.	Shortleaf pine, eastern white pine.	---
27---------- Nevin	Redosier dogwood, gray dogwood.	Bloodtwig dogwood, Tatarian honeysuckle, Siberian dogwood.	Eastern redcedar, Amur maple.	Red pine, Norway spruce, common hackberry.	Eastern cottonwood, silver maple.
28, 29. Nolin					
30G*: Rock outcrop.					
Gasconade---------	Mockorange, winged euonymus.	American plum, Amur honeysuckle, autumn-olive, lilac, Tatarian honeysuckle.	Eastern redcedar, jack pine, Siberian elm, Amur maple.	Green ash---------	---
31B---------- Sampsel	Silky dogwood-----	Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar.	Pin oak, green ash, Austrian pine, red pine, Scotch pine.	Eastern cottonwood, eastern white pine.
32B, 32C---------- Viraton	Silky dogwood-----	Alternateleaf dogwood, autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, common hackberry, jack pine.	Shortleaf pine, eastern white pine.	---
33C---------- Wilderness	Fragrant sumac----	Flowering dogwood, eastern redbud, Amur honeysuckle, eastern redcedar, jack pine, autumn-olive, green ash, Amur honeysuckle.	Black locust------	Pin oak, white oak	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
10C Alsup	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Moderate: small stones, too clayey.
10D Alsup	Moderate: small stones, slope.	Moderate: small stones, slope.	Severe: slope.	Moderate: small stones.	Moderate: slope, small stones.
11A, 11B Ashton	Severe: floods.	Slight	Slight	Slight	Slight.
12A Bado	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
13A Cedargap	Severe: floods, small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
14B Claiborne	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
14C Claiborne	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight	Moderate: small stones.
15D Clarksville	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
15F Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
17C Coulstone	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight	Severe: small stones, droughty.
17D Coulstone	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones, droughty.
17F Coulstone	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope, droughty.
18C Doniphan	Severe: small stones.	Severe: small stones.	Severe: small stones.	Moderate: large stones.	Severe: small stones.
18D Doniphan	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Moderate: large stones.	Severe: small stones.
18F Doniphan	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: large stones, slope.	Severe: small stones, slope.
19 Elsah	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
20D*: Gasconade	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, small stones.	Severe: large stones.	Severe: large stones, thin layer.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
20D*: Rock outcrop.					
22C, 22D---------- Gatewood	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight----------	Severe: small stones.
22E---------- Gatewood	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
23A---------- Hartville	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
23B---------- Hartville	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
25---------- Melvin	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
26A---------- Needleye	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty.
26B---------- Needleye	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty.
27---------- Nevin	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Slight----------	Slight.
28---------- Nolin	Severe: floods.	Slight----------	Moderate: floods.	Severe: erodes easily.	Moderate: floods.
29---------- Nolin	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.
30G*: Rock outcrop.					
Gasconade----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: large stones, slope, small stones.	Severe: large stones, slope.	Severe: large stones, slope, thin layer.
31B---------- Sampsel	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, percs slowly, wetness.	Severe: erodes easily.	Moderate: wetness.
32B---------- Viraton	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: wetness, droughty.
32C---------- Viraton	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, droughty.
33C---------- Wilderness	Severe: wetness.	Moderate: wetness, small stones.	Severe: slope, small stones, wetness.	Moderate: wetness.	Severe: droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
10C---- Alsup	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
10D---- Alsup	Poor	Fair	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
11A, 11B---- Ashton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
12A---- Bado	Fair	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
13A---- Cedargap	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
14B---- Claiborne	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
14C---- Claiborne	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
15D, 15F---- Clarksville	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
17C, 17D, 17F---- Coulstone	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
18C, 18D---- Doniphan	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
18F---- Doniphan	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
19---- Elsah	Fair	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
20D*: Gasconade----	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
22C, 22D, 22E---- Gatewood	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
23A---- Hartville	Fair	Good	Good	Good	Good	Fair	Good	Good	Good	Fair.
23B---- Hartville	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
25---- Melvin	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
26A, 26B---- Needleye	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
27---- Nevin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
28, 29---- Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
30G*: Rock outcrop.										
Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
31B Sampsel	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
32B, 32C Viraton	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
33C Wilderness	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
10C---------- Alsup	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: small stones.
10D---------- Alsup	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, too clayey, small stones.
11A, 11B---------- Ashton	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Modereate: floods.	Slight.
12A---------- Bado	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
13A---------- Cedargap	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: small stones.
14B---------- Claiborne	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: small stones.
14C---------- Claiborne	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: small stones.
15D---------- Clarksville	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: small stones.
15F---------- Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
17C---------- Coulstone	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Severe: small stones, droughty.
17D---------- Coulstone	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: frost action, slope.	Severe: small stones, droughty.
17F---------- Coulstone	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope, droughty.
18C---------- Doniphan	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: small stones.
18D---------- Doniphan	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Severe: small stones.
18F---------- Doniphan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: small stones, slope.
19---------- Elsah	Severe: cutbanks cave, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods, large stones.	Severe: floods.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
20D*: Gasconade	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
Rock outcrop.						
22C---- Gatewood	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: small stones.
22D---- Gatewood	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: small stones.
22E---- Gatewood	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: small stones, slope.
23A, 23B---- Hartville	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
25---- Melvin	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, wetness, floods.	Severe: wetness, floods.
26A, 26B---- Needleye	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness, droughty.
27---- Nevin	Severe: wetness.	Severe: floods.	Severe: wetness, floods.	Severe: floods.	Severe: frost action, low strength.	Slight.
28, 29---- Nolin	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
30G*: Rock outcrop.						
Gasconade	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
31B---- Sampsel	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
32B---- Viraton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
32C---- Viraton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
33C---- Wilderness	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10C Alsup	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness.	Poor: too clayey, hard to pack.
10D Alsup	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness, slope.	Poor: too clayey, hard to pack, small stones.
11A, 11B Ashton	Moderate: floods.	Moderate: seepage.	Moderate: floods.	Moderate: floods.	Good.
12A Bado	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness, thin layer.
13A Cedargap	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.
14B Claiborne	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
14C Claiborne	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
15D Clarksville	Moderate: slope.	Severe: seepage, slope.	Severe: seepage, too clayey.	Severe: seepage.	Poor: too clayey, small stones.
15F Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
17C Coulstone	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
17D Coulstone	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
17F Coulstone	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
18C Doniphan	Moderate: percs slowly.	Moderate: seepage, slope, large stones.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
18D Doniphan	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
18F Doniphan	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, hard to pack, slope.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
19---------- Elsah	Severe: floods, large stones.	Severe: seepage, floods, large stones.	Severe: floods, seepage, large stones.	Severe: floods, seepage.	Poor: seepage, large stones.
20D*: Gasconade----------	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, large stones.
Rock outcrop.					
22C, 22D---------- Gatewood	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
22E---------- Gatewood	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
23A---------- Hartville	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
23B---------- Hartville	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
25---------- Melvin	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
26A---------- Needleye	Severe: percs slowly, wetness.	Slight----------	Severe: wetness, too clayey.	Moderate: wetness.	Poor: small stones, too clayey, hard to pack.
26B---------- Needleye	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: small stones, too clayey, hard to pack.
27---------- Nevin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
28, 29---------- Nolin	Severe: floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
30G*: Rock outcrop.					
Gasconade----------	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
31B---------- Sampsel	Severe: wetness, percs slowly.	Moderate: slope.	Severe: depth to rock, wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
32B---------- Viraton	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Poor: small stones.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
32C---------- Viraton	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
33C---------- Wilderness	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
10C---------- Alsup	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
10D---------- Alsup	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
11A, 11B---------- Ashton	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
12A---------- Bado	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
13A---------- Cedargap	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
14B, 14C---------- Claiborne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
15D---------- Clarksville	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
15F---------- Clarksville	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
17C, 17D---------- Coulstone	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
17F---------- Coulstone	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope, area reclaim.
18C, 18D---------- Doniphan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
18F---------- Doniphan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
19---------- Elsah	Poor: large stones.	Improbable: small stones, large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
20D*: Gasconade----------	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
Rock outcrop.				
22C, 22D---------- Gatewood	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
22E---------- Gatewood	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
23A, 23B---------- Hartville	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: large stones, thin layer.
25---------- Melvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
26A, 26B---------- Needleye	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
27---------- Nevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
28, 29---------- Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
30G*: Rock outcrop.				
Gasconade----------	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
31B---------- Sampsel	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
32B, 32C---------- Viraton	Fair: wetness, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
33C---------- Wilderness	Fair: large stones, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
10C---- Alsup	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack, large stones.	Slope----	Wetness, slope, erodes easily.	Large stones, erodes easily.	Large stones, erodes easily.
10D---- Alsup	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Slope----	Wetness, droughty, slope.	Slope, large stones, wetness.	Large stones, slope, droughty.
11A---- Ashton	Moderate: seepage.	Severe: piping.	Deep to water	Favorable----	Erodes easily	Erodes easily.
11B---- Ashton	Moderate: seepage, slope.	Severe: piping.	Deep to water	Erodes easily, slope.	Erodes easily	Erodes easily.
12A---- Bado	Slight----	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
13A---- Cedargap	Severe: seepage.	Moderate: large stones.	Deep to water	Droughty, floods.	Large stones---	Large stones.
14B, 14C---- Claiborne	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----	Favorable----	Favorable.
15D, 15F---- Clarksville	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
17C---- Coulstone	Severe: seepage.	Slight----	Deep to water	Slope, droughty.	Favorable----	Droughty.
17D, 17F---- Coulstone	Severe: seepage, slope.	Slight----	Deep to water	Slope, droughty.	Slope----	Slope, droughty.
18C---- Doniphan	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Droughty, slope.	Favorable----	Droughty.
18D, 18F---- Doniphan	Severe: slope.	Moderate: hard to pack.	Deep to water	Droughty, slope.	Slope----	Slope, droughty.
19---- Elsah	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones---	Large stones, erodes easily.	Large stones, erodes easily.
20D*: Gasconade--------	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty.	Large stones, depth to rock.	Large stones, droughty.
Rock outcrop.						
22C---- Gatewood	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Large stones, depth to rock.	Large stones.
22D, 22E---- Gatewood	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
23A---------- Hartville	Slight---------	Moderate: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
23B---------- Hartville	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
25---------- Melvin	Moderate: seepage.	Severe: piping, wetness.	Floods---------	Wetness, erodes easily, floods.	Erodes easily, wetness.	Wetness, erodes easily.
26A---------- Needleye	Slight---------	Severe: hard to pack.	Percs slowly---	Wetness, droughty, percs slowly.	Wetness, large stones, erodes easily.	Erodes easily, droughty, rooting depth.
26B---------- Needleye	Moderate: slope.	Severe: hard to pack.	Percs slowly, slope.	Wetness, droughty, percs slowly.	Wetness, large stones, erodes easily.	Erodes easily, droughty, rooting depth.
27---------- Nevin	Moderate: seepage.	Moderate: wetness.	Frost action---	Wetness--------	Erodes easily, wetness.	Erodes easily.
28, 29---------- Nolin	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
30G*: Rock outcrop.						
Gasconade--------	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
31B---------- Sampsel	Moderate: depth to rock, slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
32B, 32C---------- Viraton	Moderate: slope.	Moderate: wetness, piping.	Percs slowly, slope.	Wetness, droughty, percs slowly.	Erodes easily, wetness.	Erodes easily, droughty.
33C---------- Wilderness	Moderate: slope.	Moderate: large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness.	Large stones, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
10C---------- Alsup	0-5	Silt loam--------	CL	A-6	0-20	85-100	80-100	80-100	80-100	30-40	11-20
	5-25	Silty clay loam, silty clay.	CL	A-7	0-15	90-100	85-100	85-100	85-100	40-50	20-30
	25-49	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-15	90-100	85-100	85-100	85-100	40-60	25-40
	49	Weathered bedrock									
10D---------- Alsup	0-6	Cherty silt loam, silt loam.	CL, GM	A-2-6, A-6	15-30	60-100	55-100	50-100	35-90	20-35	11-20
	6-25	Silty clay loam, silty clay.	CL	A-7	0-15	90-100	85-100	85-100	85-100	40-50	20-30
	25-45	Silty clay, clay	CL, CH	A-7	0-15	100	100	95-100	90-100	40-60	25-40
	45	Weathered bedrock.									
11A, 11B---------- Ashton	0-9	Silt loam--------	ML, CL	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	9-40	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	80-100	25-42	5-20
	40-60	Silt loam, loam, fine sandy loam.	ML, CL, SM, CL-ML	A-4, A-6	0-5	90-100	85-100	65-95	40-90	<40	NP-20
12A---------- Bado	0-13	Silt loam--------	ML	A-4	0	100	95-100	90-100	75-95	25-35	3-10
	13-17	Silty clay loam	CL	A-6	0	95-100	95-100	90-100	80-100	30-40	15-25
	17-32	Clay, silty clay	CL, CH	A-7	0	95-100	85-100	80-100	75-100	45-70	30-45
	32-65	Silt loam, silty clay loam, gravelly silty clay loam.	CL	A-6	0	65-95	60-95	55-90	50-90	30-40	11-18
13A---------- Cedargap	0-8	Cherty silt loam	SM, GM	A-1, A-2-4, A-4	2-15	40-85	30-75	20-60	15-50	25-35	3-9
	8-25	Very cherty silt loam, cherty silt loam, cherty loam.	SM, GM	A-1, A-2-4, A-4	2-15	40-85	30-75	20-60	15-50	25-35	3-9
	25-60	Very cherty silt loam, very cherty silty clay loam, very cherty clay loam.	GC	A-2-6, A-6	5-20	25-50	20-50	15-45	15-40	30-40	15-25
14B, 14C---------- Claiborne	0-6	Silt loam--------	ML, CL, CL-ML	A-4	0-5	85-100	70-95	65-90	55-80	24-35	4-10
	6-60	Silty clay loam, cherty silty clay loam.	CL, ML	A-4, A-6	0-5	85-100	70-95	65-90	60-80	28-40	8-20
15D, 15F---------- Clarksville	0-16	Very cherty silt loam, cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2-4, A-2-6	5-20	30-70	10-60	5-50	5-35	20-40	5-15
	16-51	Very cherty silty clay loam, very cherty silty clay, cherty silty clay loam.	GC, SC, SP-SC, GP-GC	A-2-6, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
	51-60	Very cherty silty clay, very cherty clay.	GC, SC, GP-GC, SP-SC	A-2-7, A-7	5-20	30-70	10-60	10-50	10-45	55-75	35-45

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
17C, 17D, 17F---- Coulstone	0-14	Cherty loam------	GM-GC, GC, SM-SC, SC	A-4, A-2-4	0-10	40-70	35-65	30-55	25-45	20-30	5-10
	14-63	Very cherty sandy loam, very gravelly sandy loam, very cherty loam.	SM, GM, GC, SC	A-4, A-2-4, A-1-b	0-10	40-70	30-65	25-55	20-45	15-30	2-10
18C, 18D, 18F---- Doniphan	0-10	Very cherty silt loam.	CL-ML, GM, GM-GC, SM-SC	A-4	5-30	50-80	45-70	45-65	35-60	20-30	2-8
	10-14	Silt loam, silty clay loam.	CL	A-6	5-30	85-100	85-100	70-85	50-70	30-40	15-25
	14-60	Clay------------	CH, MH	A-7	0-5	90-100	90-100	85-100	70-95	51-70	25-35
19---------- Elsah	0-6	Silt loam--------	CL	A-4, A-6	0-15	95-100	90-100	90-100	85-100	22-32	8-15
	6-20	Cherty loam, very cherty loam, cherty silt loam.	SM, ML, CL, SC	A-2, A-4	15-60	80-90	70-85	60-80	30-70	<30	NP-8
	20-60	Very cherty loam, very cobbly loam, very cherty silt loam.	GM, GP-GM	A-1	60-85	20-50	20-45	20-40	10-25	<30	NP-6
20D*: Gasconade-------	0-15	Extremely flaggy silty clay loam, extremely flaggy silty clay.	CL	A-6	20-70	70-85	70-85	60-75	55-65	30-40	15-25
	15-19	Flaggy silty clay, flaggy clay, extremely flaggy clay.	GC	A-2-7	20-70	40-50	40-50	30-40	20-35	55-65	35-45
	19	Unweathered bedrock.									
Rock outcrop.											
22C, 22D, 22E---- Gatewood	0-9	Cherty silt loam, very cherty silt loam.	CL, GC, SC	A-4, A-6, A-2	10-30	70-90	20-75	15-70	10-65	25-35	7-15
	9-24	Silty clay, cherty clay, clay.	CH	A-7	5-15	80-95	70-90	60-85	60-85	55-75	30-45
	24	Unweathered bedrock.									
23A, 23B---------- Hartville	0-11	Silt loam--------	ML, CL	A-4, A-6	0-5	95-100	95-100	80-95	70-90	30-40	7-15
	11-20	Silt loam, silty clay loam.	CL	A-6, A-7	0-10	95-100	95-100	90-98	85-95	35-45	20-25
	20-66	Silty clay, clay	CH	A-7	0-10	95-100	95-100	90-98	85-95	50-60	30-40
	66-78	Very cherty silty clay, cherty silty clay, very cherty clay.	CH, GC, SC	A-7	5-35	60-85	50-80	45-75	35-65	50-60	30-40
25---------- Melvin	0-10	Silt loam--------	CL, CL-ML, ML	A-4	0	95-100	90-100	80-100	80-95	25-35	4-10
	10-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	80-95	25-40	5-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
26A, 26B--------- Needleye	0-7	Silt loam---------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-100	80-90	25-35	7-15
	7-27	Silty clay loam, silty clay, cherty silty clay loam.	CL	A-6, A-7	0-5	85-100	85-100	80-100	70-90	35-45	15-22
	27-42	Cherty silty clay loam, cherty silt loam, very cherty silt loam.	SC, GC, CL	A-2-6, A-6	5-25	40-75	35-65	30-65	30-60	30-40	11-20
	42-60	Cherty clay, cherty silty clay, very cherty silty clay loam.	SC, GC, CH, MH	A-2-7, A-7	5-25	50-75	35-65	30-65	30-60	50-75	25-40
27---------- Nevin	0-14	Silt loam, silty clay loam.	CL, OL	A-6, A-7	0	100	100	100	90-95	35-45	10-20
	14-60	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	40-50	20-30
28, 29---------- Nolin	0-5	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	5-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
30G*: Rock outcrop.											
Gasconade-------	0-15	Flaggy silty clay loam.	CL	A-6	20-70	70-85	70-85	60-75	55-65	30-40	15-25
	15-19	Flaggy silty clay, flaggy clay.	GC	A-2-7	20-70	40-50	40-50	30-40	20-35	55-65	35-45
	19	Unweathered bedrock.									
31B---------- Sampsel	0-15	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-99	35-50	15-25
	15-60	Silty clay loam, silty clay, clay.	CH	A-7	0	100	100	97-100	95-100	52-75	35-47
32B, 32C--------- Viraton	0-10	Silt loam---------	CL, CL-ML	A-4, A-6	0-5	90-100	75-100	70-95	60-75	20-30	5-11
	10-20	Silt loam, silty clay loam, cherty silty clay loam.	CL, SC	A-4, A-6	0-5	85-100	50-100	50-95	45-75	25-35	8-15
	20-37	Cherty silt loam, very cherty silt loam.	SC, CL, GC	A-2-4, A-2-6, A-4, A-6	0-15	50-85	20-65	20-55	20-55	25-35	8-15
	37-60	Cherty silty clay loam, clay, cherty clay.	SC, CL, GC	A-2-6, A-2-7, A-6, A-7	0-15	40-100	20-100	20-90	20-80	30-48	11-25
33C---------- Wilderness	0-7	Cherty silt loam, very cherty silt loam.	SM-SC, SC, SP-SC, GC	A-1, A-4, A-2-4	0-10	60-85	50-75	20-50	10-40	20-30	5-10
	7-23	Very cherty silty clay loam, cherty silt loam, very cherty silt loam.	GC, GP-GC, SC, SP-SC	A-6, A-2-6	5-15	40-70	20-60	10-50	10-40	25-40	10-20
	23-29	Very cherty silt loam, very cherty silty clay loam.	GM-GC, GC, GP-GC	A-1, A-2-4, A-2-6	10-40	30-60	10-45	10-40	5-35	20-40	5-15
	29-60	Very cherty silty clay, cherty silty clay.	GC, GP-GC	A-2-6	10-40	30-60	10-45	10-40	5-35	25-40	15-25

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
10C----------	0-5	20-30	1.20-1.50	0.6-2.0	0.16-0.20	5.1-7.3	Low----------	0.37	3	6	.5-2
Alsup	5-25	35-45	1.20-1.50	0.2-0.6	0.12-0.17	4.5-6.0	Moderate-----	0.37			
	25-49	35-50	1.30-1.50	0.2-0.6	0.10-0.17	3.6-7.8	High---------	0.37			
	49	---	---	---	---	---	----------	---			
10D----------	0-6	20-30	1.20-1.50	0.6-2.0	0.12-0.18	5.1-7.3	Low----------	0.28	3	8	.5-2
Alsup	6-25	35-45	1.30-1.50	0.2-0.6	0.08-0.15	4.5-6.0	Moderate-----	0.28			
	25-60	35-50	1.30-1.50	0.2-0.6	0.08-0.15	3.6-7.8	High---------	0.28			
11A, 11B-----	0-9	10-25	---	0.6-2.0	0.16-0.23	5.6-7.3	Low----------	0.28	4	5	2-4
Ashton	9-40	18-34	---	0.6-2.0	0.18-0.23	5.6-7.3	Low----------	0.43			
	40-60	10-40	---	0.6-2.0	0.14-0.20	5.6-7.3	Low----------	0.43			
12A----------	0-13	15-25	1.20-1.50	0.2-0.6	0.22-0.24	3.6-6.0	Low----------	0.43	4	6	.5-2
Bado	13-17	30-40	1.30-1.50	0.06-0.2	0.12-0.17	3.6-5.5	Moderate-----	0.43			
	17-32	35-55	1.30-1.50	0.06-0.2	0.09-0.11	3.6-5.5	High---------	0.43			
	32-53	25-35	1.50-1.70	<0.06	0.07-0.10	3.6-5.5	Moderate-----	0.43			
	53-65	35-70	1.30-1.60	0.06-0.2	0.05-0.10	4.5-6.0	Moderate-----	0.43			
13A----------	0-8	12-25	1.20-1.45	2.0-6.0	0.11-0.18	5.6-7.3	Low----------	0.24	5	8	1-4
Cedargap	8-25	12-27	1.30-1.50	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.24			
	25-60	25-35	1.40-1.55	2.0-6.0	0.04-0.10	5.6-7.3	Low----------	0.24			
14B, 14C-----	0-6	15-27	1.35-1.45	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.32	4	8	.5-2
Claiborne	6-60	22-35	1.25-1.40	0.6-2.0	0.17-0.20	4.5-6.0	Moderate-----	0.32			
15D, 15F-----	0-16	14-20	1.30-1.60	2.0-6.0	0.07-0.12	4.5-6.0	Low----------	0.28	2	8	1-2
Clarksville	16-51	28-35	1.40-1.65	2.0-6.0	0.06-0.10	3.6-5.5	Low----------	0.28			
	51-60	40-75	1.40-1.80	2.0-6.0	0.05-0.08	3.6-5.5	Low----------	0.28			
17C, 17D, 17F----	0-14	15-25	1.3-1.5	2.0-6.0	0.06-0.13	3.6-6.5	Low----------	0.24	2	8	.5-2
Coulstone	14-63	10-25	1.3-1.5	2.0-6.0	0.04-0.11	3.6-5.0	Low----------	0.24			
18C, 18D, 18F----	0-10	18-27	1.10-1.30	2.0-6.0	0.08-0.15	4.5-6.5	Low----------	0.28	2	8	.5-2
Doniphan	10-14	27-35	1.20-1.40	0.6-2.0	0.10-0.14	3.6-5.5	Moderate-----	0.28			
	14-60	48-70	1.20-1.40	0.6-2.0	0.08-0.10	3.6-5.5	Moderate-----	0.28			
19----------	0-6	20-27	1.20-1.40	0.6-2.0	0.17-0.24	5.6-7.3	Low----------	0.37	3	5	1-2
Elsah	6-20	5-20	1.40-1.60	2.0-6.0	0.10-0.15	5.6-7.3	Low----------	0.17			
	20-60	5-15	1.50-1.70	2.0-6.0	0.06-0.11	5.6-7.3	Low----------	0.17			
20D*:											
Gasconade-------	0-15	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate-----	0.20	2	8	2-4
	15-19	40-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20			
	19	---	---	---	---	---	----------	----			
Rock outcrop.											
22C, 22D, 22E----	0-9	15-25	1.10-1.40	0.6-2.0	0.12-0.17	5.1-6.5	Low----------	0.32	3	8	.5-2
Gatewood	9-24	60-85	1.10-1.30	0.06-0.2	0.09-0.12	5.1-7.3	High---------	0.32			
	24	---	---	---	---	---	----------	----			
23A, 23B-----	0-11	20-27	1.10-1.30	0.6-2.0	0.22-0.24	4.5-5.5	Low----------	0.43	3	6	1-3
Hartville	11-20	24-40	1.20-1.40	0.06-0.2	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	20-66	40-60	1.20-1.50	0.06-0.2	0.10-0.12	4.5-5.5	High---------	0.32			
	66-78	40-60	1.20-1.50	0.06-0.2	0.05-0.09	6.6-7.3	High---------	0.32			
25----------	0-10	12-17	1.20-1.60	0.6-2.0	0.18-0.23	6.1-7.8	Low----------	0.43	5	---	.5-3
Melvin	10-60	12-35	1.30-1.60	0.6-2.0	0.18-0.23	6.1-7.8	Low----------	0.43			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
26A, 26B----------	0-7	15-25	1.30-1.50	0.6-2.0	0.15-0.19	4.5-6.0	Low----------	0.37	4	6	.5-2
Needleye	7-27	25-35	1.50-1.70	0.2-0.6	0.12-0.16	3.6-5.5	Low----------	0.37			
	27-42	20-30	1.65-1.75	0.06-0.2	0.01-0.05	3.6-6.0	Low----------	0.28			
	42-60	40-75	1.10-1.40	0.2-0.6	0.03-0.08	3.6-5.5	Moderate-----	0.28			
27----------	0-14	26-29	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7	2-4
Nevin	14-60	30-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-6.5	Moderate-----	0.43			
28, 29----------	0-5	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43	5	---	2-4
Nolin	5-60	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43			
30G*:											
Rock outcrop.											
Gasconade-------	0-15	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate-----	0.20	2	8	2-4
	15-14	40-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20			
	19	---	---	---	---	---	----------	----			
31B----------	0-15	25-35	1.30-1.50	0.2-0.6	0.21-0.24	5.6-7.3	Moderate-----	0.37	3	4	3-4
Sampsel	15-60	36-48	1.40-1.60	0.06-0.2	0.11-0.13	5.6-7.8	High---------	0.37			
32B, 32C----------	0-10	15-25	1.30-1.50	0.6-2.0	0.15-0.18	4.5-6.0	Low----------	0.43	4	6	.5-2
Viraton	10-20	18-35	1.30-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low----------	0.43			
	20-37	20-30	1.60-1.80	0.06-0.2	0.01-0.05	3.6-5.5	Low----------	0.43			
	37-60	25-45	1.10-1.40	0.2-0.6	0.02-0.06	4.5-7.3	Moderate-----	0.28			
33C----------	0-7	18-27	1.20-1.45	2.0-6.0	0.07-0.12	4.5-6.5	Low----------	0.28	2	8	.5-2
Wilderness	7-23	25-35	1.30-1.50	0.6-2.0	0.03-0.10	4.5-6.0	Low----------	0.28			
	23-29	20-35	1.70-2.00	0.06-0.2	0.01-0.05	4.5-5.0	Low----------	0.28			
	29-60	40-70	1.50-1.70	0.2-0.6	0.03-0.08	4.5-5.5	Moderate-----	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
10C, 10D---------- Alsup	C	None--------	---	---	2.5-4.0	Perched	Dec-Mar	>40	Soft	Moderate	High-----	Moderate.
11A, 11B---------- Ashton	B	Rare--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Low.
12A---------- Bado	D	None--------	---	---	0-2.0	Perched	Dec-Apr	>60	---	High-----	High-----	High.
13A---------- Cedargap	B	Occasional	Very brief	Nov-Mar	>6.0	---	---	>60	---	Moderate	Low------	Low.
14B, 14C---------- Claiborne	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
15D, 15F---------- Clarksville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
17C, 17D, 17F----- Coulstone	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
18C, 18D, 18F----- Doniphan	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
19---------- Elsah	B	Frequent----	Brief-----	Dec-May	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
20D*: Gasconade--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	High-----	Low.
Rock outcrop.												
22C, 22D, 22E----- Gatewood	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Moderate.
23A, 23B---------- Hartville	C	None--------	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	High-----	Moderate	Moderate.
25---------- Melvin	D	Frequent----	Brief-----	Dec-May	0-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
26A, 26B---------- Needleye	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
27---------- Nevin	B	Rare--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Low.
28---------- Nolin	B	Occasional	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	High-----	Low------	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
29--Nolin	B	Frequent	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	High	Low	Moderate.
30G*: Rock outcrop.												
Gasconade	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	High	Low.
31B--Sampsel	D	None	---	---	1.5-3.0	Perched	Nov-Apr	40-70	Soft	High	High	Low.
32B, 32C--Viraton	C	None	---	---	1.5-3.0	Perched	Dec-Mar	>60	---	Moderate	Moderate	High.
33C--Wilderness	C	None	---	---	1.0-2.0	Perched	Dec-Mar	>60	---	Moderate	Low	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alsup	Fine, mixed, mesic Ultic Hapludalfs
Ashton	Fine-silty, mixed, mesic Mollic Hapludalfs
Bado	Fine, mixed, mesic Typic Fragiaqualfs
Cedargap	Loamy-skeletal, mixed, mesic Cumulic Hapludolls
Claiborne	Fine-loamy, siliceous, mesic Typic Paleudults
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Coulstone	Loamy-skeletal, siliceous, mesic Typic Paleudults
Doniphan	Clayey, mixed, mesic Typic Paleudults
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
Gatewood	Very-fine, mixed, mesic Typic Hapludalfs
Hartville	Fine, mixed, mesic Aquic Hapludalfs
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Needleye	Fine-silty, mixed, mesic Aquic Fragiudults
Nevin	Fine-silty, mixed, mesic Aquic Argiudolls
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
*Sampsel	Fine, montmorillonitic, mesic, sloping Typic Argiaquolls
Viraton	Fine-loamy, siliceous, mesic Typic Fragiudalfs
Wilderness	Loamy-skeletal, siliceous, mesic Typic Fragiudalfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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