United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Missouri Agricultural
Experiment Station

Soil Survey of Webster County, Missouri

How To Use This Soil Survey

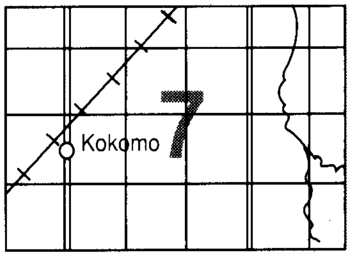
General Soil Map

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.

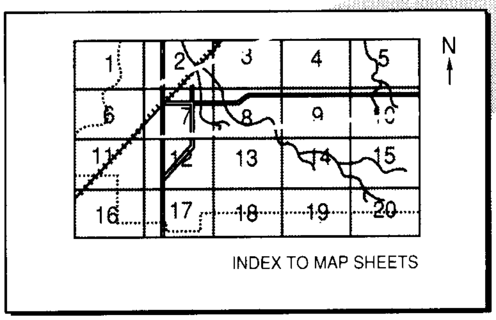
Detailed Soil Maps

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



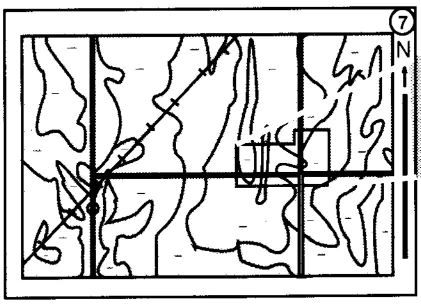
MAP SHEET

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

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.



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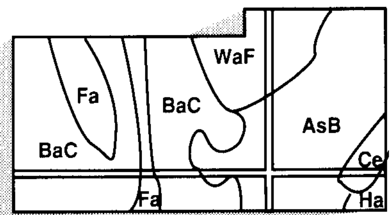

AREA OF INTEREST

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

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 Missouri Agricultural Experiment Station, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1988. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service and the Missouri Agricultural Experiment Station. The Missouri Department of Natural Resources provided a soil scientist to assist with the fieldwork. The Webster County Commission, through the Webster County Soil and Water Conservation District, provided funds for a soil scientist to assist with the fieldwork. In the initial stages of the survey, the Webster County Reassessment Office provided funds for a soil scientist to assist with soil mapping. The survey is part of the technical assistance furnished to the Webster County Soil and Water Conservation District.

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

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Typical area of the Noark-Ocie association.

Contents

Issued September 1990

Index to Map Units

Summary of Tables

Foreword

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

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

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow over 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.

Russell C. Mills
State Conservationist
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Soil Survey of Webster County, Missouri

By Jerry A. Dodd, Soil Conservation Service

Fieldwork by Joseph E. Blaine, Webster County Soil and Water Conservation District; Jerry A. Dodd, Soil Conservation Service; and Gary W. Sturdevant, Missouri Department of Natural Resources

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

WEBSTER COUNTY is in the western part of south-central Missouri (fig. 1). It is bordered on the northwest by Dallas County, on the northeast by Laclede County, on the east by Wright County, on the southeast by Douglas County, on the southwest by Christian County, and on the west by Greene County. The county has an area of 379,981 acres, or about 594 square miles. Marshfield, the largest town, is the county seat. In 1985, the population of the county was 22,300.

The southern part of the county is mostly on the Springfield Plateau, a part of the Ozark Border Area. The northern part is on the Salem Plateau, a part of the Ozark Highland Area.

Agriculture is the main enterprise in the county. Dairy and beef cattle are the main kinds of livestock. The main crop is grass for pasture and hay (fig. 2).

This soil survey updates the survey of Webster County published in 1904 *(3)*. It provides additional information and has larger maps, which show the soils in more detail.

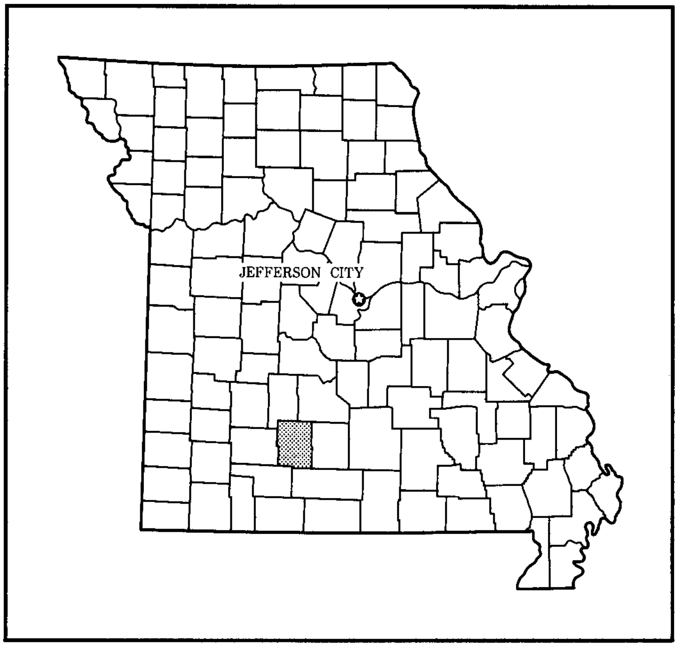

Figure 1.—Location of Webster County in Missouri.

General Nature of the County

This section gives general information concerning the county. It describes history, climate, and relief and drainage.

History

Prepared by Joseph E. Blaine, soil scientist, Webster County Soil and Water Conservation District.

The first settlers came to what is now Webster County about 1834, mainly from Kentucky and Tennessee. The county was organized in 1855. During settlement, it was not the agricultural value of the county which attracted the settlers so much as the abundant game and fish and the productive native grass, on which livestock could be raised with little effort *(3)*.

Figure 2.—Native warm-season grasses on Viraton silt loam, 2 to 5 percent slopes.

The rate of settlement increased after 1870, when the main line of the St. Louis and San Francisco Railroad was completed. With more settlement, the practice of annually burning native pastures and woods was abandoned. As a result, the native grasses began to disappear around 1870. With less native grass available, farmers grew more tilled crops *(3)*.

Webster County was one of the leading apple-producing counties at a time when Missouri led the nation in number of apple trees. In 1904, the county had an estimated 600,000 to 800,000 apple trees *(3)*. In 1892, some large apple orchards were established in the vicinity of Seymour. The largest in the Seymour area made up about 1,000 acres, some of which was used for peaches and pears *(12)*. The apple industry in southwest Missouri declined between 1930 and 1945 as a result of economic factors and the reluctance of growers to make adjustments that would have kept them competitive.

The production of tomatoes for canning is an important part of the history of agriculture in the county. The industry was started about 1900, expanded rapidly, and continued on a fairly large scale until the early 1940's *(5)*. There were several large canning factories and numerous farm- or family-operated canneries *(6)*. At least four factors contributed to the end of the tomato industry. These were a poor market resulting from a depressed economy during the 1930's, shortage of cheap labor, federal regulations that would have increased production costs, and interest in the improving dairy industry.

Around 1925, the county was one of the largest strawberry-producing counties in the state. This industry lasted only a few years in the county *(5)*.

Through the early 1900's, the typical farms were very diversified. They derived income from the sale of cream, beef, hogs, mules, sheep, eggs, fruit, firewood, and other products. In addition, farmers produced a significant amount of grain, mainly for their own livestock. In the mid-1930's, after the farmers started to sell whole milk instead of only cream, dairying became the most significant enterprise. In 1930, the county had as many dairy farms as general-purpose farms. In 1986, the county ranked second in the state in number of dairy cows *(7)*.

Beef cattle production was significant in the ninteenth century. It was of lesser importance in the early part of the twentieth century. After 1950, however, the number of beef cattle increased *(4)*. In 1986, the county had 56 percent more beef cattle than dairy cows and ranked 23rd in the state in number of beef cattle *(7)*.

In the 1800's, small flocks of sheep were common. The number of sheep declined sharply after 1910 *(8)*. Hogs were one of the leading products in the 1800's but declined in numbers in the 1900's *(4, 8)*.

By 1950, grain cropping began to give way to hay and pasture farming. During the years of higher grain production, corn was the dominant crop. Oats and wheat also were major crops. An average of 31,000 acres of corn was harvested each year between 1879 and 1934. In 1984, only 750 acres was harvested for grain *(8)*.

After the native grasses disappeared, redtop and timothy were the dominant grasses, until fescue became well established in the 1960's. After 1940, orchardgrass, small grain cut for hay, red clover, and sorghum were significant forage crops. Lespedeza production started in the 1930's and was extremely important until the 1950's, when diseases caused a decline in productivity. Alfalfa was popular by 1950 and very productive until the early 1970's, when the alfalfa weevil cut production. During the past 20 years or more, tall fescue has dominated the countryside. In recent years, alfalfa, red clover, ladino clover, small grain for silage, orchardgrass, sorghum-sudan hybrids, and tall fescue have been the main forage crops.

During the period 1945 to 1982, the number of farms decreased from 2,848 to 1,595. The average size of the farms increased from 126 to 177 acres *(8)*. Since 1950, the percentage of part-time farmers has increased. In 1982, nearly 60 percent of the county's farmers received their principal income from something other than farming *(19)*.

Climate

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

Webster County is hot in summer, especially at low elevations, and is moderately cool in winter, especially at high elevations. Rainfall is fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but the snow cover lasts for only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Marshfield, Missouri, in the period 1951 to 1984. 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 35 degrees F and the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred at Marshfield on January 10, 1982, is -15 degrees. In summer, the average temperature is 76 degrees and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 110 degrees.

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

The total annual precipitation is 40.32 inches. Of this, more than 23 inches, or about 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.68 at Marshfield on December 17, 1954. Thunderstorms occur on about 57 days each year.

The average seasonal snowfall is about 15 inches. The greatest snow depth at any one time during the period of record was 16 inches. On the average, 5 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 13 miles per hour, in late winter and early spring.

Relief and Drainage

Webster County has the largest area of land with elevations of 1,600 feet and higher in the Ozark uplift region. The highest elevation, 1,740 feet, is in the eastern part of the county, and the lowest, 1,100 feet, is in an area where the Niangua River leaves the county.

Figure 3.—An area of the James River in Webster County.

The headwaters of several creeks and rivers are in the county, but no streams enter the county. The northern half of the county is drained by the Pomme de Terre and Niangua Rivers and the Osage Fork of the Gasconade River, all of which eventually flow north to the Missouri River. Most of the southern half is drained by the James River (fig. 3) and Finley Creek, both of which eventually flow south into the White River Basin. The drainage basins of the Gasconade River and Beaver Creek also start in the county, the Gasconade River flowing to the Missouri River and Beaver Creek flowing to the White River Basin.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

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

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

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

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

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

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

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

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

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

General Soil Map Units

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

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

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

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

Soil Descriptions

1. Viraton-Gepp-Wilderness Association

Deep, moderately well drained and well drained, gently sloping and moderately sloping soils formed in loess and cherty and clayey dolomite residuum; on uplands

This association is on relatively broad ridgetops and side slopes in the uplands and on foot slopes. It makes up about 22 percent of the survey area. It is about 49 percent Viraton and similar soils, 23 percent Gepp soils, 19 percent Wilderness soils, and 9 percent minor soils (fig. 4).

The gently sloping, moderately well drained Viraton soils are on ridgetops and foot slopes. Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The part of the subsoil above a fragipan is about 15 inches thick. It is dark yellowish brown, friable silty clay loam in the upper part and dark yellowish brown, mottled, firm cherty silty clay loam in the lower part. The fragipan is multicolored, very firm, brittle very cherty silt loam about 12 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is yellowish red, firm very cherty silty clay in the upper part and dark reddish brown and dark red, mottled, firm very cherty silty clay in the lower part.

The gently sloping and moderately sloping, well drained Gepp soils are on shoulder slopes and ridgetops. Typically, the surface layer is very dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is yellowish brown, friable very cherty silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. It is light brown, mottled, friable cherty silty clay loam in the upper part; multicolored, firm cherty clay in the next part; and red, mottled, firm cherty clay in the lower part.

The gently sloping and moderately sloping, moderately well drained Wilderness soils are on shoulder slopes and ridgetops. Typically, the surface layer is dark grayish brown, friable very cherty silt loam about 4 inches thick. The subsurface layer is light yellowish brown, friable cherty silt loam about 5 inches thick. The part of the subsoil above a fragipan is yellowish brown, firm very cherty silty clay loam about 11 inches thick. The fragipan is multicolored, very firm, brittle extremely cherty silt loam about 10 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is multicolored, firm extremely cherty silty clay.

Of minor extent in this association are the poorly drained Bado soils in depressions on ridgetops, the somewhat poorly drained Hartville soils on foot slopes, and the somewhat poorly drained Plato soils on ridgetops.

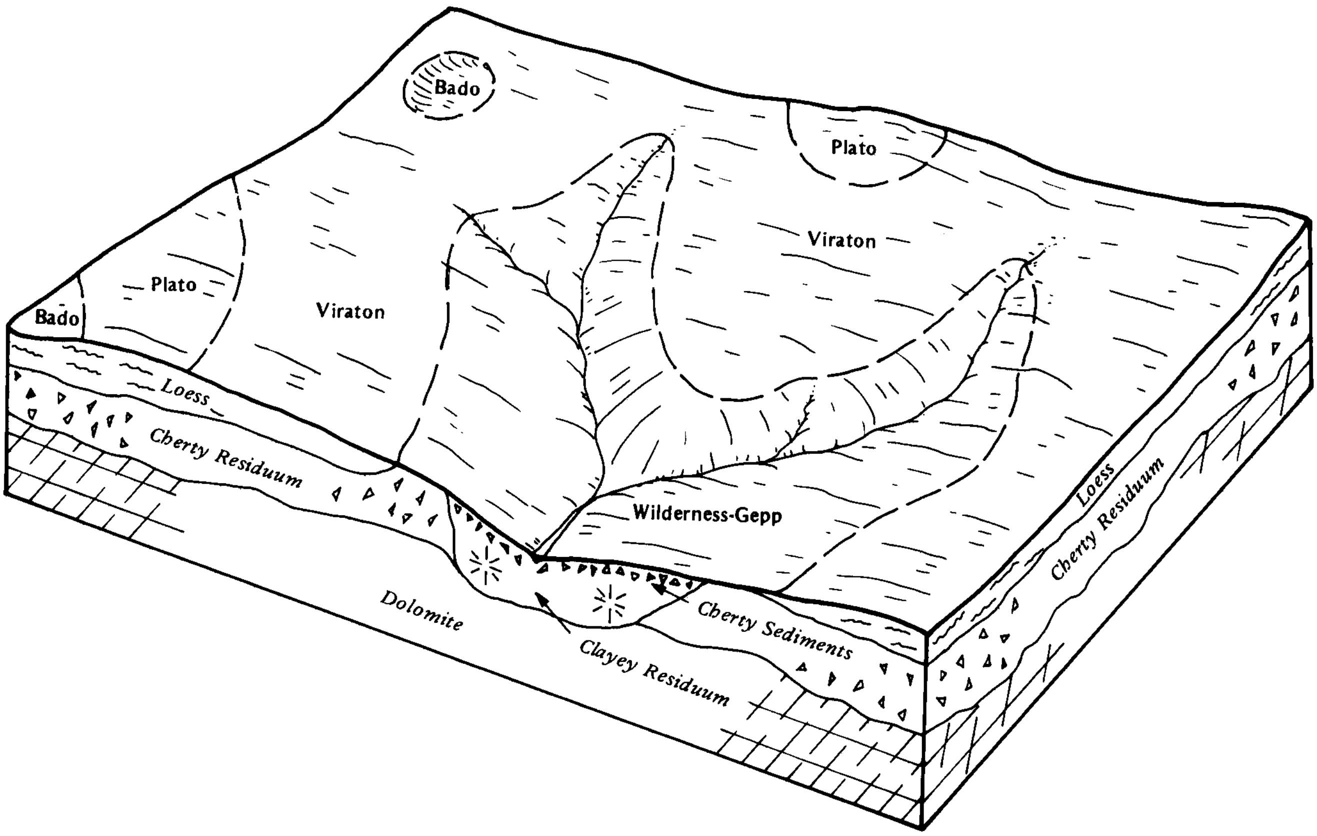

Figure 4.—Typical pattern of soils and parent material in the Viraton-Gepp-Wilderness association.

About 80 percent of this association is used for pasture and hay. The remaining acreage is used for small grain, row crops, or second-growth hardwoods.

The major soils are suited to grasses and some legumes for hay and pasture and to small grain and row crops. Dairying and raising beef calves for the feeder cattle market are the main farm enterprises. Overgrazing, seasonal wetness, and the hazard of erosion are the main management concerns in pastured areas. The hazard of erosion, seasonal droughtiness, and seasonal wetness are the main management concerns in cultivated areas.

The major soils are suited to trees. Seedling mortality and windthrow on the Viraton and Wilderness soils are the main management concerns.

The major soils are suitable as sites for buildings and sewage lagoons. The Gepp soils are suitable as sites for septic tank absorption fields, but the Viraton and Wilderness soils generally are unsuitable. The seasonal wetness of the Viraton and Wilderness soils, slow permeability and the shrink-swell potential in all the major soils, the slope of the Gepp and Wilderness soils, and seepage in the Gepp soils are the main management concerns.

2. Gepp-Ocie-Wilderness Association

Deep, well drained and moderately well drained, gently sloping to steep soils formed in cherty and clayey dolomite residuum; on uplands

This association is on highly dissected, narrow ridgetops and side slopes in the uplands. It makes up about 28 percent of the survey area. It is about 38 percent Gepp soils, 28 percent Ocie and similar soils, 9 percent Wilderness soils, and 25 percent minor soils (fig. 5).

The gently sloping to steep, well drained Gepp soils are on ridgetops and side slopes. Typically, the surface layer is very dark grayish brown, friable very cherty silt loam about 2 inches thick. The subsurface layer is pale brown, friable very cherty silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. It

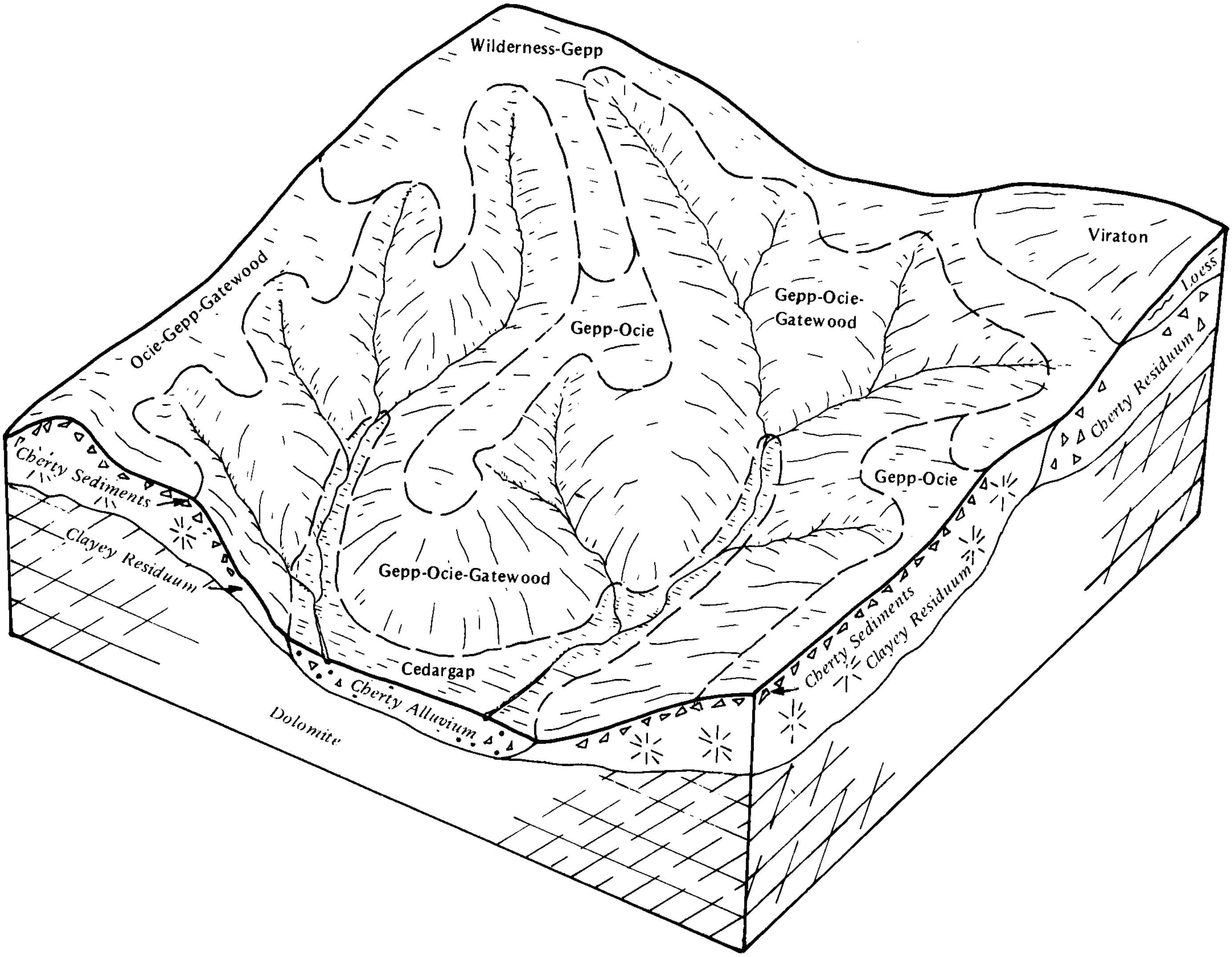

Figure 5.—Typical pattern of soils and parent material in the Gepp-Ocie-Wilderness association.

is strong brown and yellowish red, friable cherty silty clay loam in the upper part; dark red, firm clay in the next part; and dark red, mottled, firm cherty clay in the lower part.

The gently sloping to steep, well drained and moderately well drained Ocie soils are on ridgetops and side slopes. Typically, the surface layer is very dark grayish brown, friable cherty silt loam about 6 inches thick. The subsoil is about 42 inches thick. The upper part is light yellowish brown and reddish yellow, friable very cherty silty clay loam and yellowish brown and strong brown, firm cherty silty clay loam. The lower part is yellowish brown, very firm clay and yellowish brown, mottled, very firm cherty clay. It has a thin layer of chert. Hard dolomite bedrock is at a depth of about 48 inches.

The gently sloping and moderately sloping, moderately well drained Wilderness soils are on shoulder slopes and ridgetops. Typically, the surface layer is dark grayish brown, friable very cherty silt loam about 4 inches thick. The subsurface layer is light yellowish brown, friable cherty silt loam about 5 inches thick. The part of the subsoil above a fragipan is yellowish brown, firm very cherty silty clay loam about 11 inches thick. The fragipan is multicolored, very firm, brittle extremely cherty silt loam about 10 inches thick.

The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is multicolored, firm extremely cherty silty clay.

Of minor extent in this association are the Britwater, Peridge, Hartville, Cedargap, Viraton, Dameron, and Gatewood soils. Britwater and Peridge soils are less cherty and less clayey than the major soils. The somewhat poorly drained Hartville soils are on terraces and foot slopes. The nearly level and very gently sloping Cedargap and Dameron soils are on flood plains. Gatewood and Viraton soils are on ridgetops. Gatewood soils are similar to the Ocie soils. Viraton soils are less cherty than the major soils and have a fragipan.

About 65 percent of this association is used for pasture and hay. The remaining acreage supports second-growth hardwoods.

The major soils are suited to grasses and some legumes, mainly for pasture. They generally are unsuited to cultivated crops because of the slope and a severe hazard of erosion. Dairying and raising beef calves for the feeder cattle market are the main farm enterprises. Overgrazing and the hazard of erosion are the main management concerns in pastured areas.

The major soils are suited to trees. The hazard of erosion and the equipment limitation on the Gepp and Ocie soils and seedling mortality and the windthrow hazard on the Wilderness soils are the main management concerns.

The major soils are suitable as sites for buildings and sewage lagoons. The Gepp soils are suitable as sites for septic tank absorption fields. The slope, seasonal wetness, the shrink-swell potential, and restricted permeability in areas of one or all of these soils are the main management concerns.

3. Dameron-Nolin Association

Deep, well drained, nearly level soils formed in cherty and silty alluvium; on flood plains

This association is on flood plains along the Osage Fork of the Gasconade River and along the Niangua and James Rivers. It makes up about 4 percent of the survey area. It is about 35 percent Dameron soils, 29 percent Nolin soils, and 36 percent minor soils (fig. 6).

The Dameron soils are on flood plains of intermediate size. Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsurface layer is very dark grayish brown and very dark brown, friable silt loam about 25 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown, firm very cherty silty clay loam.

The Nolin soils are on wide flood plains. Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil extends to a depth of 60 inches or more. It is dark brown and brown, friable silt loam in the upper part and brown, friable silty clay loam in the lower part.

Of minor extent in this association are the gently sloping and moderately sloping Britwater and gently sloping Peridge soils on high stream terraces, the somewhat poorly drained Hartville soils on foot slopes and low stream terraces, and the poorly drained Moniteau soils on high flood plains.

About 85 percent of this association is used for pasture and hay. The remaining acreage is used for row crops or small grain.

The major soils are suited to grasses and legumes for hay and pasture and to small grain and row crops. Dairying and raising beef calves for the feeder cattle market are the main farm enterprises. Overgrazing and flooding are the main management concerns in pastured areas. The hazard of erosion caused by scouring is the main management concern in cultivated areas.

The major soils generally are unsuitable for building site development and onsite waste disposal because of the flooding.

4. Noark-Alsup Association

Deep, well drained and moderately well drained, gently sloping to steep soils formed in cherty limestone residuum and in colluvium and the underlying clayey shale residuum; on uplands

This association is on side slopes in the uplands. It is dissected by small drainageways and narrow flood plains. It makes up about 18 percent of the survey area. It is about 48 percent Noark and similar soils, 34 percent Alsup soils, and 18 percent minor soils (fig. 7).

The well drained Noark soils are on the higher side slopes. Typically, the surface layer is dark grayish brown, very friable very cherty silt loam about 5 inches thick. The subsurface layer is pale brown, very friable cherty silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. It is brown and pale brown, friable very cherty silt loam in the upper part; yellowish red and reddish brown, firm very cherty silty clay in the next part; and dark red, mottled, firm very cherty clay in the lower part.

The moderately well drained Alsup soils are on the lower side slopes. Typically, the surface layer is dark grayish brown, friable cherty silt loam about 3 inches thick. The subsurface layer is brown, friable cherty silt

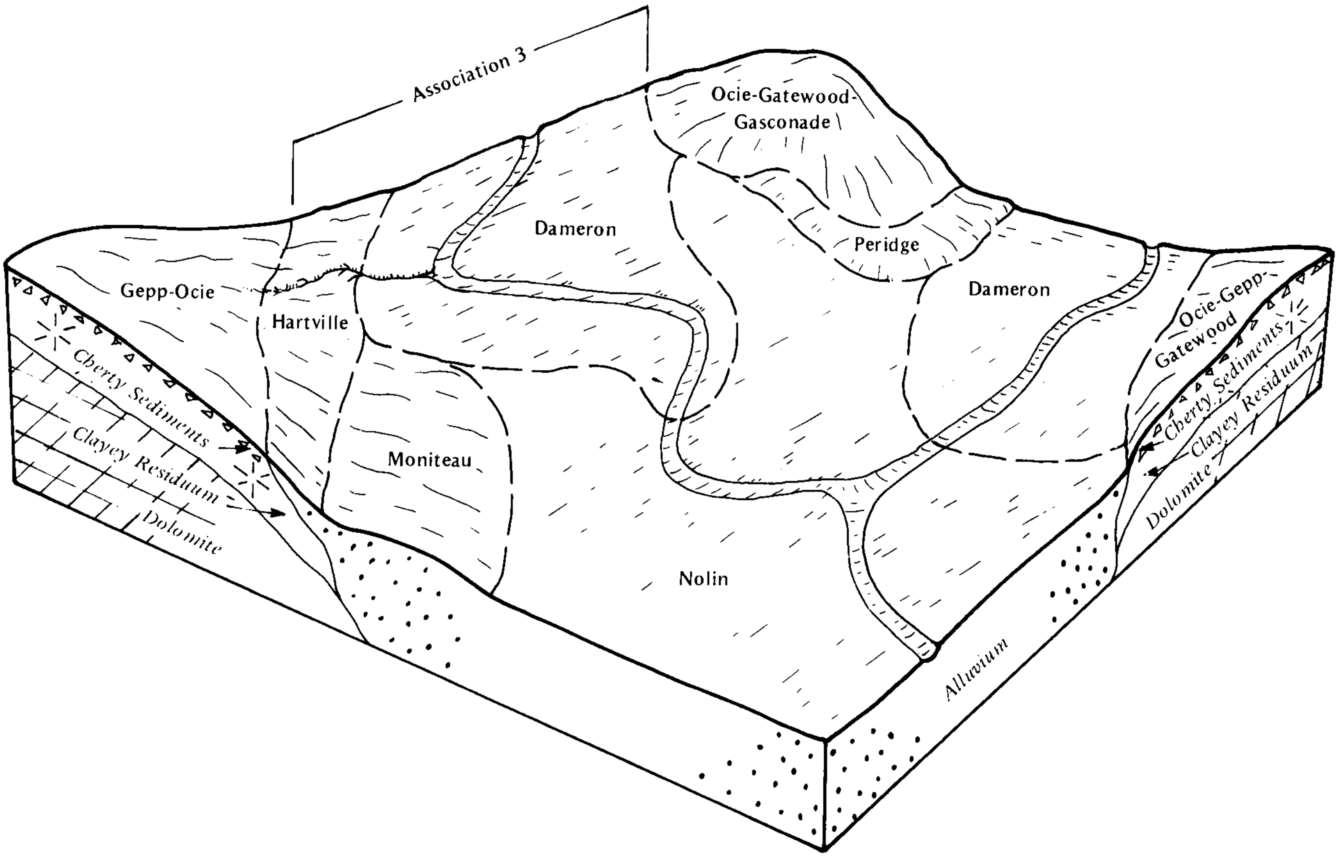

Figure 6.—Typical pattern of soils and parent material in the Dameron-Nolin association.

loam about 3 inches thick. The subsoil is about 20 inches thick. In sequence downward, it is yellowish brown and brown, friable silty clay loam; yellowish brown, firm silty clay; yellowish brown, mottled, very firm silty clay; and multicolored, very firm clay. The substratum is grayish brown and light brownish gray, very firm clay. Weathered shale bedrock is at a depth of about 40 inches.

Of minor extent in this association are the nearly level and very gently sloping, cherty Cedargap soils on narrow flood plains, Dameron soils on flood plains of intermediate size, and Scholten and Tonti soils on ridgetops. Dameron soils are moderately deep to a cherty layer. Scholten and Tonti soils have a fragipan.

About 60 percent of this association supports hardwoods. The remaining acreage is used for pasture.

The major soils are suited to trees. The equipment limitation, seedling mortality, and the hazard of erosion are the main management concerns.

The major soils are suited to grasses and some legumes, mainly for pasture. They are unsuited to cultivated crops because of the slope and the hazard of erosion. Dairying and raising beef calves for the feeder cattle market are the main farm enterprises. Overgrazing and the hazard of erosion are the main management concerns in pastured areas.

The major soils are suited to building site development. The Alsup soils are suitable as sites for sewage lagoons, and the Noark soils are suitable as sites for septic tank absorption fields. The slope, seasonal wetness, the shrink-swell potential, and restricted permeability are the main management concerns.

5. Noark-Ocie Association

Deep, well drained and moderately well drained, gently sloping to steep soils formed in cherty limestone and clayey dolomite residuum; on uplands

This association is on narrow ridgetops and highly dissected side slopes in the uplands. It makes up about 12 percent of the survey area. It is about 52 percent

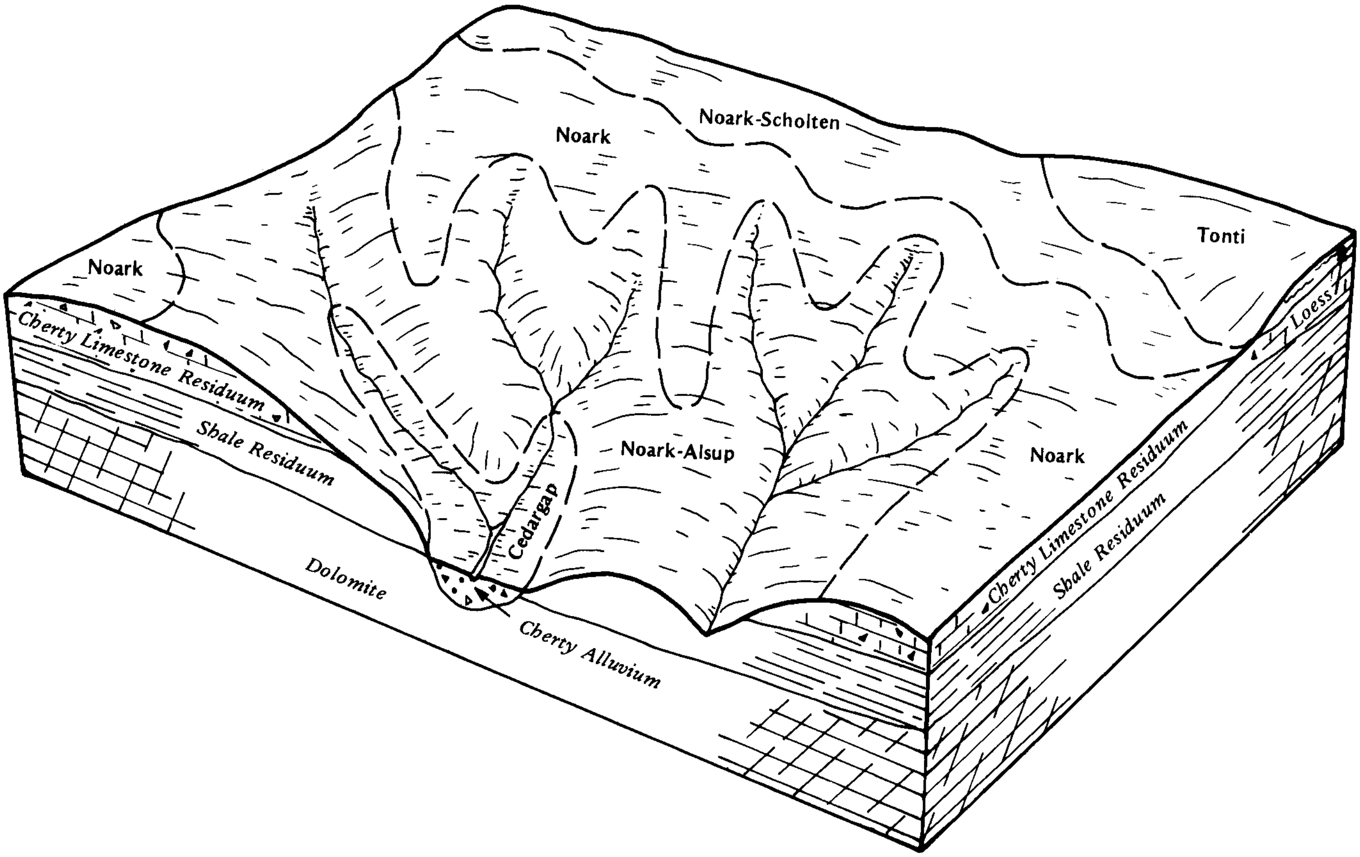

Figure 7.—Typical pattern of soils and parent material in the Noark-Alsup association.

Noark soils, 23 percent Ocie and similar soils, and 25 percent minor soils.

The gently sloping to steep, well drained Noark soils are on ridgetops and side slopes. Typically, the surface layer is very dark grayish brown and dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is dark grayish brown, grayish brown, pale brown, and light yellowish brown, friable very cherty silt loam about 14 inches thick. The subsoil extends to a depth of 60 inches or more. It is yellowish red, firm very cherty silty clay loam in the upper part and dark red, firm very cherty clay in the lower part.

The strongly sloping to steep, well drained and moderately well drained Ocie soils are on side slopes. Typically, the surface layer is dark brown, friable cherty silt loam about 2 inches thick. The subsurface layer is pale brown, friable cherty silt loam about 4 inches thick. The subsoil is about 36 inches thick. It is strong brown, firm very cherty silty clay loam in the upper part; strong brown, very firm cherty clay in the next part; and multicolored, very firm clay in the lower part. Hard dolomite bedrock is at a depth of about 42 inches.

Of minor extent in this association are the Alsop, Cedargap, Dameron, Scholten, and Tonti soils. Alsup soils are on side slopes below the Noark soils. They have less chert than the Noark soils. The cherty Cedargap soils are on narrow flood plains. Dameron soils are moderately deep to a cherty layer. They are on intermediate flood plains. Scholten and Tonti soils are on ridgetops. They have a fragipan.

About 70 percent of this association supports hardwoods. The remaining acreage is used for pasture.

The major soils are suited to trees. The equipment limitation and the hazard of erosion are the main management concerns.

The major soils are suited to grasses and some legumes for pasture or hay. They are unsuited to cultivated crops because of the slope and the hazard of erosion. Raising beef calves for the feeder cattle market and dairying are the main farm enterprises. Overgrazing and the hazard of erosion are the main management concerns in pastured areas.

The major soils are suitable for building site development. The Noark soils are suitable as sites for septic tank absorption fields, and the Ocie soils are suitable as sites for lagoons. The slope, seasonal wetness, the shrink-swell potential, and restricted permeability are the main management concerns.

6. Tonti-Noark-Captina Association

Deep, moderately well drained and well drained, very gently sloping to moderately sloping soils formed in loess and cherty limestone residuum; on uplands

This association is on broad ridgetops and side slopes in the uplands. It makes up about 16 percent of the survey area. It is about 56 percent Tonti soils, 22 percent Noark soils, 15 percent Captina and similar soils, and 7 percent minor soils (fig. 8).

The gently sloping, moderately well drained Tonti soils are on ridgetops. Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The part of the subsoil above a fragipan is yellowish brown cherty silty clay loam about 14 inches thick. It is friable in the upper part and mottled and firm in the lower part. The fragipan is multicolored, very firm, brittle very cherty silty clay loam about 17 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is red, mottled, firm extremely cherty silty clay.

The gently sloping and moderately sloping, well drained Noark soils are on shoulder slopes. Typically, the surface layer is dark grayish brown, friable very cherty silt loam about 6 inches thick. The subsurface layer is pale brown, friable very cherty silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. It is yellowish brown, friable very cherty silty clay loam in the upper part; multicolored, firm very cherty silty clay in the next part; and dark red, mottled, firm very cherty clay in the lower part.

The very gently sloping, modertely well drained

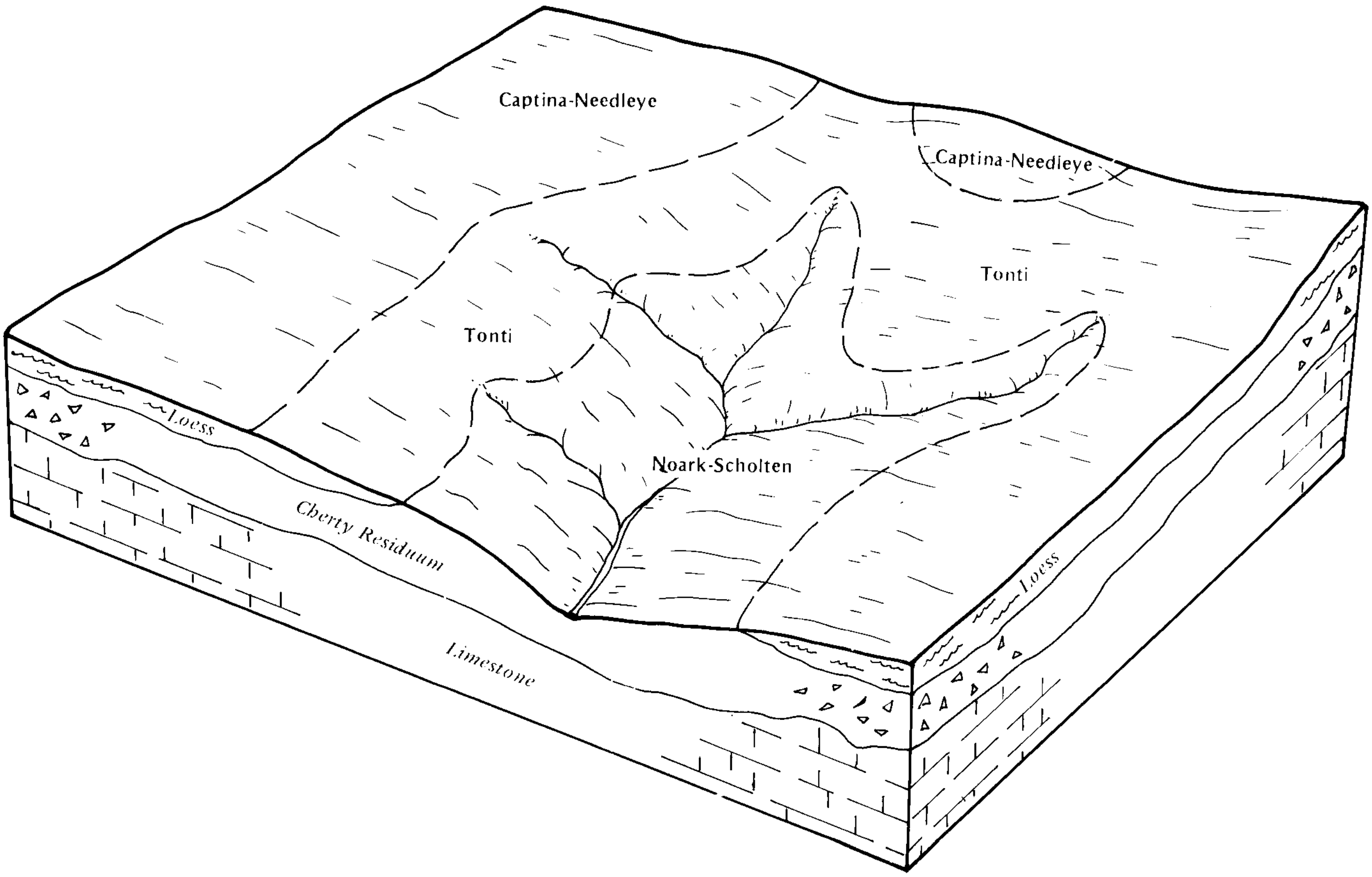

Figure 8.—Typical pattern of soils and parent material in the Tonti-Noark-Captina association.

Captina soils are in the broader areas on ridgetops. Typically, the surface layer is dark grayish brown, very friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The part of the subsoil above a fragipan is friable silty clay loam about 17 inches thick. It is yellowish brown in the upper part and multicolored in the lower part. The fragipan extends to a depth of 60 inches or more. It is multicolored, very firm, and brittle. It is silty clay loam in the upper part and very cherty silty clay loam in the lower part.

Of minor extent in this association are the poorly drained Bado soils in depressions on broad ridgetops; Needleye soils, which are similar to the Captina soils; and Scholten soils on shoulder slopes. Scholten soils have a fragipan and have more chert than the Tonti soils.

About 90 percent of this association is used for pasture and hay. The remaining acreage is used for small grain, row crops, or second-growth hardwoods.

The major soils are suited to grasses and legumes for hay and pasture. Dairying and raising beef calves for the feeder cattle market are the main farm enterprises. Overgrazing, seasonal wetness, and the hazard of erosion are the main management concerns.

The major soils are suited to small grain and row crops. The hazard of erosion, seasonal wetness, and seasonal droughtiness are the main management concerns.

The major soils are suited to trees. The hazard of windthrow on the Tonti and Captina soils and the equipment limitation and seedling mortality on the Noark soils are the main management concerns.

The major soils are suitable for building site development. The Tonti and Captina soils are suitable as sites for lagoons, and the Noark soils are suitable as sites for septic tank absorption fields. Seasonal wetness and slow permeability in the Tonti and Captina soils and seepage in the Noark soils are the main management concerns.

Detailed Soil Map Units

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

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

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

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the 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, Noark very cherty silt loam, 3 to 9 percent slopes, is a phase of the Noark series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Gasconade-Rock outcrop complex, 2 to 35 percent slopes, is an example.

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

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

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

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

Soil Descriptions

04C—Wilderness-Gepp very cherty silt loams, 2 to 9 percent slopes. These deep, gently sloping and moderately sloping soils are on ridges in the uplands. Individual areas range from about 5 to more than 1,000 acres in size. They generally are about 50 percent moderately well drained Wilderness soil and 35 percent well drained Gepp soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Wilderness soil is dark grayish brown, friable very cherty silt loam about 4 inches thick. The subsurface layer is light yellowish brown, friable very cherty silt loam about 5 inches thick. The part of the subsoil above a fragipan is yellowish brown, firm very cherty silty clay loam about 11 inches thick. The fragipan is multicolored, very firm, brittle extremely cherty silt loam about 10 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is multicolored, firm extremely cherty silty clay. In some areas the surface layer is cherty silt loam.

Typically, the surface layer of the Gepp soil is very dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is yellowish brown, friable very cherty silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is light brown, mottled, friable cherty silty clay loam. The next part is multicolored, firm cherty clay. The lower part is red, mottled, firm cherty clay. In some areas the subsoil has a higher content of coarse fragments. In other areas the surface layer is thicker or is cherty silt loam. In places the soil is strongly sloping.

Included with these soils in mapping are areas of Viraton soils and areas of soils that are stony and bouldery. Included soils make up 10 to 15 percent of the unit. Viraton soils have a lower content of coarse fragments than the Wilderness soil and have less clay than the Gepp soil. They generally are upslope from both soils.

Permeability is moderate above and below the fragipan in the Wilderness soil and slow in the fragipan. Surface runoff is medium. The available water capacity is very low. A perched water table is at a depth of 1 to 2 feet during winter and spring in most years. Natural fertility and the organic matter content are low. The shrink-swell potential is moderate in the part of the subsoil below the fragipan. The rooting depth is restricted by the fragipan at a depth of about 20 inches.

Permeability is moderate in the Gepp soil. Suface runoff is medium. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderate. The shrink-swell potential is moderate in the subsoil.

Most areas have been cleared and are used for hay or pasture. Some areas are wooded. A few areas are used for small grain or row crops. These soils are suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is a major hazard if the soils are tilled during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion. Droughtiness is a problem during the summer because of the coarse fragments and moderate rooting depth in the Wilderness soil and the content of coarse fragments in the surface soil and high content of clay in the subsoil of the Gepp soil.

Seepage is a hazard if ponds are constructed on these soils. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

A few areas support native hardwoods. These soils are suited to trees. Seedling mortality and the hazard of windthrow are management concerns on the Wilderness soil. Planting container-grown nursery stock increases the seedling survival rate. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

These soils are suited to small grain and row crops only if the crops are grown on a limited basis. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on these soils are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

These soils are suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. The shrink-swell potential and the wetness are limitations affecting the suitability of the Wilderness soil for building site development. These limitations can be overcome by designing and constructing footings, foundations, and basement walls with adequately reinforced concrete, backfilling with sand or gravel, and installing tile drains around foundations or basement walls. Septic tank absorption fields can function properly on the Gepp soil if the restricted permeability is overcome by an increase in the length of the lateral field. The soils generally are unsuitable as sites for sewage lagoons because of the slope.

The land capability classification is IVe. The woodland ordination symbol is 3D in areas of the Wilderness soil and 3A in areas of the Gepp soil.

05C—Noark-Scholten very cherty silt loams, 2 to 9 percent slopes. These deep, gently sloping and moderately sloping soils are on ridges in the uplands.

Individual areas range from 5 to more than 500 acres in size. They generally are about 65 percent well drained Noark soil and 20 percent moderately well drained Scholten soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Noark soil is dark grayish brown, friable very cherty silt loam about 6 inches thick. The subsurface layer is pale brown, friable very cherty silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, friable very cherty silty clay loam. The next part is multicolored, firm very cherty silty clay. The lower part is dark red, mottled, firm very cherty clay. In some areas the subsoil has a lower content of coarse fragments. In other areas the soil has less clay. In places the surface layer is cherty silt loam. Some areas are strongly sloping.

Typically, the surface layer of the Scholten soil is brown, friable very cherty silt loam about 6 inches thick. The subsurface layer is pale brown and brown, friable very cherty silt loam about 5 inches thick. The part of the subsoil above a fragipan is about 12 inches thick. It is yellowish brown and dark yellowish brown, friable very cherty silty clay loam in the upper part and yellowish brown, mottled, firm very cherty silty clay loam in the lower part. The fragipan is pale brown and yellowish brown, very firm, brittle extremely cherty silty clay loam about 9 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is red, mottled, firm extremely cherty silty clay. In some areas the surface layer is cherty silt loam.

Included with these soils in mapping are areas of Tonti soils. These included soils make up 10 to 15 percent of the unit. They have a lower content of clay and coarse fragments than the Noark soil and a lower content of coarse fragments than the Scholten soil. They are upslope from both soils.

Permeability is moderate in the Noark soil. Surface runoff is medium. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low.

Permeability is moderate above the fragipan in the Scholten soil, very slow in the fragipan, and moderately rapid below the fragipan. Surface runoff is medium. The available water capacity is very low. A perched water table is at a depth of 1.5 to 2.5 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the part of the subsoil below the fragipan. The rooting depth is restricted by the fragipan at a depth of about 23 inches.

Most areas have been cleared and are used for hay or pasture. Some areas are wooded. A few areas are used for small grain or row crops. These soils are well suited to cool-season grasses (fig. 9), warm-season grasses, and some kinds of legumes. Erosion is a major hazard if the soils are tilled during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion. Droughtiness is a problem during the summer because of the content of coarse fragments in both soils and the moderate rooting depth in the Scholten soil.

Seepage is a hazard if ponds are constructed on these soils. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

A few areas support native hardwoods. These soils are suited to trees. Seedling mortality is a management concern on both soils, but it can be controlled by planting container-grown nursery stock. The use of tree-planting and site-preparation equipment is limited on the Noark soil. Hand planting or direct seeding may be needed. Windthrow is a hazard on the Scholten soil. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

These soils are suited to small grain and row crops only if the crops are grown on a limited basis. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on these soils are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

These soils are suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. The shrink-swell potential and the wetness are limitations affecting the suitability of the Scholten soil for building site development. These limitations generally can be overcome by designing and constructing concrete footings, foundations, and basement walls with adequately reinforced concrete, backfilling with sand or gravel, and installing tile drains around foundations or basement walls. Septic tank absorption fields can function properly on the Noark soil if the restricted

Figure 9.—Cattle grazing cool-season grasses in an area of Noark-Scholten very cherty silt loams, 2 to 9 percent slopes.

permeability is overcome by an increase in the length of the lateral field. The soils generally are unsuited to sewage lagoons because of the slope.

The land capability classification is IVe. The woodland ordination symbol is 3F in areas of the Noark soil and 2D in areas of the Scholten soil.

08B—Tonti silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on ridges in the uplands. Individual areas range from about 5 to more than 1,000 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The part of the subsoil above a fragipan is yellowish brown cherty silty clay loam about 14 inches thick. It is friable in the upper part and mottled and firm in the lower part. The fragipan is multicolored, very firm, brittle very cherty silty clay loam about 17 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is red, mottled, firm extremely cherty silty clay. In some cultivated areas the upper part of the subsoil has been mixed with the surface layer and subsurface layer. In places the soil is moderately sloping.

Included with this soil in mapping are areas of Captina, Noark, and Scholten soils. These soils make up 10 to 15 percent of the unit. Captina soils have less chert in the part of the subsoil above the fragipan than the Tonti soil. Noark soils are well drained, have more chert than the Tonti soil, and do not have a fragipan. Scholten soils have more chert in the part of the subsoil above a fragipan than the Tonti soil. Captina soils are in landscape positions similar to those of the Tonti soil. Noark and Scholten soils are on the lower side slopes.

Permeability is moderate above and below the fragipan in the Tonti soil and slow in the fragipan. Surface runoff is medium. The available water capacity is low. A perched water table is at a depth of 1.5 to 2.5 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the part of the subsoil below the fragipan. The rooting depth is restricted by the fragipan at a depth of about 23 inches.

Most areas have been cleared and are used for hay (fig. 10) or pasture. A few areas are used for small grain or row crops. A few are wooded. This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is a major hazard if the soil is tilled during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion. Droughtiness is a problem during the summer because of the restricted rooting depth.

Seepage is a hazard if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

This soil is suited to small grain and row crops. If small grain or intertilled row crops are grown, erosion is a hazard. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

A few small areas support native hardwoods. This soil is suited to trees. Windthrow is a hazard because of the fragipan. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soil. Installing tile drains around foundations or basement walls helps to prevent the damage caused by seasonal wetness. The soil generally is unsuitable as a site for septic tank absorption fields because of the seasonal wetness and the slow permeability in the fragipan. Sealing the bottom and berms of sewage lagoons helps to prevent seepage.

The land capability classification is IIIe. The woodland ordination symbol is 3D.

09B—Captina-Needleye silt loams, 1 to 3 percent slopes. These deep, very gently sloping soils are on the tops of broad ridges in the uplands. Individual areas range from about 5 to more than 1,000 acres in size. They generally are about 55 percent moderately well drained Captina soil and 30 percent somewhat poorly drained Needleye soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Captina soil is dark grayish brown, very friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The part of the subsoil above a fragipan is friable silty clay loam about 17 inches thick. It is yellowish brown in the upper part and multicolored in the lower part. The fragipan extends to a depth of 60 inches or more. It is multicolored, very firm, and brittle. It is silty clay loam in the upper part and very cherty silty clay loam in the lower part. In some places the soil does not have a fragipan. In other places the surface layer is thicker. In some areas the soil is gently sloping.

Typically, the surface layer of the Needleye soil is dark grayish brown, very friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The part of the subsoil above a fragipan is silty clay loam about 20 inches thick. The upper part is yellowish brown and friable, the next part is yellowish brown, mottled, and friable, and the lower part is multicolored and firm. The fragipan extends to a depth of 60 inches or more. It is multicolored, very firm, and brittle. It is silty clay loam in the upper part and extremely cherty silty clay loam in the lower part. In some areas the surface layer is thicker.

Included with these soils in mapping are areas of Bado and Tonti soils. These included soils make up about 15 percent of the unit. Bado soils are poorly drained and are in landscape positions similar to those of the Needleye soil. They have more clay in the subsoil than the Captina and Needleye soils. Tonti soils have more chert above the fragipan than the Captina and Needleye soils. They are in landscape positions similar to those of the Captina soil.

Figure 10.—Bales of tall fescue hay on Tonti silt loam, 2 to 5 percent slopes.

Permeability is moderate above the fragipan in the Captina soil and slow in the fragipan. Surface runoff is medium. The available water capacity is low. A perched water table is at a depth of 2 to 3 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The rooting depth is restricted by the fragipan at a depth of about 24 inches.

Permeability is moderately slow above the fragipan in the Needleye soil and very slow in the fragipan. Surface runoff is medium. The available water capacity is low. A perched water table is at a depth of 1.5 to 3.0 feet during winter and spring in most years. Natural fertility and the organic matter content are low. The rooting depth is restricted by the fragipan at a depth of about 26 inches.

Most areas are cleared and are used for hay or pasture. A few areas are used for small grain or row crops. A few are wooded. These soils are well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is a major hazard if the soils are tilled during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion. Droughtiness is a problem during the summer because of the restricted rooting depth.

Seepage is a hazard if ponds are constructed on these soils. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

These soils are suited to small grain and row crops. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, terraces and grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

A few areas support native hardwoods. These soils are suited to trees. Windthrow is a hazard. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely. Seedling mortality is a problem on the Needleye soil.

Seedling survival rates can be increased by planting container-grown nursery stock.

These soils are suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Installing tile drains around foundations or basement walls helps to prevent the damage caused by seasonal wetness. The soils generally are unsuitable as sites for septic tank absorption fields because of the seasonal wetness and the slow permeability in the fragipan. Sealing the bottom and berms of sewage lagoons helps to prevent seepage.

The land capability classification is IIe. The woodland ordination symbol is 3D.

10—Bado silt loam. This deep, nearly level, poorly drained soil is in depressions on the tops of broad ridges in the uplands. Individual areas range from about 5 to more than 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 4 inches thick. The subsurface layer is light brownish gray, very friable silt loam about 5 inches thick. The part of the subsoil above a fragipan is about 26 inches thick. It is grayish brown, friable silty clay loam and dark gray, very firm clay. The fragipan extends to a depth of about 60 inches. It is multicolored, firm, brittle silty clay loam and cherty silty clay loam. The lower part of the subsoil to a depth of 66 inches is multicolored, very firm very cherty silty clay. In areas in the southern part of the county, the lower part of the subsoil is more acid.

Included with this soil in mapping are areas of Needleye and Plato soils. These soils make up 10 to 15 percent of the unit. They are somewhat poorly drained and generally are on the lower side slopes. Needleye soils have less clay in the subsoil than the Bado soil.

Permeability is very slow in the fragipan of the Bado soil and moderate below the fragipan. Surface runoff is very slow. The available water capacity is low. A perched water table is within a depth of 2 feet during winter and spring in most years. Natural fertility and the organic matter content are low. The shrink-swell potential is high in the part of the subsoil above the fragipan. The rooting depth is restricted by the fragipan at a depth of about 35 inches.

Most areas either have been cleared and are used for pasture and some hay or are wooded. A few areas are used for small grain or row crops. This soil is suited to some cool-season grasses, some warm-season grasses, and legumes that can withstand wetness. The wetness is a problem during the fall, winter, and spring months, and droughtiness is a problem during the summer because of the restricted rooting depth. Shallow-rooted grasses and legumes that are tolerant of both wetness and droughtiness should be selected for planting. A seedbed can be easily prepared only during dry periods.

Seepage is a hazard if ponds are constructed on this soil. Sites should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

This soil is suited to small grain and row crops. Wetness and summer droughtiness are problems if small grain or intertilled crops are grown. Shallow surface ditches and land grading can reduce the wetness. Irrigation generally is needed to overcome summer moisture stress. If row crops are grown, high plant populations should be avoided and early planting is beneficial in most years.

Many areas support native hardwoods that can withstand both seasonal wetness and seasonal droughtiness. This soil is suited to trees. The use of equipment is restricted because of the wetness. The equipment should be operated only during periods when the soil is dry or frozen. Ridging the soil and then planting on the ridges increase the seedling survival rate. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soil. Installing tile drains around foundations or basement walls helps to prevent the damage caused by seasonal wetness. The soil generally is unsuitable as a site for septic tank absorption fields because of the seasonal wetness and the very slow permeability in the fragipan. Sewage lagoons can function adequately if they are designed and installed properly.

The land capability classification is IIIw. The woodland ordination symbol is 2W.

21B—Peridge silt loam, 2 to 5 percent slopes. This deep, gently sloping, well drained soil is on terraces and in low, concave upland areas around the head and sides of drainageways. Individual areas range from about 5 to more than 700 acres in size.

Typically, the surface layer is brown, friable silt loam about 10 inches thick. The subsoil to a depth of 60 inches or more is silty clay loam. The upper part is brown and friable, the next part is yellowish red and red and is firm, and the lower part is multicolored and firm. In some places the soil is moderately well drained. In other places the surface layer is darker and thicker. In some cultivated areas the brown, friable part of the subsoil has been mixed with the surface layer and subsurface layer. In some areas the soil is moderately sloping.

Included with this soil in mapping are areas of Britwater, Gepp, and Noark soils. These soils make up 10 to 15 percent of the unit. Britwater and Noark soils have a higher content of coarse fragments than the Peridge soil, and Gepp soils have more clay in the subsoil. Britwater soils are in landscape positions similar to those of the Peridge soil. Gepp and Noark soils are on the higher sides of ridges in the uplands.

Permeability is moderate in the Peridge soil. Surface runoff is medium. The available water capacity is high. Natural fertility is medium, and the organic matter content is moderate.

Most areas are used for hay or pasture. A few areas are used for small grain or row crops. A few are wooded. This soil is well suited to cool-season grasses, warm-season grasses, and legumes. No serious problems affect pasture or hayland. Erosion is a hazard in newly seeded areas. Timely seedbed preparation helps to ensure a good ground cover.

Seepage is a hazard if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

This soil is well suited to small grain and row crops. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, a combination of terraces and grassed waterways or tile outlets, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

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

This soil is suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Septic tank absorption fields can function properly if the restricted permeability is overcome by an increase in the length of the lateral field. Sewage lagoons should be sealed with slowly permeable material, which helps to prevent seepage. The slope is a limitation on some lagoon sites, but these sites generally can be leveled.

The land capability classification is IIe. The woodland ordination symbol is 3A.

23B—Hartville silt loam, 1 to 5 percent slopes. This deep, very gently sloping and gently sloping, somewhat poorly drained soil is on foot slopes and low stream terraces. It is subject to rare flooding. Individual areas range from about 5 to more than 300 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is grayish brown, friable silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown, mottled, friable silty clay loam; yellowish brown, mottled, firm silty clay; grayish brown, mottled, firm clay; and mottled grayish brown and yellowish brown, firm silty clay. In places, the surface layer is darker and the subsoil is grayer. In some areas the lower part of the subsoil has a higher content of coarse fragments. In some cultivated areas the upper part of the brown subsoil has been mixed with the surface layer and subsurface layer.

Included with this soil in mapping are areas of Moniteau soils. These soils make up 10 to 15 percent of the unit. They are poorly drained and are on the lower stream terraces. They have less clay in the subsoil than the Hartville soil.

Permeability is slow in the Hartville soil. Surface runoff is medium. The available water capacity is moderate. A perched water table is at a depth of 1.5 to 3.0 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderate. The shrink-swell potential is high in the subsoil.

Most areas are used for hay or pasture. A few areas are used for small grain or row crops. A few are wooded. This soil is well suited to cool-season grasses, warm-season grasses, and some legumes. The species that are tolerant of wetness grow best. Erosion is the main problem during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The soil is suitable as a site for properly designed and constructed ponds.

This soil is suited to small grain and row crops. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, diversion terraces and grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops that can withstand wetness. Some type of grade stabilization structure generally is needed in grassed waterways.

A few areas support native hardwoods. This soil is suited to trees. Planting container-grown nursery stock increases seedling survival rates. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soil. Installing tile drains around foundations or basement walls helps to prevent the damage caused by seasonal wetness. The soil generally is unsuitable as a site for septic tank absorption fields because of the seasonal wetness and the slow permeability in the subsoil. The slope is a limitation on some lagoon sites, but these sites generally can be leveled.

The land capability classification is IIe. The woodland ordination symbol is 3C.

24F—Basehor fine sandy loam, 9 to 35 percent slopes, extremely bouldery. This shallow, strongly sloping to steep, well drained soil is on the lower side slopes of ridges in the uplands. Typically, about 14 percent of the surface is covered with boulders 2 to 5 feet in diameter. Individual areas range from about 5 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 5 inches thick. The subsoil is brown, very friable fine sandy loam about 12 inches thick. Hard sandstone bedrock is at a depth of about 17 inches. In some areas the depth to sandstone bedrock is more than 20 inches.

Included with this soil in mapping are areas of Gatewood and Ocie soils and sandstone rock outcrop. These included areas make up 10 to 15 percent of the unit. Gatewood and Ocie soils are deeper over bedrock than the Basehor soil and have more clay and less sand. They are in landscape positions similar to those of the Basehor soil. The sandstone outcrop is adjacent to and on steep breaks.

Permeability is moderately rapid in the Basehor soil. Surface runoff is medium. The available water capacity is very low. Natural fertility and the organic matter content are low. The rooting depth is restricted by the sandstone bedrock at a depth of about 17 inches.

Most areas are wooded. Some areas are used as marginal pasture. Because of the slope, the shallowness to sandstone bedrock, the sandstone boulders on the surface, and droughtiness, this soil is unsuited to cultivated crops. It is best suited to trees. Many areas support fair or poor stands of hardwoods. Erosion is a hazard. Carefully designing logging roads and skid trails, around and among surface boulders, can minimize the steepness and length of the slopes and the concentration of water. The slope and the boulders on the surface restrict the use of equipment, but these limitations can be minimized by constructing roads and skid trails on the contour or, where necessary, by yarding the logs uphill to the roads and skid trails. Seeding of disturbed areas may be needed after harvesting is completed. The use of tree-planting and site-preparation equipment is severely restricted. Hand planting or direct seeding may be necessary. Seedling mortality rates and the hazard of windthrow are management concerns. Planting container-grown nursery stock increases the seedling survival rate. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil generally is not used for pasture grasses because of the shallowness to bedrock and droughtiness. Because of the surface boulders, tillage is nearly impossible.

This soil generally is unsuitable for building site development and onsite waste disposal because of the shallowness to bedrock, the surface boulders, the rock outcrop, and the slope.

The land capability classification is VIIs. The woodland ordination symbol is 2R.

26F—Ocie-Gatewood-Gasconade complex, 5 to 35 percent slopes. These moderately sloping to steep soils are on the sides of ridges in the uplands. Individual areas range from about 5 to more than 600 acres in size. They generally are about 40 percent deep, well drained Ocie soil; 30 percent moderately deep, moderately well drained Gatewood soil; and 15 percent shallow, somewhat excessively drained Gasconade soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Ocie soil is very dark grayish brown, friable cherty silt loam about 5 inches thick. The subsurface layer is light yellowish brown, friable cherty silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown and light yellowish brown, firm very cherty silty clay loam. The next part is multicolored, very firm clay. The lower part is multicolored, very firm cherty clay. Hard dolomite bedrock is at a depth of about 45 inches. In some areas the upper part of the subsoil has a lower content of coarse fragments. In places the surface layer is very cherty silt loam.

Typically, the surface layer of the Gatewood soil is very dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is dark grayish brown, friable very cherty silt loam about 5 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, mottled, very firm cherty clay. The next part is yellowish brown and light yellowish brown, very firm clay. The lower part is brown and pale brown, very firm cherty clay. Hard dolomite bedrock is at a depth of about 30 inches. In some areas the subsoil has a lower content of coarse fragments. In other areas the soil is well drained. In places the surface layer is cherty silt loam.

Typically, the surface layer of the Gasconade soil is black, firm flaggy silty clay loam about 8 inches thick. The subsoil is very dark grayish brown, very firm very flaggy silty clay about 6 inches thick. Hard dolomite bedrock is at a depth of about 14 inches. In some areas the subsoil has less clay. In other areas it is channery. In places the surface layer is cherty.

Included with these soils in mapping are areas of Cedargap and Gepp soils and areas of dolomite rock outcrop and of stones and boulders. These included areas make up 10 to 15 percent of the unit. Cedargap and Gepp soils are more than 60 inches deep over dolomite bedrock. Cedargap soils have less clay than the Ocie, Gatewood, and Gasconade soils. They are on narrow flood plains. Gepp soils typically are on the higher side slopes. The rock outcrop typically is on the steeper slopes.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil.

Permeability is slow in the Gatewood soil. Surface runoff is rapid. The available water capacity is very low. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 30 inches.

Permeability is moderately slow in the Gasconade soil. Surface runoff is rapid. The available water capacity is very low. Natural fertility is medium, and the organic matter content is moderate. The shrink-swell potential also is moderate. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 14 inches.

Most areas are wooded. A few areas have been cleared and are used for pasture. These soils are unsuited to cultivated crops because of the slope, the depth to bedrock in the Gatewood and Gasconade soils, the stony and bouldery areas, and the rock outcrop.

The Ocie and Gatewood soils are suited to trees. Commercial timber management generally is not feasible on the Gasconade soil because of low production. Low-quality trees generally grow on the south- and west-facing slopes and better quality hardwoods grow on the north- and east-facing slopes. Erosion is a hazard. Carefully designing logging roads and skid trails can minimize the steepness and length of the slopes and the concentration of water. The slope limits the use of equipment, but this limitation can be overcome by constructing roads and skid trails on the contour or, where necessary, by yarding the logs uphill to the roads and skid trails. Seeding of disturbed areas may be needed after harvesting is completed. The use of tree-planting and site-preparation equipment is restricted because of the content of chert in the soils. Hand planting or direct seeding may be necessary. Seedling mortality and the hazard of windthrow are management concerns on the Gatewood and Gasconade soils. Planting container-grown nursery stock increases the seedling survival rate. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

The Ocie and Gatewood soils are suited to cool-season grasses, warm-season grasses, and some kinds of legumes, but the Gasconade soil is poorly suited. Droughtiness during the summer, erosion, and the stony and bouldery areas are the main management problems. Tillage should be avoided. The soils generally are unsuited to hay because of the slope and the stony and bouldery included areas.

Seepage, the depth to bedrock, and the slope are limitations if ponds are constructed on these soils. Sites should be carefully selected. Exposed bedrock should be covered, and all areas thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

These soils generally are unsuited to building site development and onsite waste disposal because of the slope and the shallowness to bedrock.

The land capability classification is VIIe. The woodland ordination symbol is 3R in areas of the Ocie soil and 2R in areas of the Gatewood and Gasconade soils.

32C2—Alsup cherty silt loam, 3 to 9 percent slopes, eroded. This deep, gently sloping and moderately sloping, moderately well drained soil is on foot slopes in the uplands. Individual areas range from about 5 to more than 600 acres in size.

Typically, the surface layer is dark grayish brown, friable cherty silt loam about 1 inch thick. The subsurface layer is pale brown and light brownish gray, friable cherty silt loam about 3 inches thick. The subsoil is about 20 inches thick. The upper part is yellowish brown, friable silty clay loam. The next part is yellowish red, firm silty clay loam. The lower part is multicolored, firm silty clay. The substratum is multicolored, very firm clay. Weathered shale bedrock is at a depth of about 50 inches. In some places the surface layer is silt loam. In other places the soil is cherty to a depth of 60 inches or more. In some areas the yellowish brown part of the subsoil has been mixed with the surface layer and subsurface layer. In other areas the soil is strongly sloping.

Included with this soil in mapping are areas of Britwater, Gatewood, Gepp, and Ocie soils. These soils make up 10 to 15 percent of the unit. Britwater soils are well drained and are on terraces below the Alsup soil. They have less clay in the subsoil than the Alsup soil. Gatewood, Gepp, and Ocie soils are on side slopes below the Alsup soil. Gatewood soils are moderately deep over bedrock. Gepp soils are well drained. They are redder in the subsoil than the Alsup soil. Ocie soils have more chert and clay than the Alsup soil.

Permeability is moderately slow in the Alsup soil. Surface runoff is medium. The available water capacity is moderate. A perched water table is at a depth of 2.5 to 4.0 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil.

Most areas are used for hay or pasture. A few areas are used for small grain. A few are wooded. This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. The species that are tolerant of wetness grow best. Erosion control during seedbed preparation is the main problem. Timely tillage and a quickly established ground cover help to prevent excessive erosion.

Seepage, the depth to bedrock, and the slope are limitations if ponds are constructed on this soil. Seepage generally is a problem only where shale bedrock or siltstone is exposed. Sites should be carefully selected (fig. 11). Bedrock should be covered, and all areas should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored.

This soil is suited to small grain and row crops only if the crops are grown on a limited basis. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

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

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. The soil generally is unsuitable as a site for septic tank absorption fields because of the seasonal wetness and the slow permeability. Sewage lagoons can function adequately if they are designed and installed properly and the berms are sealed with slowly permeable material.

The land capability classification is IVe. The woodland ordination symbol is 3A.

40F—Alsup-Noark complex, 9 to 35 percent slopes. These deep, strongly sloping to steep soils are on the sides of ridges in the uplands (fig. 12). The moderately well drained Alsup soil is on the lower side slopes. The well drained Noark soil is on the higher side slopes. Individual areas range from about 5 to more than 1,000 acres in size. They generally are about 45 percent Alsup soil and 40 percent Noark soil. The two soils occur as areas so small or so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Alsup soil is dark grayish brown, friable cherty silt loam about 3 inches thick. The subsurface layer is brown, friable cherty silt

Figure 11.—Fenced pond in an area of tall fescue pasture on Alsup cherty silt loam, 3 to 9 percent slopes, eroded.

loam about 3 inches thick. The subsoil is about 20 inches thick. In sequence downward, it is yellowish brown and brown, friable silty clay loam; yellowish brown, firm silty clay; yellowish brown, mottled, very firm silty clay; and multicolored, very firm clay. The substratum is grayish brown and light brownish gray, very firm clay. Weathered shale bedrock is at a depth of about 40 inches. In some areas the depth to weathered shale bedrock is less than 40 inches. In other areas the surface layer is silt loam.

Typically, the surface layer of the Noark soil is dark grayish brown, very friable very cherty silt loam about 5 inches thick. The subsurface layer is pale brown, very friable very cherty silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and pale brown, friable very cherty silt loam. The next part is yellowish red and reddish brown, firm very cherty silty clay. The lower part is dark red, mottled, firm very cherty clay. In some areas the subsoil has less chert or less clay. In some places the surface layer is cherty. In other places the surface layer and subsurface layer are thicker.

Included with these soils in mapping are areas of Basehor, Gatewood, and Ocie soils; a stony Alsup soil; and dolomite and siltstone rock outcrop. These areas make up 10 to 15 percent of the unit. Basehor soils are shallow over sandstone bedrock, Gatewood and Ocie soils are shallower over bedrock than the Alsup and Noark soils. The stony Alsup soil has siltstone on the surface. Basehor, Gatewood, and Ocie soils and the dolomite rock outcrop are downslope from the Alsup and Noark soils. The other included areas are in landscape positions similar to those of the Alsup soil.

Permeability is moderately slow in the Alsup soil. Surface runoff is rapid. The available water capacity is low. A perched water table is at a depth of 2.5 to 4.0 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil.

Permeability is moderate in the Noark soil. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low.

Most areas are wooded with native hardwoods. Many areas have been cleared and are used for pasture. Because of the slope and the rock outcrop, these soils generally are unsuited to cultivated crops. They are suited to trees. Erosion is a hazard. Carefully designing logging roads and skid trails can minimize the steepness and length of the slopes and the concentration of water. The slope limits the use of equipment, but this limitation can be overcome by constructing roads and skid trails on the contour or, where necessary, by yarding the logs uphill to the roads or skid trails. Because of the stony areas of Alsup soil and the content of chert in the Noark soil, the use of tree-planting and site-preparation equipment is limited. Hand planting or direct seeding may be needed.

These soils are suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Because of seasonal wetness, the species that are tolerant of wetness grow best on the Alsup soil. Droughtiness is a problem on both soils during the summer. Erosion is the main hazard. Tillage should be avoided. The soils generally are unsuitable for hayland because of the slope and the rock outcrop.

Seepage, the slope, and the depth to bedrock are limitations if ponds are constructed on these soils. Sites should be carefully selected. The better sites are in areas of the Alsup soil (fig. 13). The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

These soils generally are suitable for building site

Figure 12.—An area of Alsup-Noark complex, 9 to 35 percent slopes.

Figure 13.—Pond in an area of Alsup-Noark complex, 9 to 35 percent slopes.

development and onsite waste disposal if proper design and installation procedures are used. Land shaping can modify the slope. Otherwise, dwellings should be designed so that they conform to the natural slope of the land. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the Alsup soil. This soil should not be selected as a building site. Septic tank absorption fields can function properly on the Noark soil if the moderate permeability is overcome by an increase in the length of the lateral field and the slope is overcome by proper design.

The land capability classification is VIIe. The woodland ordination symbol is 3R.

42C—Gepp-Ocie very cherty silt loams, 3 to 9 percent slopes. These deep, gently sloping and moderately sloping soils are on ridges in the uplands. Individual areas range from about 5 to more than 100 acres in size. They generally are about 65 percent well drained Gepp soil and 20 percent moderately well drained Ocie soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Gepp soil is dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is brown, friable very cherty silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is strong brown, firm cherty silty clay loam. The next part is red and strong brown, very firm clay. The lower part is red and strong brown, very firm cherty clay. In some areas the subsoil has a higher content of coarse fragments. In other areas it has some gray mottles. In some places the content of coarse fragments is lower in the surface layer and subsurface layer. In other places the soil is strongly sloping. In some areas the surface layer and subsurface layer are thicker.

Typically, the surface layer of the Ocie soil is very dark grayish brown, friable very cherty silt loam about 6 inches thick. The subsurface layer is brown and dark grayish brown, friable very cherty silt loam about 14 inches thick. The subsoil is about 38 inches thick. It is multicolored. In sequence downward, it is firm very cherty silty clay loam, firm cherty clay, very firm clay, and very firm cherty clay. Hard dolomite bedrock is at a depth of about 58 inches. In some areas the content of coarse fragments is lower. In other areas the subsoil has gray mottles. In some places the soil is strongly sloping. In other places the surface layer is very cherty silt loam.

Included with these soils in mapping are areas of Gatewood and Wilderness soils and some stony and bouldery areas. These included areas make up 10 to 15 percent of the unit. Gatewood soils are moderately deep over bedrock. They are in landscape positions similar to those of the Ocie soil. Wilderness soils have a fragipan. They generally are upslope from the Gepp and Ocie soils.

Permeability is moderate in the Gepp soil. Surface runoff is medium. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is medium. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 58 inches.

Most areas have been cleared and are used for pasture. Some areas are wooded, and a few areas are used for small grain or row crops. These soils are well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is the main problem. Also, droughtiness is a problem during the summer. A good ground cover is necessary at all times if production is to be maintained. Companion crops help to prevent excessive erosion in newly seeded areas. Timely tillage is needed. Also, the soils should be tilled on the contour. No-till seeding methods help to protect the surface. Overgrazing should be avoided.

Seepage and slope are limitations if ponds are constructed on these soils. The depth to bedrock also is a limitation in the Ocie soil. Sites should be carefully selected. Exposed bedrock should be covered, and all areas should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

Some areas support native hardwoods. These soils are suited to trees. No major hazards or limitations affect planting or harvesting.

These soils are suited to small grain and row crops only if the crops are grown on a limited basis. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on these soils are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

These soils generally are suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soils. Because of the depth to bedrock, the Ocie soil should not be selected as a site for buildings with basements. Septic tank absorption fields can function properly on the Gepp soil if the restricted permeability is overcome by an increase in the length of the lateral field.

The land capability classification is IVe. The woodland ordination symbol is 3A.

42D—Gepp-Ocie very cherty silt loams, 9 to 14 percent slopes. These deep, strongly sloping, well drained soils are on the sides of ridges in the uplands. Individual areas range from about 5 to more than 400 acres in size. They generally are about 65 percent Gepp soil and 20 percent Ocie soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Gepp soil is very dark grayish brown, friable very cherty silt loam about 2 inches thick. The subsurface layer is pale brown, friable very cherty silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is strong brown and yellowish red, friable cherty silty clay loam. The next part is dark red, firm clay. The lower part is dark red, mottled, firm cherty clay. In some areas the surface layer and subsurface layer are thicker. In other areas the surface layer is cherty silt loam. In some places the subsoil has a higher content of coarse fragments. In other places it has some gray mottles.

Typically, the surface layer of the Ocie soil is dark grayish brown, friable very cherty silt loam about 2 inches thick. The subsurface layer is pale brown, friable very cherty silt loam about 8 inches thick. The subsoil is about 46 inches thick. In sequence downward, it is light brown and reddish yellow, firm very cherty silty clay loam; yellowish red and brown, very firm cherty clay; multicolored, very firm clay; and multicolored, very firm cherty clay. Hard dolomite bedrock is at a depth of about 56 inches. In some areas the upper part of the subsoil has a lower content of coarse fragments. In other areas the subsoil has some gray mottles. In some places the soil is moderately steep and has a surface layer of very cherty silt loam. In other places the surface layer and subsurface layer are thicker.

Included with these soils in mapping are areas of Cedargap and Gatewood soils and some stony and bouldery areas. Included areas make up 10 to 15 percent of the unit. Cedargap soils have less clay than the Gepp and Ocie soils. They are on narrow flood plains. Gatewood soils are moderately well drained and moderately deep over bedrock. They are in landscape positions similar to those of the Ocie soil.

Permeability is moderate in the Gepp soil. Surface runoff is medium or rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is medium or rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 56 inches.

Most areas have been cleared and are used for pasture. Some areas are wooded. Because of the slope and droughtiness, these soils are unsuited to cultivated crops. They are suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is the main problem. A good ground cover is necessary at all times if production is to be maintained. Companion crops help to prevent excessive erosion in newly seeded areas. Timely tillage is needed. Also, the soils should be tilled on the contour. No-till seeding methods help to protect the surface. Droughtiness is a problem during the summer. Overgrazing should be avoided.

Seepage and slope are limitations if ponds are constructed on these soils. The depth to bedrock also is a limitation in the Ocie soil. Sites should be carefully selected. Exposed bedrock should be covered, and all areas should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

Some areas support native hardwoods. These soils are suited to trees. No major hazards or limitations affect planting or harvesting.

These soils generally are suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soils. Land shaping may be necessary to modify the slope. Because of the depth to bedrock, the Ocie soil should not be selected as a site for buildings with basements. Septic tank absorption fields can function properly on the Gepp soil if the restricted permeability is overcome by an increase in the length of the lateral field.

The land capability classification is VIe. The woodland ordination symbol is 3A.

42F—Gepp-Ocie very cherty silt loams, 14 to 35 percent slopes. These deep, moderately steep and steep, well drained soils are on the sides of ridges in the uplands. Individual areas range from about 5 to more than 300 acres in size. They generally are about 65 percent Gepp soil and 20 percent Ocie soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Gepp soil is dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is pale brown, friable cherty silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is strong brown, firm cherty silty clay loam. The next part is red, very firm cherty clay. The lower part is yellowish red, very firm clay. In some areas the subsoil has a higher content of coarse fragments. In other areas the soil is strongly sloping. In some places the subsoil has some gray mottles. In other places the surface layer and subsurface layer are thicker. In some areas the surface layer is cherty silt loam.

Typically, the surface layer of the Ocie soil is brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is pale brown and light brownish gray, friable very cherty silt loam about 7 inches thick. The subsoil is about 48 inches thick. The upper part is strong brown and reddish yellow, firm very cherty silty clay loam. The next part is yellowish red, very firm cherty clay. The lower part is strong brown and brown, very firm cherty clay. Hard dolomite bedrock is at a depth of about 58 inches. In some areas the upper part of the subsoil has a lower content of coarse fragments. In other areas the subsoil has some gray mottles. In some places the soil is strongly sloping. In other places the surface layer is very cherty silt loam.

Included with these soils in mapping are areas of Cedargap and Gatewood soils, outcrops of dolomite, and stony and bouldery areas. These included areas make up 10 to 15 percent of the unit. Cedargap soils have less clay than the Gepp and Ocie soils. They are on narrow flood plains. Gatewood soils are moderately well drained and moderately deep over bedrock. They are in landscape positions similar to those of the Ocie soil.

Permeability is moderate in the Gepp soil. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 58 inches.

Most areas are wooded with native hardwoods. Many areas have been cleared and are used for pasture. Because of the slope, these soils are unsuited to cultivated crops. They are suited to trees. Erosion is a hazard in the wooded areas. Carefully designing logging roads and skid trails can minimize the steepness and length of the slopes and the concentration of water. The slope limits the use of equipment, but this limitation can be overcome by constructing roads and skid trails on the contour or, where necessary, by yarding the logs uphill to the roads and skid trails.

These soils are suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Droughtiness during the summer, erosion, and the coarse fragments in the surface layer are the main management problems. Tillage should be avoided. The soils generally are unsuited to hay because of the slope and the outcrops of dolomite.

These soils generally are suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Land shaping can modify the slope. Otherwise, dwellings should be designed so that they conform to the natural slope of the land. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soils. The Ocie soil is not suitable as a site for dwellings with basements because of the depth to bedrock. An alternative site should be selected. Septic tank absorption fields can function properly on the Gepp soil if the moderate permeability is overcome by an increase in the length of the lateral field and the slope is overcome by proper design.

The land capability classification is VIIe. The woodland ordination symbol is 3R.

43C—Noark very cherty silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, well drained soil is on the tops of ridges in the uplands. Individual areas range from 5 to more than 200 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is friable very cherty silt loam about 14 inches thick. The upper part is dark grayish brown and grayish brown, and the lower part is pale brown and light yellowish brown. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish red, firm very cherty silty clay loam. The lower part is dark red, firm very cherty clay. In some areas the subsoil has a lower content of coarse fragments, and in other areas it has a lower content of clay. In some places the surface layer is cherty silt loam. In other places the soil is strongly sloping.

Included with this soil in mapping are areas of Tonti and Scholten soils. These soils make up 10 to 15 percent of the unit. They are moderately well drained and on the higher side slopes. They have a fragipan.

Permeability is moderate in the Noark soil. Surface runoff is medium. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low.

Most areas have been cleared and are used for hay or pasture. Some areas are wooded. A few areas are used for small grain or row crops.

This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Because of the high content of chert, droughtiness is a problem during the summer. Erosion is a major hazard if the soil is tilled during seedbed preparation. Timely tillage and a

Figure 14.—A good stand of hardwood trees on Noark very cherty silt loam, 3 to 9 percent slopes.

quickly established ground cover help to prevent excessive erosion.

Seepage is a hazard if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

A few areas support native hardwoods (fig. 14). This soil is suited to trees. The use of tree-planting and site-preparation equipment is limited. Hand planting or direct seeding may be needed. Seedling mortality is a limitation. Planting container-grown nursery stock increases seedling survival rates.

This soil is suited to small grain and row crops only if the crops are grown on a limited basis. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

This soil is suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Increasing the size of septic tank absorption fields helps to compensate for the moderate permeability.

The land capability classification is IVe. The woodland ordination symbol is 3F.

43D—Noark very cherty silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is on the sides of ridges in the uplands. Individual areas range from 5 to more than 100 acres in size.

Typically, the surface layer is dark grayish brown, friable very cherty silt loam about 2 inches thick. The subsurface layer is brown, friable very cherty silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, mottled, firm very cherty silty clay loam. The lower part is dark red, very firm very cherty clay. In some areas the subsoil has a lower content of coarse fragments. In other areas the surface layer is cherty silt loam. In some places the surface layer and subsurface layer are thicker. In other places the content of clay is lower. In some areas the soil is moderately steep.

Included with this soil in mapping are areas of Cedargap soils on flood plains. These soils make up 10 to 15 percent of the unit. They have less clay than the Noark soil.

Permeability is moderate in the Noark soil. Surface runoff is medium or rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low.

Most areas have been cleared and are used for hay or pasture. Some areas are wooded. Because of the slope and droughtiness, this soil is unsuited to cultivated crops. It is suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is the main problem. Also, droughtiness is a problem during the summer. A good ground cover is necessary at all times if production is to be maintained. Companion crops help to prevent excessive erosion in newly seeded areas. The soil should be tilled on the contour. No-till seeding methods help to protect the surface. Overgrazing should be avoided.

Seepage and the slope are limitations if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

A few areas support native hardwoods. This soil is suited to trees. The use of tree-planting and site-preparation equipment is limited. Hand planting or direct seeding may be needed. Seedling mortality is a limitation. Planting container-grown nursery stock increases seedling survival rates.

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Land shaping may be necessary to modify the slope. Enlarging septic tank absorption fields helps to compensate for the moderate permeability. Properly designing the fields helps to overcome the slope. The soil generally is unsuitable as a site for sewage lagoons because of seepage and slope.

The land capability classification is VIe. The woodland ordination symbol is 3F.

43F—Noark very cherty silt loam, 14 to 35 percent slopes. This deep, moderately steep and steep, well drained soil is on the sides of ridges in the uplands. Individual areas range from 5 to more than 1,000 acres in size.

Typically, the surface layer is dark grayish brown, friable very cherty silt loam about 4 inches thick. The subsurface layer is brown, friable very cherty silt loam about 13 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is strong brown, friable very cherty silty clay loam. The next part is yellowish red and dark red, firm cherty silty clay. The lower part is dark red, very firm cherty clay. In some areas the subsoil has a lower content of coarse fragments. In other areas the content of clay is lower. In some places the soil is strongly sloping. In other places the surface layer and subsurface layer are thicker. In some areas the surface layer is cherty silt loam.

Included with this soil in mapping are areas of Alsup, Cedargap, Gasconade, Gatewood, and Ocie soils. These soils make up 10 to 15 percent of the unit. Alsup soils have less chert than the Noark soil, Cedargap soils have less clay, and Gasconade, Gatewood, and Ocie soils have less chert and are shallower over bedrock. Alsup soils are on side slopes below the Noark soil and above Gasconade, Gatewood, and Ocie soils. Cedargap soils are on narrow flood plains.

Permeability is moderate in the Noark soil. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low.

Most areas are wooded with native hardwoods. Some areas are used for pasture. Because of the slope and droughtiness, this soil is unsuited to cultivated crops. It is suited to trees. Erosion is a hazard in the wooded areas. Carefully designing logging roads and skid trails can minimize the steepness and length of the slopes and the concentration of water. The slope limits the use of equipment, but this limitation can be overcome by constructing roads and skid trails on the contour or by yarding the logs uphill to the roads and skid trails. Hand planting or direct seeding may be needed. Planting container-grown nursery stock increases seedling survival rates.

This soil is suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is the main problem. Also, droughtiness is a problem during the summer. Tillage should be avoided. The soil generally is unsuitable for hay because of the slope and the content of chert.

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Land shaping generally is necessary to modify the slope. Enlarging septic tank absorption fields helps to compensate for the moderate permeability. Properly designing the fields helps to overcome the slope. The soil generally is unsuitable as a site for sewage lagoons because of seepage and slope.

The land capability classification is VIIe. The woodland ordination symbol is 3R.

44F—Ocie-Gepp-Gatewood cherty silt loams, 3 to 35 percent slopes, extremely stony. These gently sloping to steep soils are on the sides of ridges in the uplands. The Ocie and Gepp soils are deep and well drained, and the Gatewood soil is moderately deep and moderately well drained. Typically, about 5 percent of the surface is covered with stones 10 inches to 2 feet in diameter. Individual areas range from about 5 to more than 300 acres in size. They are about 40 percent Ocie soil, 30 percent Gepp soil, and 15 percent Gatewood soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Ocie soil is very dark grayish brown, friable cherty silt loam about 4 inches thick. The subsurface layer is pale brown, friable cherty silt loam about 13 inches thick. The subsoil is about 28 inches thick. The upper part is light yellowish brown and yellowish brown, firm very cherty silty clay loam. The next part is multicolored, very firm clay. The lower part is multicolored, very firm cherty clay. Hard dolomite bedrock is at a depth of about 45 inches. In some areas the upper part of the subsoil has a lower content of coarse fragments. In other areas the surface layer is very cherty.

Typically, the surface layer of the Gepp soil is very dark grayish brown, friable cherty silt loam about 3 inches thick. The subsurface layer is dark grayish brown and grayish brown, friable very cherty silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark red and reddish brown, firm cherty silty clay loam. The next part is dark red, very firm clay. The lower part is dark red, mottled, very firm clay. In some areas the subsoil has more chert. In other areas the surface layer and subsurface layer are thicker. In places the surface layer is very cherty silt loam.

Typically, the surface layer of the Gatewood soil is black, friable cherty silt loam about 4 inches thick. The subsurface layer is grayish brown, friable cherty silt loam about 3 inches thick. The subsoil is very firm clay about 22 inches thick. The upper part is yellowish brown and mottled, and the lower part is multicolored. Hard dolomite bedrock is at a depth of about 29 inches. In some areas the surface layer is very cherty silt loam.

Included with these soils in mapping are areas of Cedargap and Gasconade soils and rock outcrop of dolomite. These included areas make up about 10 to 15 percent of the unit. Cedargap soils have less clay than the Ocie, Gepp, and Gatewood soils. They are on narrow flood plains. Gasconade soils are somewhat excessively drained and are shallow over dolomite bedrock. The Gasconade soils and the rock outcrop are scattered throughout the unit.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 45 inches.

Permeability is moderate in the Gepp soil. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Permeability is slow in the Gatewood soil. Surface runoff is rapid. The available water capacity is very low. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 29 inches.

Most areas are wooded with native hardwoods. A few scattered areas have been cleared and are used for pasture. They generally are not used for hay and pasture or cultivated crops because of the slope and the stones and boulders, which make tillage impractical.

These soils are suited to trees. Erosion is a hazard. Carefully designing logging roads and skid trails, around and among surface stones and boulders, can minimize the steepness and length of the slopes and the concentration of water. The slope restricts the use of equipment, but this limitation can be overcome by constructing roads and skid trails on the contour or by yarding the logs uphill to the roads and skid trails.

These soils generally are unsuited to building site development and onsite waste disposal because of the slope and the stoniness.

The land capability classification is VIIe. The woodland ordination symbol is 3R in areas of the Ocie and Gepp soils and 2R in areas of the Gatewood soil.

48C—Ocie-Gepp-Gatewood complex, 3 to 9 percent slopes. These gently sloping and moderately sloping soils are on ridges in the uplands. The Ocie and Gepp soils are deep, and the Gatewood soil is moderately deep. The Ocie and Gatewood soils are moderately well drained, and the Gepp soil is well drained. Individual areas range from about 5 to more than 200 acres in size. They are about 40 percent Ocie soil, 30 percent Gepp soil, and 15 percent Gatewood soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Ocie soil is dark grayish brown, friable cherty silt loam about 3 inches thick. The subsurface layer is pale brown, friable cherty silt loam about 4 inches thick. The subsoil is about 41 inches thick. In sequence downward, it is light yellowish brown, mottled, friable very cherty silty clay loam; multicolored, firm cherty clay and very firm clay;

yellowish brown, very firm clay; and multicolored, very firm cherty clay. A thin layer of weathered dolomite bedrock is at a depth of about 48 inches. Hard dolomite bedrock is at a depth of about 53 inches. In places the upper part of the subsoil has a lower content of coarse fragments. In some areas the soil is well drained, and in other areas it is strongly sloping. In some places the surface layer is very cherty silt loam. In other places the surface layer and subsurface layer are thicker.

Typically, the surface layer of the Gepp soil is very dark grayish brown, friable cherty silt loam about 2 inches thick. The subsurface layer is light yellowish brown, friable cherty silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, firm silty clay loam. The next part is strong brown, mottled, very firm clay. The lower part is multicolored, very firm clay. In some areas the subsoil has a higher content of coarse fragments. In other areas the content of coarse fragments is lower in the surface layer and subsurface layer. In some places the soil is strongly sloping. In other places the surface layer and subsurface layer are thicker. In some areas the surface layer is very cherty.

Typically, the surface layer of the Gatewood soil is very dark grayish brown, friable very cherty silt loam about 4 inches thick. The subsurface layer is brown, friable very cherty silt loam about 3 inches thick. The subsoil is very firm clay about 20 inches thick. It is strong brown and brown and is mottled, and the lower part is yellowish brown and pale brown, very firm clay. Weathered, sandy dolomite bedrock is at a depth of about 27 inches. Hard dolomite bedrock is at a depth of about 30 inches. Some areas are strongly sloping. In some places the surface layer and subsurface layer are thicker. In other places the surface layer is cherty silt loam.

Included with these soils in mapping are areas of Gasconade and Wilderness soils, outcrops of dolomite, and areas of stones and boulders. These included areas make up 10 to 15 percent of the unit. Gasconade soils and the rock outcrop are in scattered areas throughout the unit. Gasconade soils are somewhat excessively drained and are shallow over dolomite bedrock. Wilderness soils have a fragipan. They generally are upslope from the Gepp soil.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is medium. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 53 inches.

Permeability is moderate in the Gepp soil. Surface runoff is medium. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Permeability is slow in the Gatewood soil. Surface runoff is medium. The available water capacity is very low. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 30 inches.

Most areas have been cleared and are used for pasture. Some areas are wooded. A few areas are used for small grain or row crops. These soils are well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. The species that are tolerant of seasonal wetness grow best on these soils. Erosion is the main problem. A good ground cover is necessary at all times if production is to be maintained. Companion crops help to prevent excessive erosion in newly seeded areas. Timely tillage is needed. Also, the soils should be tilled on the contour. No-till seeding methods help to protect the surface. Droughtiness is a problem during the summer. Overgrazing should be avoided.

Seepage and the depth to bedrock are limitations if ponds are constructed on these soils. Sites should be carefully selected. Exposed bedrock should be covered, and all areas should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

Some areas support native hardwoods. These soils are suited to trees. No major hazards or limitations affect planting or harvesting.

These soils are suited to small grain and row crops only if the crops are grown on a limited basis. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on these soils are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

These soils generally are suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soils. The Gatewood and Ocie soils should not be selected as sites for buildings with basements because of the depth to bedrock. Septic tank absorption fields can function properly on the Gepp soil if the restricted permeability is overcome by an increase in the length of the absorption field.

The land capability classification is IVe. The woodland ordination symbol is 3A in areas of the Gepp and Ocie soils and 2A in areas of the Gatewood soil.

48D—Ocie-Gepp-Gatewood complex, 9 to 14 percent slopes. These strongly sloping soils are on the sides of ridges in the uplands. The Ocie and Gepp soils are deep and well drained, and the Gatewood soil is moderately deep and moderately well drained. Individual areas range from about 5 to more than 100 acres in size. They are about 40 percent Ocie soil, 30 percent Gepp soil, and 15 percent Gatewood soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Ocie soil is very dark grayish brown, friable cherty silt loam about 6 inches thick. The subsoil is about 42 inches thick. The upper part is light yellowish brown and reddish yellow, friable very cherty silty clay loam and yellowish brown and strong brown, firm cherty silty clay loam. The lower part is yellowish brown, very firm clay and yellowish brown, mottled, very firm cherty clay. It has a thin layer of chert. Hard dolomite bedrock is at a depth of about 48 inches. In some areas the upper part of the subsoil has a lower content of coarse fragments. In other areas the soil is moderately steep. In places the surface layer is very cherty silt loam.

Typically, the surface layer of the Gepp soil is dark grayish brown, friable cherty silt loam about 2 inches thick. The subsurface layer is yellowish brown, friable cherty silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, firm silty clay loam. The lower part is strong brown, mottled, very firm clay. In some areas the subsoil has a higher content of coarse fragments. In other areas the soil is moderately steep. In some places the surface layer and subsurface layer are thicker. In other places the surface layer is very cherty silt loam.

Typically, the surface layer of the Gatewood soil is dark grayish brown, friable very cherty silt loam about 3 inches thick. The subsurface layer is brown, friable very cherty silt loam about 4 inches thick. The subsoil extends to a depth of about 28 inches. The upper part is yellowish brown, firm cherty silty clay. The next part is dark yellowish brown, very firm clay. The lower part is yellowish brown, mottled, very firm clay. Hard dolomite bedrock is at a depth of about 28 inches. In some areas the soil is moderately steep. In other areas the surface layer and subsurface layer are thicker. In places the surface layer is cherty silt loam.

Included with these soils in mapping are areas of Cedargap and Gasconade soils, outcrops of dolomite, and areas of stones and boulders. These included areas make up 10 to 15 percent of the unit. Cedargap soils have less clay than the Ocie, Gepp, and Gatewood soils. They are on narrow flood plains. Gasconade soils are somewhat excessively drained and are shallow over bedrock. Gasconade soils, the rock outcrop, and the stones and boulders are in scattered areas throughout the unit.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is medium or rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 48 inches.

Permeability is moderate in the Gepp soil. Surface runoff is medium or rapid. The available water capacity is moderate. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Permeability is slow in the Gatewood soil. Surface runoff is medium or rapid. The available water capacity is very low. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 28 inches.

Most areas have been cleared and are used for pasture. Some areas are wooded. Because of the slope and the outcrops of dolomite, these soils are unsuited to cultivated crops. They are suited to cool-season grasses, warm-season grasses, and some kinds of legumes. The species that are tolerant of seasonal wetness grow best on these soils. Erosion is the main problem. Also, droughtiness is a problem during the summer. A good ground cover is necessary at all times if production is to be maintained. Companion crops help to prevent excessive erosion in newly seeded areas. Timely tillage is needed. Also, the soils should be tilled on the contour. No-till seeding methods help to protect the surface. Overgrazing should be avoided.

Seepage, the depth to bedrock, and the slope are limitations if ponds are constructed on these soils. Sites should be carefully selected. Exposed bedrock should be covered, and all areas should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

Some areas support native hardwoods. These soils are suited to trees. No major hazards or limitations affect planting or harvesting.

These soils generally are suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soils. Land shaping may be needed to modify the slope. The Gatewood and Ocie soils should not be selected as sites for buildings with basements because of the depth to bedrock. Septic tank absorption fields can function properly on the Gepp soil if the restricted permeability is overcome by an increase in the length of the lateral field.

The land capability classification is VIe. The woodland ordination symbol is 3A in areas of the Gepp and Ocie soils and 2A in areas of the Gatewood soil.

48F—Ocie-Gepp-Gatewood complex, 14 to 35 percent slopes. These moderately steep and steep soils are on the sides of ridges in the uplands. The Ocie and Gepp soils are deep and well drained, and the Gatewood soil is moderately deep and moderately well drained. Individual areas range from about 5 to more than 200 acres in size. They are about 40 percent Ocie soil, 30 percent Gepp soil, and 15 percent Gatewood soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the surface layer of the Ocie soil is dark brown, friable cherty silt loam about 2 inches thick. The subsurface layer is pale brown, friable cherty silt loam about 4 inches thick. The subsoil is about 36 inches thick. The upper part is strong brown, firm very cherty silty clay loam. The next part is strong brown, very firm cherty clay. The lower part is multicolored, very firm clay. Hard dolomite bedrock is at a depth of about 42 inches. In some areas the upper part of the subsoil has a lower content of coarse fragments. In other areas the soil is strongly sloping. In some places the surface layer is very cherty silt loam. In other places the surface layer and subsurface layer are thicker.

Typically, the surface layer of the Gepp soil is dark grayish brown, friable very cherty silt loam about 5 inches thick. The subsurface layer is light brownish gray and pale brown, friable very cherty silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and strong brown, firm cherty silty clay loam. The next part is yellowish red, very firm clay. The lower part is multicolored, very firm clay. In some areas the subsoil has more chert. In other areas the soil is strongly sloping. In some places the surface layer and subsurface layer are thicker. In other places the surface layer is cherty silt loam.

Typically, the surface layer of the Gatewood soil is very dark grayish brown, friable very cherty silt loam about 4 inches thick. The subsurface layer is pale brown and dark grayish brown, friable very cherty silt loam about 2 inches thick. The subsoil is about 27 inches thick. The upper part is multicolored, firm cherty silty clay. The next part is multicolored, very firm clay. The lower part is multicolored, very firm cherty clay. Weathered dolomite bedrock is at a depth of about 33 inches. It is underlain by hard dolomite bedrock. In some places the soil is strongly sloping. In other areas the subsoil has less chert. In some places the surface layer and subsurface layer are thicker. In other places the surface layer is very cherty silt loam.

Included with these soils in mapping are areas of Cedargap and Gasconade soils, outcrops of dolomite, and areas of stones and boulders. These included areas make up about 10 to 15 percent of the unit. Cedargap soils have less clay than the Ocie, Gepp, and Gatewood soils. They are on narrow flood plains. Gasconade soils are somewhat excessively drained and are shallow over dolomite bedrock. Gasconade soils, the rock outcrop, and the stones and boulders are in scattered areas throughout the unit.

Permeability is moderate in the upper part of the Ocie soil and slow in the lower part. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderate. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 42 inches.

Permeability is moderate in the Gepp soil. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Permeability is slow in the Gatewood soil. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The rooting depth is restricted by the hard dolomite bedrock at a depth of about 33 inches.

Most areas are wooded with native hardwoods. Many areas have been cleared and are used for pasture. Because of the slope, these soils are unsuited to cultivated crops. They are suited to trees. Erosion is a hazard in the wooded areas. Carefully designing logging roads and skid trails can minimize the steepness and length of the slopes and the concentration of water. The slope limits the use of equipment, but this limitation can be overcome by constructing roads and skid trails on the contour or by yarding the logs uphill to the roads and skid trails. The included areas of rock outcrop and stones also hinder the use of equipment in many places.

These soils are suited to warm-season grasses and some kinds of legumes. Erosion, droughtiness during the summer, and the coarse fragments in the surface layer are the main management problems. Tillage should be avoided. The soils generally are unsuited to hay because of the slope.

These soils generally are suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Land shaping may be needed to modify the slope. Otherwise, dwellings should be designed so that they conform to the natural slope of the land. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soils. The Gatewood and Ocie soils should not be selected as sites for buildings with basements because of the depth to bedrock. Septic tank absorption fields can function properly on the Gepp soil if the design of the field compensates for the restricted permeability rate and the slope.

The land capability classification is VIIe. The woodland ordination symbol is 3R in areas of the Gepp and Ocie soils and 2R in areas of the Gatewood soil.

55A—Nolin silt loam, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on the wider flood plains. It is occasionally flooded for brief periods. Individual areas range from about 5 to more than 500 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 10 inches thick. The subsoil extends to a depth of 60 inches or more. It is dark brown and brown, friable silt loam in the upper part and brown, friable silty clay loam in the lower part. In places the surface layer is darker. In some areas the lower part of the subsoil has gray mottles.

Included with this soil in mapping are areas of Dameron and Moniteau soils and areas of soils that have a light colored surface layer and are moderately deep to coarse fragments. Included soils make up 10 to 15 percent of the unit. Dameron soils and the soils that have a light colored surface layer have more chert in the lower part than the Nolin soil. They are in landscape positions similar to those of the Nolin soil. Moniteau soils are poorly drained and are on low stream terraces next to the uplands.

Permeability is moderate in the Nolin soil. Surface runoff is slow. The available water capacity is very high. A seasonal high water table is at a depth of 3 to 6 feet during winter and spring in most years. Natural fertility is medium, and the organic matter content is moderate.

Most areas are used for hay or pasture. Some areas are used for small grain or row crops (fig. 15). A few are wooded. This soil is well suited to cool-season grasses, warm-season grasses, and legumes. The occasional flooding is the main problem. The species that are tolerant of wetness grow best. The possible periods of flooding should be considered when a grazing system is designed. Because seepage is a severe hazard in this soil, ponds generally are located on the adjacent soils, which are better sites for ponds.

This soil is well suited to small grain and row crops. If small grain or intertilled row crops are grown, scouring by floodwater is a hazard. The measures commonly used to control the erosion caused by scouring are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, diversion terraces, and a conservation cropping system that includes close-growing pasture and hay crops.

A few small areas support native hardwoods. This soil is suited to trees. The equipment limitation and seedling mortality are moderate. Equipment should be used only during periods when the soil is not flooded.

This soil generally is unsuited to building site development and onsite waste disposal because of the flooding.

The land capability classification is IIw. The woodland ordination symbol is 11A.

57C—Britwater silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, well drained soil is on terraces and foot slopes. Individual areas range from 5 to more than 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsurface layer is dark

Figure 15.—Corn in an area of Nolin silt loam, 0 to 3 percent slopes.

yellowish brown, friable silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is brown, friable silty clay loam; dark brown, mottled, firm cherty silty clay loam; dark brown, mottled, firm very cherty silty clay loam; dark brown, mottled, very firm very cherty clay; and multicolored, very firm very cherty clay. In some areas the surface layer is gravelly silt loam. In other areas the subsoil has a higher content of coarse fragments. In some places the lower part of the subsoil has some gray mottles. In other places the surface layer and subsurface layer have been mixed with the upper part of the subsoil.

Included with this soil in mapping are areas of Peridge and Viraton soils and small areas of sandy soils. Included soils make up 10 to 15 percent of the unit. They are in landscape positions similar to those of the Britwater soil. Peridge soils have a lower content of coarse fragments than the Britwater soil. Viraton soils are moderately well drained and have a fragipan.

Permeability is moderate in the Britwater soil. Surface runoff is medium. The available water capacity is moderate. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the lower part of the subsoil.

Most areas have been cleared and are used for hay or pasture. A few areas are wooded. A few are used for small grain or row crops. This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. No serious problems affect pasture or hayland. Erosion is a hazard in newly seeded areas. Timely seedbed preparation helps to ensure a good ground cover.

Seepage and slope are limitations if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

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

This soil is suited to small grain and row crops. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

This soil is suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Footings and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling in the lower part of the subsoil. Septic tank absorption fields can function properly if the restricted permeability is overcome by an increase in the length of the lateral field. Sewage lagoons should be sealed with slowly permeable material, which helps to prevent seepage. The slope is a limitation on some lagoon sites, but these sites generally can be leveled.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

76A—Moniteau silt loam, 0 to 3 percent slopes. This deep, nearly level, poorly drained soil is on low stream terraces and the wider flood plains. It is occasionally flooded. It ranges from about 5 to more than 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsurface layer is light brownish gray, mottled, friable silt loam about 14 inches thick. The subsoil to a depth of 60 inches or more is firm silty clay loam. It is gray and mottled in the upper part and multicolored in the lower part. In some places the surface layer is darker. In other places the soil is darker throughout. In some areas the lower part of the subsoil has some coarse fragments. In other areas the surface layer and subsoil have more clay.

Included with this soil in mapping are areas of Nolin soils. These soils make up about 10 to 15 percent of the unit. They are well drained and are on the adjacent flood plains.

Permeability is moderately slow in the Moniteau soil. Surface runoff is slow. The available water capacity is high. A seasonal high water table is within a depth of 1 foot during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the subsoil.

Most areas are used for hay or pasture. Some areas are used for small grain or row crops. A few areas are wooded.

This soil is well suited to cool-season grasses, warm-season grasses, and legumes. Wetness is the main problem. It should be considered when forage species are selected for planting. A seedbed can be easily prepared. A drainage system is beneficial, especially if deep-rooted species are grown. The soil is suitable as a site for ponds.

This soil is suited to small grain and row crops. If small grain or intertilled row crops are grown, scouring by floodwater is a hazard and wetness is a limitation. The measures commonly used to control scouring on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops that are tolerant of wetness, diversion terraces, and a conservation cropping system that includes close-growing pasture and hay crops.

A few small areas support native hardwoods. This soil is suited to trees. Equipment should be used only during periods when the soil is dry or frozen. Seedling mortality rates can be reduced by ridging the soil and then planting on the ridges. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is unsuited to building site development and onsite waste disposal because of the occasional flooding and the seasonal high water table.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

81B—Viraton silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on ridges in the uplands. Individual areas range from about 5 to more than 1,000 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The part of the subsoil above a fragipan is about 15 inches thick. It is dark yellowish brown, friable silty clay loam in the upper part and dark yellowish brown, mottled, firm cherty silty clay loam in the lower part. The fragipan is multicolored, very firm, brittle very cherty silt loam about 12 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is yellowish red, firm very cherty silty clay in the upper part and dark reddish brown and dark red, mottled, firm very cherty silty clay in the lower part. In some places the part of the subsoil above the fragipan has less chert. In other places the soil has more clay. In some areas the surface layer is darker. In some eroded areas the upper part of the subsoil has been mixed with the surface layer and subsurface layer. In places the soil is moderately sloping.

Included with this soil in mapping are areas of Hobson, Plato, and Wilderness soils and areas that have stones and boulders on the surface. Included areas make up 10 to 15 percent of the unit. Hobson and Plato soils are in landscape positions similar to those of the Viraton soil. Hobson soils have more sand than the Viraton soil. Plato soils are somewhat poorly drained and have more clay and less chert in the part of the subsoil above the fragipan than the Viraton soil. Wilderness soils have a higher content of coarse fragments than the Viraton soil. They are on the lower side slopes. The stones and boulders are in scattered areas throughout the map unit.

Permeability is moderate above the fragipan in the Viraton soil and very slow in the fragipan. Surface runoff is medium. The available water capacity is low. A perched water table is at a depth of 1.5 to 2.5 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the part of the subsoil below the fragipan. The rooting depth is restricted by the fragipan at a depth of about 21 inches.

Most areas have been cleared and are used for hay or pasture. A few areas are used for small grain or row crops. A few are wooded.

This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Erosion is a major hazard if the soil is tilled during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion. Droughtiness is a problem during the summer because of the restricted rooting depth.

Seepage is a limitation if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

This soil is suited to small grain and row crops. If small grain or intertilled row crops are grown, erosion is a hazard. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

A few areas support native hardwoods. This soil is suited to trees. Seedling mortality rates can be reduced by planting container-grown nursery stock. Windthrow is a hazard. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soil. Installing tile drains around foundations or basement walls helps to prevent the damage caused by seasonal wetness. The soil generally is unsuitable as a site for septic tank absorption fields because of the seasonal wetness and the very slow permeability in the fragipan. Sealing the bottom and berms of sewage lagoons helps to prevent seepage.

The land capability classification is IIIe. The woodland ordination symbol is 3D.

82C—Hobson loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on ridges in the uplands. Individual areas range from about 5 to more than 500 acres in size.

Typically, the surface layer is very dark grayish brown and dark grayish brown, very friable loam about 2 inches thick. The subsurface layer is yellowish brown, very friable loam about 4 inches thick. The part of the subsoil above a fragipan is about 15 inches thick. It is yellowish brown, mottled, friable loam in the upper part and strong brown, firm clay loam in the lower part. The fragipan is about 19 inches of multicolored, firm, brittle cherty clay loam and very cherty sandy clay loam. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is red, very firm cherty clay. In places the surface layer and subsoil have less sand. In eroded areas the surface layer and subsurface layer have been mixed with the upper part of the subsoil.

Included with this soil in mapping are areas of Gepp, Viraton, and Wilderness soils and areas of sandy, well drained soils. Included soils make up 10 to 15 percent of the unit. The well drained Gepp soils and the sandy soils do not have a fragipan. Gepp soils have more clay and less sand than the Hobson soil. Viraton and Wilderness soils have a higher content of coarse fragments and a lower content of sand than the Hobson soil. Gepp and Wilderness soils are on the lower side slopes. Viraton soils and the sandy soils are in landscape positions similar to those of the Hobson soil.

Permeability is moderate above the fragipan in the Hobson soil and slow in the fragipan. Surface runoff is medium. The available water capacity is moderate. A perched water table is at a depth of 1.5 to 3.0 feet during winter and spring in most years. Natural fertility and the organic matter content are low. The shrink-swell potential is moderate in the part of the subsoil below the fragipan. The rooting depth is restricted by the fragipan at a depth of about 21 inches.

Most areas have been cleared and are used for hay or pasture. A few areas are used for small grain or row crops. A few are wooded.

This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Droughtiness is a problem during the summer because of the restricted rooting depth. Erosion is a major hazard if the soil is tilled during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion.

Seepage and slope are limitations if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

This soil is suited to small grain and row crops. If small grain or intertilled row crops are grown, erosion is a hazard. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

A few areas support native hardwoods. This soil is suited to trees. Seedling mortality rates can be reduced by planting container-grown nursery stock. Windthrow is a hazard. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suitable for building site development and some kinds of onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soil. Installing tile drains around foundations or basement walls helps to prevent the damage caused by seasonal wetness. The soil generally is unsuitable as a site for septic tank absorption fields because of the seasonal wetness and the slow permeability in the fragipan. Sealing the bottom and berms of sewage lagoons helps to prevent seepage.

The land capability classification is IIIe. The woodland ordination symbol is 3D.

83F—Gasconade-Rock outcrop complex, 2 to 35 percent slopes. This map unit consists of a shallow, gently sloping to steep, somewhat excessively drained Gasconade soil intermingled with dolomite rock outcrops. The Gasconade soil is on ridges and side slopes in the uplands. Individual areas range from about 5 to more than 50 acres in size. They are about 60 percent Gasconade soil and 25 percent Rock outcrop. The Gasconade soil and Rock outcrop occur as areas are so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Gasconade soil is black, firm flaggy silty clay loam about 7 inches thick. The subsoil is very dark grayish brown and dark grayish brown, firm very flaggy silty clay about 7 inches thick. Hard dolomite bedrock is at a depth of about 14 inches. In some places the subsoil has less clay. In other places the soil has a lower content of coarse fragments. In some areas the surface layer is cherty silty clay loam. In other areas the soil is well drained.

Included with the Gasconade soil and Rock outcrop in mapping are areas of Gatewood and Ocie soils. These soils make up about 10 to 15 percent of the unit. They are deeper over bedrock than the Gasconade soil. They are in landscape positions similar to those of the Gasconade soil, in areas where less Rock outcrop is exposed.

Permeability is moderately slow in the Gasconade soil. Surface runoff is rapid. The available water capacity is very low. Natural fertility is medium, and the organic matter content is moderate. The shrink-swell potential also is moderate. The rooting depth is restricted by the hard bedrock at a depth of about 14 inches.

Most areas are glades that support native warm-season grasses, eastern redcedar, and scrub hardwoods or are marginal pasture. Because of the slope, the high content of coarse fragments, the shallowness to bedrock, and the Rock outcrop, the Gasconade soil is unsuited to cultivated crops. It is poorly suited to cool-season grasses, warm-season grasses, and legumes because of the shallowness to bedrock and seasonal droughtiness. Tilling the surface layer is nearly impossible.

Because of low production, commercial timber management generally is not feasible on this unit.

The Gasconade soil generally is unsuitable for building site development and onsite waste disposal because of the shallowness to bedrock, the Rock outcrop, and the slope.

The land capability classification is VIIs. The woodland ordination symbol assigned to the Gasconade soil is 2R. No woodland ordination symbol is assigned to the Rock outcrop.

84—Pits, quarries. This map unit consists of open excavations from which soil material has been removed and limestone or dolomite quarried. Individual areas range from about 5 to 40 acres in size.

The typical pit has one or more vertical faces or exposures of the rock formation being mined. The exposures are 10 to 50 feet high. Above this vertical rock face, the overburden of soil and residual material is 5 to 20 feet thick. Before the rocks are quarried, the overburden is removed and piled in the adjoining undisturbed areas or returned to previously mined pits. Some pits have no outlet and are partly filled with water.

Included in mapping are some areas where marketable stone material is processed and stockpiled. These areas are around the pits. They make up about 15 percent of the map unit.

Many areas support no vegetation, but some have a scant cover of grasses, weeds, and brush. Abandoned pits and the included areas have potential for certain recreational uses and for the development of wildlife habitat. Because the areas of this map unit vary greatly, onsite investigation is needed to determine the suitability for any proposed use and the limitations affecting that use.

No land capability classification or woodland ordination symbol is assigned.

85—Udorthents, shallow. These soils are in open excavations from which soil material has been removed for use in highway construction. Most of these borrow areas are on side slopes. Removal of the soil material has left only a thin layer of soil over bedrock, generally dolomite. A few borrow areas are on broad ridges where excavations have left depressions in which water collects. The map unit includes the slopes created by the process of borrowing. Individual areas are about 5 to more than 8 acres in size.

Typically, the surface layer is strong brown and dark brown, firm very cherty silty clay about 11 inches thick. Below this is about 4 inches of weathered dolomite bedrock. Hard dolomite bedrock is at a depth of about 15 inches. In some areas the surface layer has a lower content of coarse fragments. In other areas it is clay.

Included with these soils in mapping are areas of exposed bedrock. These included areas make up about 15 percent of the unit.

Permeability is moderate to slow in the Udorthents. Surface runoff ranges from ponded to very rapid. The available water capacity is very low. Natural fertility is low, and the organic matter content is very low. The shrink-swell potential is moderate or high in the surface layer. The rooting depth is restricted by the bedrock at a depth of about 15 inches.

Most areas support no vegetation, but some support a scant cover of grasses, weeds, and brush. These soils are unsuitable for crops, grasses, and trees because of the content of chert and the shallowness to bedrock. They generally are not used for building site development or onsite waste disposal because of the shallowness to bedrock.

No land capability classification or woodland ordination symbol is assigned.

91B—Plato silt loam, 2 to 5 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on ridges in the uplands. Individual areas range from about 5 to more than 1,000 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The part of the subsoil above a fragipan is about 18 inches thick. It is mottled and firm. It is yellowish brown silty clay loam in the upper part and dark gray silty clay in the lower part. The fragipan is multicolored, very firm, brittle cherty silty clay loam about 29 inches thick. The part of the subsoil below the fragipan extends to a depth of 60 inches or more. It is dark red, mottled, very firm very cherty clay. In some places the part of the subsoil above the fragipan has less clay. In other places the surface layer is darker. In some cultivated areas the upper part of the subsoil has been mixed with the surface layer and subsurface layer.

Included with this soil in mapping are areas of Bado and Viraton soils. These soils make up 10 to 15 percent of the unit. Bado soils are poorly drained and are in nearly level or depressional areas. Viraton soils are moderately well drained and generally are in downslope areas. They have a higher content of coarse fragments and a lower content of clay in the part of the subsoil above the fragipan than the Plato soil.

Permeability is moderately slow in the upper part of the Plato soil, very slow in the fragipan, and moderate below the fragipan. Surface runoff is slow or medium. The available water capacity is low. A perched water table is at a depth of 1.5 to 2.5 feet during winter and spring in most years. Natural fertility is low, and the organic matter content is moderately low. The shrink-swell potential is moderate in the part of the subsoil above the fragipan. The rooting depth is restricted by the fragipan at a depth of about 24 inches.

Most areas have been cleared and are used for hay or pasture. A few areas are used for small grain or row crops. A few are wooded.

This soil is well suited to cool-season grasses, warm-season grasses, and legumes that can withstand wetness. The wetness is a problem during the fall, winter, and spring months. Droughtiness is a problem during the summer. Erosion is a major hazard if the soil is tilled during seedbed preparation. Timely tillage and a quickly established ground cover help to prevent excessive erosion.

Seepage is a limitation if ponds are constructed on this soil. Sites should be carefully selected. The ponds should be thoroughly compacted with a sheepsfoot roller or other appropriate equipment. The dam should be properly cored. Where seepage is most severe, applications of chemicals or expanding kinds of clay are needed.

This soil is suited to small grain and row crops. If small grain or intertilled row crops are grown, the hazard of erosion is severe. The measures commonly used to control erosion on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, terraces and grassed waterways, contour farming, and a conservation cropping system that includes close-growing pasture or hay crops. Some type of grade stabilization structure generally is needed in grassed waterways.

A few areas support native hardwoods. This soil is suited to trees. Windthrow is a hazard. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suitable for building site development and onsite waste disposal if proper design and installation procedures are used. Footings, foundations, and basement walls should be constructed with adequately reinforced concrete and backfilled with sand or gravel. These measures help to prevent the damage caused by shrinking and swelling of the soil. Installing tile drains around foundations or basement walls helps to prevent the damage caused by wetness. Sealing the bottom and berms of sewage lagoons helps to prevent seepage.

The land capability classification is IIe. The woodland ordination symbol is 3D.

94A—Cedargap cherty silt loam, clayey substratum, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on narrow flood plains. It is frequently flooded. Individual areas range from about 5 to more than 1,000 acres in size.

Typically, the surface layer is very dark brown, very friable cherty silt loam about 6 inches thick. The subsurface layer is about 28 inches thick. It is very dark brown and very dark grayish brown. It is friable very cherty silty clay loam in the upper part and firm extremely cherty silty clay loam in the lower part. The substratum to a depth of 60 inches or more is dark brown, firm extremely cherty silty clay. In some places the surface layer is very cherty, and in other places it is silt loam. In some areas it is lighter colored. In other areas the substratum has a lower content of coarse fragments or of clay.

Included with this soil in mapping are areas of other cherty soils adjacent to the uplands, on moderately sloping foot slopes. Also included are areas of Dameron soils, which are on the wider flood plains and have less chert in the upper part than the Cedargap soil. Included soils make up 10 to 15 percent of the unit.

Permeability is moderately slow in the Cedargap soil. Surface runoff is slow. The available water capacity is low. Natural fertility is medium, and the organic matter content is moderate. The shrink-swell potential also is moderate.

Most areas are used for hay or pasture. Some areas are wooded. This soil is suited to small grain and row crops. It generally is not used for cultivated crops, however, because of the narrowness of the areas, summer droughtiness, and the frequent flooding.

This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Flooding and droughtiness are the main problems. Planting species that can withstand flooding helps to maintain the stand. Ponds for livestock water should be constructed on the adjacent soils that are better sites for ponds.

Some areas support native hardwoods. This soil is suited to trees. Seedling mortality rates can be reduced by planting container-grown nursery stock.

This soil generally is unsuitable for building site development and onsite waste disposal because of the frequent flooding.

The land capability classification is IIIw. The woodland ordination symbol is 3F.

95A—Dameron silt loam, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on flood plains of intermediate size. It is frequently flooded. Individual areas range from about 5 to more than 1,000 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsurface layer is very dark grayish brown and very dark brown, friable silt loam about 25 inches thick. The substratum to a depth of 60 inches or more is dark grayish brown, firm very cherty silty clay loam. In places the surface layer is lighter colored. Some areas adjacent to the uplands are gently sloping. In some areas the soil is moderately well drained.

Included with this soil in mapping are areas of Cedargap and Nolin soils. These soils make up 10 to 15 percent of the unit. Cedargap soils have more chert in the upper part than the Dameron soil. They are on the parts of the flood plains adjacent to stream channels, at a slightly lower elevation. Nolin soils have less chert throughout than the Dameron soil. They are in positions on the flood plains similar to those of the Dameron soil.

Permeability is moderate in the Dameron soil. Surface runoff is slow. The available water capacity is moderate. Natural fertility is medium, and the organic matter content is moderate.

Most areas are used for hay or pasture. A few areas are used for small grain or row crops. A few are wooded.

This soil is well suited to cool-season grasses, warm-season grasses, and some kinds of legumes. Flooding and droughtiness are the main problems. Planting species that can withstand flooding helps to maintain the stand. Ponds for livestock water should be constructed on the adjacent soils that are better sites for ponds.

This soil is suited to small grain and row crops, but the scouring caused by floodwater is a hazard. The measures commonly used to control scouring on this soil are a system of conservation tillage that leaves a protective cover of crop residue on the surface, winter cover crops, diversion terraces, and a conservation cropping system that includes close-growing pasture and hay crops.

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

This soil generally is unsuited to building site development and onsite waste disposal because of the frequent flooding.

The land capability classification is IIw. The woodland ordination symbol is 5A.

Prime Farmland

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

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

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

About 29,840 acres in Webster County, or nearly 8 percent of the total acreage, meets the soil requirements for prime farmland. An additional 11,560 acres also would qualify if protected against flooding, and another 1,140 acres would qualify if drained. Scattered areas of this land are throughout the county, mainly in associations 1, 2, 3, and 6, which are described under the heading "General Soil Map Units." Most of the prime farmland in the county is used for hay and pasture.

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

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

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

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 to 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

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.

Approximately 250,500 acres in Webster County is used as pasture, hayland, or cropland. The 180,000 acres of pasture dominantly supports cool-season grasses, but an occasional seed crop or hay crop is grown on part of this acreage. Also, a few acres are being converted to warm-season grasses as a result of a recent promotion of these grasses. Approximately 62,000 acres is used for hay production. Some of this acreage is grazed late in summer and in fall. Tilled crops for silage and small grain are grown on about 8,500 acres.

About 25,000 acres in the county is used for towns, highways and roads, and housing developments in rural areas. The acreage used for housing developments has increased during the last decade, particularly in the western part of the county. If this change in land use continues, it will put pressure on the farmland in the future.

The soils in Webster County are suited to increased crop production in the areas of pasture, hayland, and cropland. About 132,960 acres in these areas occurs as nearly level to gently sloping soils. Of this acreage, about 29,840 acres is prime farmland. Another 12,700 acres would qualify for prime farmland if protected against flooding or if drained. About 109,610 acres in the county occurs as moderately sloping soils that are suited to pasture and hay if properly managed, and about 127,180 acres occurs as strongly sloping to steep soils that are suited to pasture if properly managed. Crop production can be increased by extending the latest technology to all of the pasture, hayland, and cropland in the county. This survey can help to facilitate the application of such technology. The following paragraphs describe the main concerns in managing the soils in the county for crops, hay, and pasture.

Erosion is the major management concern on about 90 percent of the pasture, hayland, and cropland in the county. All soils that have slopes of more than 2 percent are susceptible to erosion unless they are protected by a vegetative cover or by mechanical methods. The very gently sloping Captina and Needleye soils, the gently sloping Hartville, Peridge, Plato, Tonti, and Viraton soils, and the moderately sloping Alsup, Britwater, and Hobson soils are the most intensively cultivated soils in the county and thus are the most susceptible to erosion.

Loss of the surface layer through erosion reduces the level of fertility and available water capacity of the soils and results in deterioration of tilth. This loss is especially damaging to the Captina, Hobson, Plato, Tonti, and Viraton soils, which have a limited rooting depth because of a fragipan.

The eroded soil material enters water impoundments and streams. Control of erosion minimizes this pollution and improves the water quality for domestic, municipal, and recreational uses.

If properly managed, grasses and legumes grown for hay or pasture can keep soil loss below tolerable limits. A system of conservation tillage that does not invert the soil and leaves a protective cover of crop residue on or near the surface increases the rate of water infiltration, helps to maintain good tilth, and helps to control runoff and erosion. No-till grass and legume seeders and row crop planters disturb the surface substantially less than conventional tillage methods, thereby reducing the hazard of erosion and the number of chert fragments on the surface in areas where the soil is cherty.

Delaying plowing until spring leaves crop residue on the surface throughout the fall and winter months and helps to protect the soil against erosion. Contour farming and contour stripcropping are erosion-control measures that are applicable in some areas of the county. They are best suited to soils that have reasonably smooth and uniform slopes, such as Captina, Needleye, Peridge, Plato, Tonti, and Viraton soils. These soils also are suited to terracing, which reduces the length of slopes and thus minimizes erosion.

Natural soil fertility is low in most of the soils in Webster County. Some exceptions are Cedargap, Dameron, and Nolin soils on flood plains and Peridge soils on terraces and uplands. On all of the soils in the county, additions of plant food are needed for maximum production. Nearly all of the soils, particularly the ones on uplands, are naturally acid in the upper part of the root zone. Before legumes can grow well, applications of ground limestone or ground dolomite are needed to raise the pH and calcium and magnesium levels. On all soils, applications of lime and fertilizer should be based on the results of a soil test, on the needs of the crop, and on the expected level of yields.

Soil tilth is an important factor affecting seedbed preparation, the germination of seeds, and the infiltration of water into the soil. Soils that have good tilth are granular and porus. Many of the soils in the county have a silt loam surface layer that is low or moderately low in organic matter content. Frequent tillage of these soils tends to weaken or destroy the soil structure. Also, a surface crust forms during periods of heavy rainfall. The crust reduces the rate of water infiltration and increases the runoff rate. Returning crop residue to the soil, working in green manure, and adding barnyard manure improve soil structure, thereby minimizing crusting and increasing the infiltration rate.

The pasture and hay crops that are suited to the soils and climate of the county include several kinds of legumes, cool-season grasses, and warm-season grasses. Alfalfa and red clover are the most common legumes grown for hay. Deep, well drained soils that have a high available water capacity and that are high in content of calcium and magnesium or are adequately limed are well suited to alfalfa for hay or silage. Nolin and Peridge soils are examples. Dameron and Britwater soils are moderately suited to alfalfa for hay or silage. Soils that have a fragipan or are characterized by a limited depth to bedrock or seasonal wetness are better suited to clover for hay or pasture. If lime and fertilizer are applied, most of the soils in the county are suited to pasture and hay and can support red, ladino, and other clovers. Most are suited to tall fescue (fig. 16), orchardgrass, and other cool-season grasses. These grasses grow best in spring, early in summer, and in fall. Where additional midsummer pasture or hay is needed, native warm-season grasses and warm-season legumes can be grown.

Deep, well drained soils that have a high available water capacity are well suited to warm-season grasses, such as bermudagrass, big bluestem, Caucasian bluestem, indiangrass, and switchgrass. Nolin and Peridge soils are examples. Soils that have a low or moderate available water capacity are suited to warm-season grasses. Alsup, Bado, Britwater, Captina, Cedargap, Dameron, Gatewood, Gepp, Hartville, Hobson, Needleye, Noark, Ocie, Plato, Scholten, Tonti,

Figure 16.—Tall fescue hay on Dameron silt loam, 0 to 3 percent slopes.

Viraton, and Wilderness soils are examples. Warm-season grasses grow best late in spring, in summer, and early in fall.

The deep Nolin and Peridge soils are well suited to such crops as corn and sorghum-sudan hay. The moderately sloping Alsup, Britwater, and Hobson soils, the nearly level Bado soils, the very gently sloping Captina and Needleye soils, the gently sloping Hartville, Plato, Tonti, and Viraton soils, and other soils that have a restricted rooting depth or other properties that reduce the available water capacity are suited to these crops (fig. 17). The moderately sloping Alsup, Britwater, and Hobson soils, the very gently sloping Captina and Needleye soils, the gently sloping Hartville, Peridge, Plato, Tonti, and Viraton soils, and the nearly level Nolin soils are well suited to small grain, such as winter wheat.

The specialty crops grown commercially in the county are apples (fig. 18), blueberries, and strawberries. Most of the soils that are used for specialty crops require supplemental irrigation at some time during the growing season in most years. If the soil has a fragipan, the main limitations are a restricted rooting depth, inadequate drainage in spring, and droughtiness in summer.

Yields Per Acre

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

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

The management needed to obtain the indicated

Figure 17.—Sorghum-sudan hay on Captina-Needleye silt loams, 1 to 3 percent slopes.

yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

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

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

Land Capability Classification

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

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit *(17)*. 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 few limitations or hazards that restrict their use.

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

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

Class IV soils have very severe limitations or hazards 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 or hazards that make them generally unsuitable for cultivation.

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

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

There are no class I, V, or VIII soils in Webster 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 hazard is the risk of water 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" and in the yields table.

Figure 18.—An apple orchard on Tonti silt loam, 2 to 5 percent slopes.

Woodland Management and Productivity

James L. Robinson, Soil Conservation Service, and Carl E. Hauser, Missouri Department of Conservation, helped prepare this section.

About 104,500 acres in Webster County is woodland. About 88 percent of the woodland is in areas of the Noark-Alsup, Gepp-Ocie-Wilderness, and Noark-Ocie associations on uplands. The forest species are those characteristic of the Ozarks.The primary forest cover type is oak-hickory. The most common species are black oak, post oak, white oak, hickories, and blackjack oak (fig. 19). Other common species include black walnut, red oak, white ash, sycamore, elm, and blackgum.

Knowledge of soils helps to provide a basic understanding of how forest types develop and how tree growth occurs. The soil serves as a reservoir for moisture, provides an anchor for roots, and supplies most of the nutrients for tree growth. Many soil properties affect tree growth. These include reaction, fertility, drainage, texture, structure, and depth. Aspect and landscape position also are important. Although little can be done to change the physical soil properties, management of the best suited tree species can maximize productivity.

The supply of nutrients affects tree growth. Nutrients become available to tree roots through the decomposition of the leaf litter. Fire, excessive grazing by livestock, and erosion result in the loss of these nutrients and reduce productivity.

Aspect is an important factor affecting tree growth. South- and west-facing slopes tend to be droughty. Trees grow slowly on these slopes, and the quality of timber tends to be marginal. Management practices should be limited to those that require little or no investment. These slopes have a greater predominance of post oak, chinkapin oak, eastern redcedar, and shagbark hickory than north- and east-facing slopes.

Soils on north- and east-facing slopes typically have more available moisture than those on south- and west-facing slopes. Also, tree growth and quality are better. The dominant species on these slopes are typically white oak, northern red oak, bitternut hickory, and black walnut. Management practices commonly include thinning, timber stand improvement, and walnut pruning and release.

Tree growth and quality are intermediate on ridgetops. Some management generally is feasible in these areas. The dominant species typically are black oak, post oak, and white oak.

The soils on bottom land along streams and

Figure 19.—An oak-hickory stand on Noark very cherty silt loam, 14 to 35 percent slopes.

tributaries support northern red oak, white oak, black walnut, sycamore, ash, hackberry, and elm. Tree growth and quality can be good or excellent along these drainageways.

The condition of the timber stands in the county is much lower than the potential. Forest fires have been detrimental in the past, and many stands still exhibit serious fire damage. Overgrazing has also been detrimental. Grazing results in soil compaction, erosion, root damage, a reduction in the available water capacity, and a depletion of the understory plants. Fire and grazing have seriously reduced timber growth rates on many sites.

High-grade cutting, in which only the largest and best trees are harvested and the poor-quality, hollow, or rotten trees are left in the stand, has caused degradation of many timber stands. These stands commonly are dominated by trees with little or no commercial value. Proper harvesting techniques can result in the regeneration of desirable species. Removing cull or undesirable trees along with the commercial sawtimber allows sunlight to reach the forest floor. In the oak-hickory forests in Missouri, this removal can be accomplished through clearcuts 2 to 20 acres in size or through group selection cuts 150 to 300 feet in diameter.

Many forest sites in the county have the potential to produce high-quality timber. This potential can be realized only through measures that protect the stands from fires and destructive grazing, proper harvesting and regeneration techniques, and application of the appropriate management techniques during the life of the stands.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

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

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

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

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

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

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

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

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

Trees to plant are those that are suitable for 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, help to keep snow on the fields, and provide food and cover for wildlife.

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

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

Recreation

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

A total of 2,247 acres in Webster County is used for recreational activities *(14)*. Recreational facilities include swimming areas (fig. 20), hunting and fishing areas (fig. 21), camping areas, trails, game courts, ball fields, picnic areas, play areas, and horse arenas. The population of the county is expected to grow by 52.3 percent to a total of about 23,900 by 1990 *(10)*. This growth is likely to increase the demand for recreational facilities.

Opportunities for hunting are available on 1,076 acres of state-owned forest administered by the Missouri Department of Conservation and on a 160-acre tract owned by the county. The Missouri Department of Conservation has purchased a 62-acre tract along the Osage Fork of the Gasconade River for public access to the river for fishing. Other publicly owned recreational areas in the county are the city parks in Marshfield, Seymour, Rogersville, and Fordland.

The county has several private and semiprivate recreational enterprises *(11)*. These enterprises are Camp Arrowhead, a boy scout retreat; a Baptist youth camp; a golf course; a miniature golf course; a rifle and pistol club; an archery club; and a commercial drive-through zoo, which is directly south of Interstate 44, in the western part of the county.

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

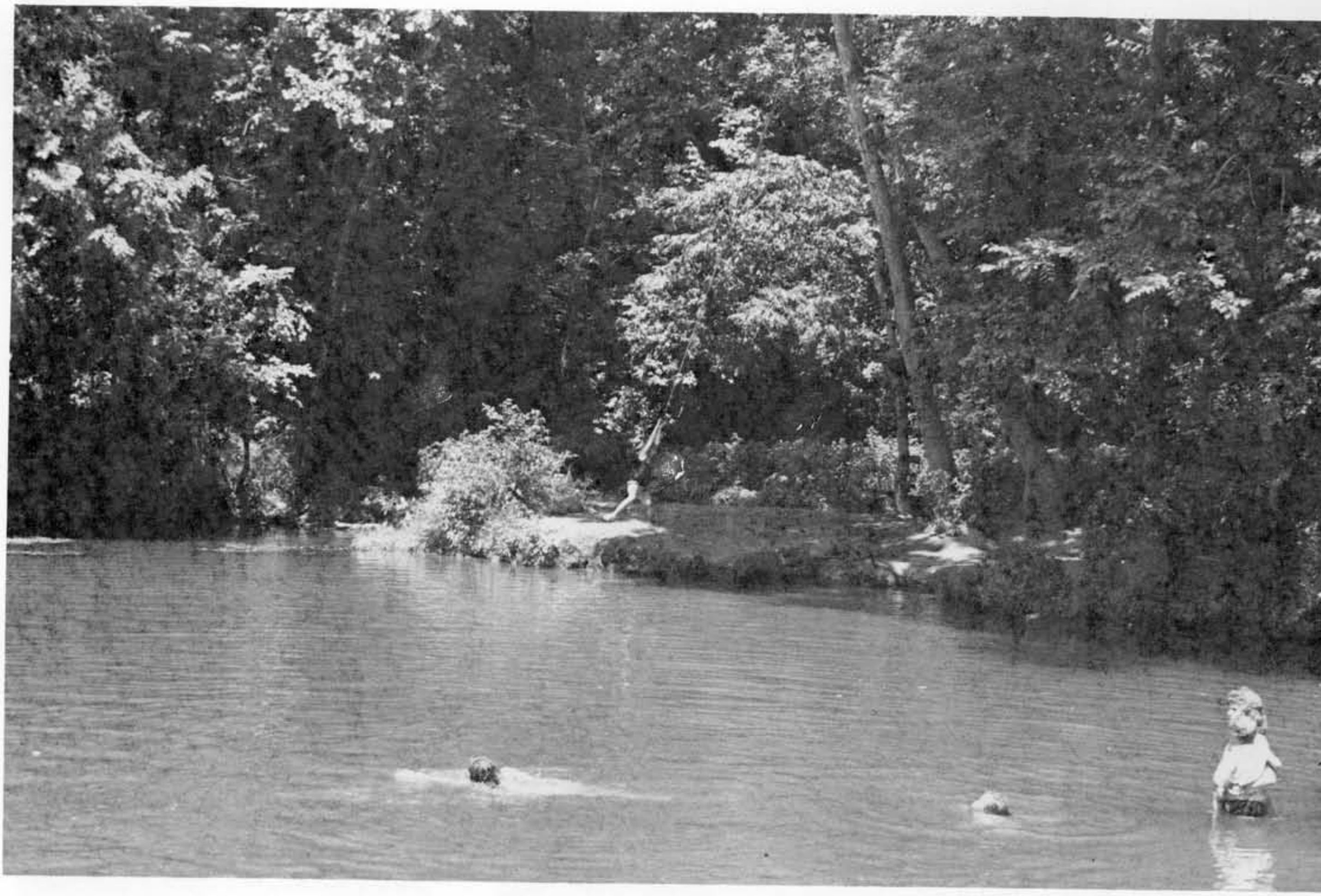

Figure 20.—Swimming in the James River.

features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are 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

Figure 21.—Fishing on the James River.

heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

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

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

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

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

Wildlife Habitat

Bob Schroeppel, biologist, Missouri Department of Conservation, helped prepare this section.

Webster County is in the south-central part of the state, where in presettlement times the tall-grass prairie merged with the oak-hickory forest of the Ozarks. The county is about equally divided by two different natural sections within the Ozark Natural Division. These are the Springfield Plateau and the Upper Ozark *(15)*.

Early records indicate that about 3 percent of the county, or 16 square miles, was tall-grass prairie in presettlement times *(13)*. The prairie has gradually changed from mixed prairie grasses and forbs to cool-season grasses, the most common of which is tall fescue.

Forest land makes up about 27 percent of the county. It typically occurs as an oak-hickory forest of pole-size stands that have a closed canopy and generally do not have a diverse, well developed understory. Most of the forest land is under private ownership. The only exception is 1,076 acres of state forest land. The remaining public land is the Rader Access area along the Osage Fork of the Gasconade River, in the northeast corner of the county.

Documented accounts indicate that more than 170 fish and wildlife species inhabit the county. Another 220 species are likely to inhabit the county, according the the Missouri Fish and Wildlife Information System. There are about 120 nongame species. Typical examples of these species are bleeding shiner, slimy salamander, Osage copperhead, indigo bunting, white-breasted nuthatch, prairie vole, and southern flying squirrel. The most common game species are white-tailed deer, wild turkey, eastern cottontail rabbit, fox and gray squirrels, beaver, red fox, raccoon, smallmouth bass, bluegill, largemouth bass, and channel catfish.

Only four species in the county are considered rare or endangered. These are bluestripe and Niangua darters, black-tailed jackrabbit, and long-tailed weasel.

The furbearer population in the county is fair to good. The species harvested for fur in 1986-87 were opossum, muskrat, raccoon, mink, red fox, gray fox, coyote, bobcat, and beaver *(9)*. The county has a higher population of coyotes than the state average.

The primary woodland game species are white-tailed deer, wild turkey, and gray and fox squirrels. Hunter interest in deer and turkey is high. Selective clearing of timber on bottom land and the grazing of woodland have had major adverse effects on the woodland wildlife. Grazing areas of timber can result in tree damage, destruction of the habitat, and increased erosion and soil compaction.

The populations of bobwhite quail and eastern cottontail rabbits in areas of openland habitat are generally poor and fair, respectively. The shortage of small grain in the county limits the winter food supply for many birds and animals. Also, the grasslands are frequently overgrazed and offer little diversity to openland wildlife. Some species would benefit from the establishment of warm-season grasses. Dove populations generally are low, but heavy concentrations occasionally occur around harvested cornfields on dairy farms.

Wetland habitat is extremely scarce in the county. The habitat for waterfowl is limited to areas along streams. Wood duck is the most common species of waterfowl. The county has four active great blue heron rookeries. The largest had 56 individual birds and 56 active nests in 1987.

The major streams and rivers in the county are the Niangua, James, and Pomme de Terre Rivers, the Osage Fork of the Gasconade River, and Finley Creek. The streams provide opportunities for warm-water fishing. Typical sport fish include largemouth bass, green sunfish, smallmouth bass, suckers, and channel catfish.

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

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

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

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

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

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 also are considerations. Examples of grasses and legumes are bluegrass, fescue, switchgrass, orchardgrass, indiangrass, clover, alfalfa, trefoil, and lespedeza.

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 also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, pokeweed, foxtail, croton, and partridge pea.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, wild plum, sumac, and persimmon.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and juniper.

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

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

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

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

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, 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, 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 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, the 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, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

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

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. Slope and bedrock 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 the shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils 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 as much as 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 *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 in 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. 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 help to control water 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 soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, 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 classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

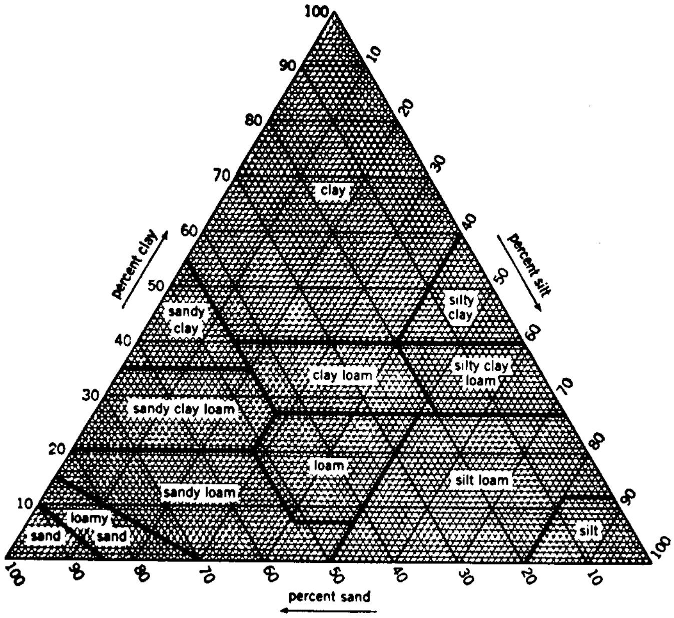

Figure 22.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

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

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 22). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

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

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

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

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

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 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 content of clay in each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ 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.

The 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.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

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 infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 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, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17. 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. 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 either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

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

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

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

For concrete, the risk of corrosion also is 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 *(18)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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 Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

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 Fragiudults (*Fragi*, meaning fragipan, plus *udult*, the suborder of the Ultisols that has a udic 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 Fragiudults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size 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-loamy, mixed, mesic Typic Fragiudults.

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. 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 (16)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (18)*. 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 soils on uplands. These soils formed in colluvium and in the underlying clayey shale residuum. Permeability is moderately slow. Slopes range from 3 to 35 percent.

Typical pedon of Alsup cherty silt loam, 3 to 9 percent slopes, eroded; 330 feet east and 2,640 feet north of the southwest corner of sec. 3, T. 29 N., R. 19 W.

A—0 to 1 inch; dark grayish brown (10YR 4/2) cherty silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; friable; few fine and common medium roots; about 20 percent chert fragments, 5 percent more than 3 inches in size; strongly acid; clear smooth boundary.

E—1 to 4 inches; pale brown (10YR 6/3) and light brownish gray (10YR 6/2) cherty silt loam; moderate very fine and fine granular structure; friable; few fine and common medium roots; about 20 percent chert fragments; strongly acid; clear smooth boundary.

2Bt1—4 to 9 inches; yellowish brown (10YR 5/6) silty clay loam; moderate very fine and fine subangular blocky structure; friable; few fine, common medium, and few coarse roots; few faint clay films on faces of peds; about 5 percent chert fragments; very strongly acid; gradual smooth boundary.

2Bt2—9 to 16 inches; yellowish red (5YR 5/6) silty clay loam; moderate very fine and fine subangular blocky structure; firm; few fine, common medium, and few coarse roots; few faint clay films on faces of peds; about 2 percent chert fragments; very strongly acid; clear wavy boundary.

2Bt3—16 to 24 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and yellowish red (5YR 4/6) silty clay; moderate very fine and fine angular blocky structure; firm; few fine, common medium, and few coarse roots; common faint clay films on faces of peds; very strongly acid; gradual wavy boundary.

2C—24 to 50 inches; mottled light olive gray (5Y 6/2), strong brown (7.5YR 5/6), and yellowish red (5YR 4/6) clay; massive; very firm; few fine and few medium roots; very strongly acid; abrupt wavy boundary.

2Cr—50 to 60 inches; weathered shale.

The depth to weathered shale is more than 40 inches. The A horizon has value of 3 to 5 and chroma of 2 or 3. It typically is cherty silt loam, but the range includes silt loam. The 2Bt horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 6, and chroma of 4 to 8. It is silty clay loam, silty clay, or clay.

Bado Series

The Bado series consists of deep, poorly drained soils on uplands. These soils formed in loess and in the underlying cherty dolomite or limestone residuum. They have a fragipan. Permeability is very slow in the fragipan. Slopes range from 0 to 2 percent.

Typical pedon of Bado silt loam, 930 feet south and 275 feet west of the northeast corner of sec. 16, T. 30 N., R. 16 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; very friable; common fine and few medium roots; extremely acid; clear smooth boundary.

E—4 to 9 inches; light brownish gray (10YR 6/2) silt loam; moderate fine and very fine granular structure; very friable; common fine and few medium and coarse roots; very strongly acid; clear smooth boundary.

Bt1—9 to 17 inches; grayish brown (10YR 5/2) silty clay loam; moderate very fine and fine subangular blocky structure; friable; few fine, medium, and coarse roots; common faint clay films on faces of peds; extremely acid; clear smooth boundary.

Bt2—17 to 35 inches; dark gray (10YR 4/1) clay; weak medium subangular blocky structure; very firm; few fine, medium, and coarse roots; many faint clay films on faces of peds; extremely acid; clear wavy boundary.

2Btx1—35 to 50 inches; mottled grayish brown (10YR 5/2), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) silty clay loam; massive; firm; brittle; few faint clay flows in cracks; about 5 percent chert fragments; extremely acid; gradual wavy boundary.

2Btx2—50 to 60 inches; mottled gray (10YR 5/1), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) very cherty silty clay loam; weak very fine and fine subangular blocky structure; firm; brittle; common faint clay flows in cracks; about 35 percent chert fragments; extremely acid; clear wavy boundary.

3Bt—60 to 66 inches; mottled red (2.5YR 4/6), yellowish brown (10YR 5/4), and gray (10YR 5/1) very cherty silty clay; moderate very fine and fine angular blocky structure; very firm; many distinct clay films on faces of peds; about 35 percent chert fragments, 10 percent more than 3 inches in size; medium acid.

Depth to the fragipan ranges from 18 to 40 inches.

The A horizon has value of 3 to 5 and chroma of 1 or 2. The Bt horizon has value of 3 to 6 and chroma of 1 or 2. It is silty clay loam, silty clay, or clay. The 2Btx horizon has hue of 10YR to 2.5YR, value of 4 to 6, and chroma of 1 to 6. It is silt loam, silty clay loam, or the cherty analogs of those textures. The 3Bt1 horizon is the cherty or very cherty analogs of silty clay loam, silty clay, or clay.

Basehor Series

The Basehor series consists of shallow, well drained soils on uplands. About 14 percent of the surface is covered with boulders 2 to 5 feet in diameter. These soils formed in sandstone residuum. Permeability is moderately rapid. Slopes range from 9 to 35 percent.

Typical pedon of Basehor fine sandy loam, 9 to 35 percent slopes, extremely bouldery; 2,310 feet south and 2,380 feet east of the northwest corner of sec. 4, T. 29 N., R. 18 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak very fine and fine granular structure; very friable; common fine and medium and few coarse roots; about 10 percent chert and sandstone fragments, 5 percent more than 3 inches in size; medium acid; clear smooth boundary.

Bw—5 to 17 inches; brown (10YR 5/3) fine sandy loam; weak very fine and fine subangular blocky structure; very friable; few fine, common medium, and few coarse roots; about 10 percent chert and sandstone fragments, 5 percent more than 3 inches in size; strongly acid; abrupt wavy boundary.

R—17 inches; hard sandstone bedrock.

The depth to sandstone bedrock is 10 to 20 inches. The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is fine sandy loam or loam.

Britwater Series

The Britwater series consists of deep, well drained soils on foot slopes and stream terraces. These soils formed in a thin layer of loess or other silty sediments and in the underlying cherty dolomite residuum. Permeability is moderate. Slopes range from 3 to 9 percent.

Typical pedon of Britwater silt loam, 3 to 9 percent slopes; 2,376 feet north and 1,850 feet west of the southeast corner of sec. 9, T. 31 N., R. 18 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine and fine granular structure; friable; common fine and few medium roots; about 2 percent chert fragments; medium acid; clear smooth boundary.

A—6 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; moderate very fine and fine granular structure; friable; common fine roots; about 2 percent chert fragments; medium acid; gradual smooth boundary.

Bt1—10 to 21 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; few faint clay films on faces of peds; about 5 percent chert fragments; medium acid; clear smooth boundary.

Bt2—21 to 24 inches; dark brown (7.5YR 4/4) cherty silty clay loam; few fine faint brown (7.5YR 5/4) mottles; moderate very fine subangular blocky structure; firm; few fine roots; common clay films on faces of peds; about 20 percent chert fragments; medium acid; clear smooth boundary.

2Bt3—24 to 42 inches; dark brown (7.5YR 4/4) very cherty silty clay loam; common fine faint brown (7.5YR 5/4) mottles; weak very fine subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; about 60 percent chert fragments; medium acid; clear smooth boundary.

2Bt4—42 to 55 inches; dark brown (7.5YR 4/4) very cherty clay; many fine distinct strong brown (7.5YR 4/6) mottles; moderate fine and very fine angular blocky structure; very firm; few fine roots; common faint clay films on faces of peds; about 60 percent chert fragments; strongly acid; clear smooth boundary.

2Bt5—55 to 60 inches; mottled strong brown (7.5YR 5/6) and brown (10YR 5/3 and 7.5YR 5/4) very cherty clay; moderate fine and very fine angular blocky structure; very firm; common faint clay films on faces of peds; about 40 percent chert fragments; strongly acid.

The A or Ap horizon has value of 4 or 5 and chroma of 3 or 4. It typically is silt loam, but the range includes loam and the cherty analogs of silt loam and loam. The Bt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5, and chroma of 4 to 8. It is silty clay loam, clay loam, or the cherty analogs of those textures. The 2Bt horizon has hue of 10R or 7.5YR, value of 3 to 5, and chroma of 4 to 8. It is silty clay loam, silty clay, clay, or the cherty, very cherty, or extremely cherty analogs of those textures.

Captina Series

The Captina series consists of deep, moderately well drained soils on uplands. These soils formed in a thin layer of loess and in the underlying cherty limestone residuum. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 1 to 3 percent.

Typical pedon of Captina silt loam, in an area of Captina-Needleye silt loams, 1 to 3 percent slopes; 5,670 feet north and 1,200 feet west of the southeast corner of sec. 4, T. 29 N., R. 18 W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

E—2 to 7 inches; brown (10YR 5/3) silt loam; moderate very fine and fine granular structure; friable; common fine and few medium roots; strongly acid; gradual smooth boundary.

Bt1—7 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; common fine and few medium roots; few faint clay films on faces of peds; about 5 percent chert fragments; very strongly acid; clear wavy boundary.

Bt2—20 to 24 inches; mixed yellowish brown (10YR 5/4) and pale brown (10YR 6/3) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; common faint clay films on faces of peds; about 5 percent chert fragments; very strongly acid; gradual wavy boundary.

2Btx1—24 to 31 inches; mottled yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) silty clay loam; moderate fine subangular blocky structure; very firm; brittle; common faint clay films on faces of peds and clay flows in cracks; about 10 percent chert fragments; very strongly acid; gradual wavy boundary.

2Btx2—31 to 41 inches; mixed yellowish brown (10YR 5/6), light yellowish brown (10YR 6/4), and yellowish red (5YR 5/6) very cherty silty clay loam; massive; very firm; brittle; few faint clay flows in cracks; about 60 percent chert fragments; very strongly acid; clear wavy boundary.

2Btx3—41 to 60 inches; yellowish red (5YR 4/6) very cherty silty clay loam; common medium distinct strong brown (7.5YR 5/6) and common fine prominent grayish brown (10YR 5/2) mottles; massive; very firm; brittle; few faint clay flows in cracks; about 60 percent chert fragments; extremely acid.

Depth to the fragipan ranges from 16 to 30 inches. The A or Ap horizon has value of 4 or 5 and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 6. It is silt loam or silty clay loam. The Btx and 2Btx horizons have hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 2 to 8. They are silt loam, silty clay loam, or the cherty or very cherty analogs of those textures.

Cedargap Series

The Cedargap series consists of deep, well drained soils on narrow flood plains. These soils formed in cherty alluvium. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Typical pedon of Cedargap cherty silt loam, clayey substratum, 0 to 3 percent slopes; 1,180 feet south and 1,580 feet west of the northeast corner of sec. 5, T. 28 N., R. 16 W.

Ap—0 to 6 inches; very dark brown (10YR 2/2) cherty silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; very friable; common fine roots; about 30 percent chert fragments; slightly acid; clear smooth boundary.

A1—6 to 14 inches; very dark brown (10YR 2/2) very cherty silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and very fine granular structure; friable; common fine roots; about 40 percent chert fragments; neutral; gradual wavy boundary.

A2—14 to 19 inches; very dark grayish brown (10YR 3/2) very cherty silty clay loam, grayish brown (10YR 5/2) dry; moderate fine granular and weak very fine subangular blocky structure; friable; few fine roots; about 50 percent chert fragments; neutral; gradual wavy boundary.

A3—19 to 24 inches; very dark grayish brown (10YR 3/2) extremely cherty silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular and weak very fine subangular blocky structure; firm; few fine roots; about 65 percent chert fragments, 10 percent more than 3 inches in size; neutral; gradual wavy boundary.

A4—24 to 34 inches; very dark grayish brown (10YR 3/2) extremely cherty silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular and weak very fine subangular blocky structure; firm; few fine roots; about 70 percent chert fragments, 10 percent more than 3 inches in size; slightly acid; diffuse wavy boundary.

C—34 to 60 inches; dark brown (10YR 4/3) extremely cherty silty clay; massive; firm; few fine roots; about 75 percent chert fragments, 10 percent more than 3 inches in size; slightly acid.

The A1 or Ap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3. It typically is cherty silt loam, but the range includes very cherty silt loam and silt loam. The lower part of the A horizon is the very cherty or extremely cherty analogs of silt loam or silty clay loam. 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 or extremely cherty analogs of silty clay loam, clay loam, or silty clay.

Dameron Series

The Dameron series consists of deep, well drained soils on flood plains. These soils formed in silty and cherty alluvium. Permeability is moderate. Slopes range from 0 to 3 percent.

Typical pedon of Dameron silt loam, 0 to 3 percent slopes; 1,700 feet north and 1,080 feet east of the southwest corner of sec. 1, T. 29 N., R. 18 W.

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate very fine and fine granular structure; friable; many medium roots; about 10 percent chert fragments; neutral; clear smooth boundary.

A1—10 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; friable; common fine roots; about 5 percent chert fragments; neutral; gradual smooth boundary.

A2—18 to 35 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; friable; few fine roots; about 5 percent chert fragments; neutral; abrupt wavy boundary.

2C—35 to 60 inches; dark grayish brown (10YR 4/2) very cherty silty clay loam; massive; firm; about 55 percent chert fragments, 10 percent more than 3 inches in size; neutral.

The Ap or A horizon has hue of 10YR or 7.5YR and value and chroma of 2 or 3. It typically is silt loam, but the range includes silty clay loam. The C horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is the cherty, very cherty, or extremely cherty analogs of silty clay loam.

Gasconade Series

The Gasconade series consists of shallow, somewhat excessively drained soils on uplands. These soils formed in dolomite or limestone residuum. Permeability is moderately slow. Slopes range from 2 to 35 percent.

Typical pedon of Gasconade flaggy silty clay loam, in an area of Gasconade-Rock outcrop complex, 2 to 35 percent slopes; 1,740 feet west and 20 feet south of the northeast corner of sec. 1, T. 31 N., R. 18 W.

A—0 to 7 inches; black (10YR 2/1) flaggy silty clay loam, very dark gray (10YR 3/1) dry; moderate very fine and fine subangular blocky structure; firm; few fine roots; about 20 percent dolomite fragments and 15 percent chert fragments, 20 percent more than 3 inches in size; neutral; clear smooth boundary.

Bw—7 to 14 inches; very dark grayish brown (2.5Y 3/2) and dark grayish brown (2.5Y 4/2) very flaggy silty clay; moderate very fine subangular blocky structure; firm; few fine roots; about 25 percent dolomite fragments and 15 percent chert fragments, 20 percent more than 3 inches in size; mildly alkaline; abrupt irregular boundary.

R—14 inches; hard dolomite bedrock.

The depth to dolomite or limestone bedrock is 4 to 20 inches. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is silty clay loam, silty clay, clay loam, or the flaggy analogs of those textures. The Bw horizon has hue of 7.5YR to 2.5Y, value of 3 or 4, and chroma of 2 to 4. It is the flaggy analogs of silty clay, clay loam, or clay.

Gatewood Series

The Gatewood series consists of moderately deep, moderately well drained soils on uplands. These soils formed in cherty sediments and in material weathered from cherty dolomite that has thinly interbedded sandstone. Permeability is slow. Slopes range from 3 to 35 percent.

Typical pedon of Gatewood very cherty silt loam, in an area of Ocie-Gepp-Gatewood complex, 3 to 9 percent slopes; 2,300 feet north and 500 feet west of the southeast corner of sec. 20, T. 32 N., R. 17 W.

Ap—0 to 4 inches; very dark grayish brown (10YR 3/2) very cherty silt loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; friable; common fine roots; about 35 percent chert fragments, 15 percent more than 3 inches in size; medium acid; clear smooth boundary.

E—4 to 7 inches; brown (10YR 5/3) very cherty silt loam; moderate very fine and fine granular structure; friable; common fine roots; about 50 percent chert fragments, 15 percent more than 3 inches in size; strongly acid; clear wavy boundary.
2Bt1—7 to 17 inches; strong brown (7.5YR 4/6) and brown (7.5YR 4/4) clay; few fine prominent dark red (2.5YR 3/6) mottles; moderate very fine angular blocky structure; very firm; few fine roots; common faint clay films on faces of peds; strongly acid; clear wavy boundary.
2Bt2—17 to 20 inches; brown (7.5YR 4/4) and strong brown (7.5YR 5/6) clay; few fine prominent dark red (2.5YR 3/6) mottles; moderate very fine angular blocky structure; very firm; few fine roots; common faint clay films on faces of peds; strongly acid; gradual wavy boundary.
2Bt3—20 to 27 inches; yellowish brown (10YR 5/4) and pale brown (10YR 6/3) clay; moderate fine angular blocky structure; very firm; few fine roots; common faint clay films on faces of peds; strongly acid; abrupt smooth boundary.
2Cr—27 to 30 inches; weathered sandy dolomite bedrock.
2R—30 inches; hard dolomite bedrock.

The depth to bedrock ranges from 20 to 40 inches. The A or Ap horizon has value of 2 to 6 and chroma of 1 to 4. It typically is very cherty silt loam, but the range includes cherty silt loam and silt loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is clay, silty clay, or the cherty analogs of those textures.

Gepp Series

The Gepp series consists of deep, well drained soils on uplands. These soils formed in cherty sediments and cherty dolomite residuum. Permeability is moderate. Slopes range from 3 to 35 percent.

Typical pedon of Gepp very cherty silt loam, in an area of Gepp-Ocie very cherty silt loams, 9 to 14 percent slopes; 1,780 feet east and 1,300 feet north of the southwest corner of sec. 5, T. 31 N., R. 17 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) very cherty silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; common fine, medium, and coarse roots; about 35 percent chert fragments, 10 percent more than 3 inches in size; strongly acid; clear smooth boundary.
E—2 to 7 inches; pale brown (10YR 6/3) very cherty silt loam; moderate fine granular structure; friable; common fine, medium, and coarse roots; about 40 percent chert fragments, 10 percent more than 3 inches in size; strongly acid; clear smooth boundary.
BE—7 to 12 inches; strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) cherty silty clay loam; moderate very fine and fine subangular blocky structure; friable; few fine, medium, and coarse roots; about 25 percent chert fragments; very strongly acid; clear smooth boundary.
2Bt1—12 to 32 inches; dark red (2.5YR 3/6) clay; strong very fine and fine angular blocky structure; firm; few fine and coarse and common medium roots; many faint clay films on faces of peds; about 5 percent chert fragments; very strongly acid; gradual smooth boundary.
2Bt2—32 to 60 inches; dark red (2.5YR 3/6) cherty clay; few fine prominent yellowish red (5YR 5/6) mottles; moderate very fine and fine angular blocky structure; firm; few fine and medium roots; many faint clay films on faces of peds; about 30 percent chert fragments; strongly acid.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is cherty silt loam or very cherty silt loam. The Bt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5, and chroma of 6 to 8.

Hartville Series

The Hartville series consists of deep, somewhat poorly drained soils on foot slopes and low stream terraces. These soils formed in a thin layer of loess or other silty sediments and in the underlying clayey colluvium and alluvium over dolomite residuum. Permeability is slow. Slopes range from 1 to 5 percent.

Typical pedon of Hartville silt loam, 1 to 5 percent slopes; 2,000 feet west and 800 feet south of the northeast corner of sec. 17, T. 30 N., R. 17 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine and fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.
E—7 to 13 inches; grayish brown (10YR 5/2) silt loam; weak very fine granular structure; friable; common fine roots; medium acid; clear smooth boundary.
BE—13 to 19 inches; brown (10YR 5/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak very fine subangular blocky structure; friable; few fine roots; medium acid; clear smooth boundary.
2Bt1—19 to 22 inches; yellowish brown (10YR 5/4) silty

clay; many fine faint brown (10YR 5/3), few fine distinct grayish brown (10YR 5/2), and few medium faint dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—22 to 33 inches; grayish brown (10YR 5/2) clay; few fine prominent yellowish brown (10YR 5/6) and few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine angular blocky structure; firm; few fine roots; many faint clay films on faces of peds; strongly acid; gradual smooth boundary.

2Bt3—33 to 49 inches; grayish brown (10YR 5/2) clay; many fine faint dark brown (10YR 4/3) and few fine prominent brown (7.5YR 4/4) mottles; weak fine angular blocky structure; firm; few fine roots; many faint clay films on faces of peds; strongly acid; clear smooth boundary.

2BC—49 to 60 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silty clay; weak very fine and fine subangular blocky structure; firm; about 10 percent chert fragments; strongly acid.

The A or Ap horizon has value of 4 or 5 and chroma of 2 to 4. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 6.

Hobson Series

The Hobson series consists of deep, moderately well drained soils on uplands. These soils formed in mixed sandstone and cherty dolomite residuum. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 3 to 9 percent.

Typical pedon of Hobson loam, 3 to 9 percent slopes; 1,780 feet north and 1,715 feet west of the southeast corner of sec. 17, T. 31 N., R. 19 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) dry; moderate very fine granular structure; very friable; common fine and few medium and coarse roots; very strongly acid; clear smooth boundary.

E—2 to 6 inches; yellowish brown (10YR 5/4) loam; weak very fine granular structure; very friable; few fine, medium, and coarse roots; very strongly acid; clear smooth boundary.

BE—6 to 10 inches; yellowish brown (10YR 5/4) loam; few fine prominent strong brown (7.5YR 5/8) mottles; weak very fine subangular structure; friable; few fine, common medium, and few coarse roots; very strongly acid; clear smooth boundary.

Bt1—10 to 21 inches; strong brown (7.5YR 4/6) clay loam; moderate very fine and fine subangular blocky structure; firm; common fine and medium and few coarse roots; few faint clay films on faces of peds; about 5 percent chert fragments; very strongly acid; clear smooth boundary.

2Btx1—21 to 26 inches; mottled yellowish brown (10YR 5/4), brown (7.5YR 5/2), and strong brown (7.5YR 5/6) cherty clay loam; weak thin platy structure; firm; brittle; few prominent clay flows in cracks; about 25 percent chert fragments; very strongly acid; gradual smooth boundary.

2Btx2—26 to 40 inches; mottled yellowish brown (10YR 5/4), strong brown (7.5YR 5/6), and brown (7.5YR 5/2) very cherty sandy clay loam; massive; firm; brittle; few prominent clay flows in cracks; about 55 percent chert fragments and a few sandstone fragments 15 to 24 inches in size; very strongly acid; abrupt smooth boundary.

3Bt—40 to 60 inches; red (2.5YR 4/6) cherty clay; moderate fine angular blocky structure; very firm; common faint clay films on faces of peds; about 20 percent chert fragments and a few sandstone fragments 15 to 24 inches in size; very strongly acid.

The A or Ap horizon has value of 3 to 5 and chroma of 2 or 3. It typically is silt loam, but the range includes loam and fine sandy loam. The Bt horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. It is sandy clay loam or clay loam. The 2Btx horizon has value of 4 to 6 and chroma of 2 to 6. It is fine sandy loam, loam, sandy clay loam, clay loam, or the cherty analogs of those textures. The 3Bt horizon has hue of 7.5YR to 2.5YR, value of 3 to 6, and chroma of 3 to 8. It is sandy clay loam, clay loam, clay, or the cherty analogs of those textures.

Moniteau Series

The Moniteau series consists of deep, poorly drained soils on the wider high flood plains. These soils formed in silty alluvium. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Typical pedon of Moniteau silt loam, 0 to 3 percent slopes; 350 feet south and 1,780 feet east of the northwest corner of sec. 2, T. 31 N., R. 17 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

E—10 to 24 inches; light brownish gray (10YR 6/2) silt loam; common medium faint gray (10YR 5/1) and few fine prominent dark yellowish brown (10YR 4/6) mottles; weak fine granular structure; friable; common fine roots; few fine concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Btg1—24 to 34 inches; gray (10YR 5/1) silty clay loam; common fine faint light brownish gray (10YR 6/2) and few fine distinct dark yellowish brown (10YR 4/4) mottles; weak very fine and fine subangular blocky structure; firm; few fine roots; few distinct clay films on faces of peds and in root channels; few fine concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Btg2—34 to 60 inches; mottled gray (10YR 5/1), light gray (10YR 6/1), and dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; few distinct clay films on faces of peds and in root channels; few fine concretions of iron and manganese oxide; medium acid.

The Ap horizon has value of 4 or 5 and chroma of 1 or 2. The Bt horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2.

Needleye Series

The Needleye series consists of deep, somewhat poorly drained soils on uplands. These soils formed in a thin layer of loess and in the underlying cherty limestone residuum. They have a fragipan. Permeability is moderately slow above the fragipan and very slow in the fragipan. Slopes range from 1 to 3 percent.

Typical pedon of Needleye silt loam, in an area of Captina-Needleye silt loams, 1 to 3 percent slopes; 5,940 feet north and 1,190 feet west of the southeast corner of sec. 4, T. 29 N., R. 18 W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

E—2 to 6 inches; brown (10YR 5/3) silt loam; moderate fine and very fine granular structure; friable; common fine and few medium roots; very strongly acid; gradual smooth boundary.

Bt1—6 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and very fine subangular blocky structure; friable; few fine, few medium, and few coarse roots; few faint clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—14 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate fine and very fine subangular blocky structure; friable; few fine, few medium, and few coarse roots; few faint clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—20 to 26 inches; mottled dark grayish brown (10YR 4/2), yellowish brown (10YR 5/6), and light brownish gray (10YR 6/2) silty clay loam; moderate fine subangular blocky structure; firm; few fine, few medium, and few coarse roots; common distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

2Btx1—26 to 50 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and brown (10YR 5/3) silty clay loam; moderate medium platy structure parting to moderate very fine angular and subangular blocky; very firm; brittle; few fine roots in cracks; very few prominent clay flows in cracks; very strongly acid; clear wavy boundary.

3Btx2—50 to 60 inches; mottled brown (7.5YR 4/4), gray (10YR 6/1), and yellowish brown (10YR 5/6) extremely cherty silty clay loam; moderate very fine and fine subangular blocky structure; very firm; brittle; few faint clay films on faces of peds and very few prominent clay flows in cracks; about 65 percent chert fragments; very strongly acid.

Depth to the fragipan ranges from 18 to 36 inches. The A or Ap horizon has value of 3 to 5 and chroma of 2 to 4. The part of the Bt horizon above the fragipan has hue of 10YR or 7.5YR, value of 2 to 6, and chroma of 2 to 6. It typically is silty clay loam, but the range includes silt loam. The Btx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 to 6. It is silt loam, silty clay loam, or the extremely cherty analogs of silt loam or silty clay loam.

Noark Series

The Noark series consists of deep, well drained soils on uplands. These soils formed in cherty limestone residuum. Permeability is moderate. Slopes range from 3 to 35 percent.

Typical pedon of Noark very cherty silt loam, in an area of Alsup-Noark complex, 9 to 35 percent slopes; 6,390 feet south and 1,450 feet east of the northwest corner of sec. 1, T. 29 N., R. 18 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) very cherty silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; very friable; common fine and common medium roots; about 40 percent chert fragments; medium acid; clear smooth boundary.

E—5 to 12 inches; pale brown (10YR 6/3) very cherty silt loam; moderate very fine and fine granular structure; very friable; common fine and common medium roots; about 50 percent chert fragments; strongly acid; gradual smooth boundary.

BE—12 to 16 inches; brown (7.5YR 5/4) and pale brown (10YR 6/3) very cherty silt loam; weak very fine and fine subangular blocky structure; friable; common fine, common medium, and few coarse roots; about 50 percent chert fragments; strongly acid; clear smooth boundary.

Bt1—16 to 27 inches; yellowish red (5YR 4/6) and reddish brown (5YR 5/4) very cherty silty clay; moderate very fine and fine subangular blocky structure; firm; few fine, few medium, and few coarse roots; few faint clay films on faces of peds; about 40 percent chert fragments, 5 percent more than 3 inches in size; very strongly acid; clear wavy boundary.

Bt2—27 to 41 inches; dark red (2.5YR 3/6) very cherty clay; many medium prominent reddish brown (5YR 5/4) and common medium prominent pale brown (10YR 6/3) mottles; moderate very fine and fine angular blocky structure; firm; few fine roots; common faint clay films on faces of peds; about 50 percent chert fragments, 5 percent more than 3 inches in size; very strongly acid; gradual wavy boundary.

Bt3—41 to 60 inches; dark red (2.5YR 3/6) very cherty clay; common medium prominent reddish brown (5YR 5/4) and few medium prominent light gray (10YR 7/1) mottles; moderate fine angular blocky structure; firm; few fine and few medium roots; many faint clay films on faces of peds; about 60 percent chert fragments, 10 percent more than 3 inches in size; extremely acid.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 6 to 8.

Nolin Series

The Nolin series consists of deep, well drained soils on the wider flood plains. These soils formed in silty alluvium. Permeability is moderate. Slopes range from 0 to 3 percent.

Typical pedon of Nolin silt loam, 0 to 3 percent slopes; 4,090 feet south and 1,300 feet west of the northeast corner of sec. 4, T. 29 N., R. 18 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; very friable; many fine roots; slightly acid; gradual smooth boundary.

BA—10 to 20 inches; dark brown (10YR 4/3) silt loam; weak very fine and fine granular structure; very friable; many fine roots; medium acid; gradual smooth boundary.

Bw1—20 to 26 inches; dark brown (10YR 4/3) silt loam; weak very fine and fine subangular blocky structure; friable; many fine roots; medium acid; gradual smooth boundary.

Bw2—26 to 48 inches; brown (7.5YR 4/4) silt loam; weak very fine and fine subangular blocky structure; friable; few fine roots; strongly acid; gradual smooth boundary.

Bw3—48 to 60 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine and fine subangular blocky structure; friable; few fine roots; strongly acid.

The A or Ap horizon has value of 4 or 5 and chroma of 2 or 3. It typically is silt loam, but the range includes loam and silty clay loam. The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or silt loam.

Ocie Series

The Ocie series consists of deep, well drained and moderately well drained soils on uplands. These soils formed in cherty sediments and in material weathered from cherty dolomite and interbedded sandstone. Permeability is moderate in the upper part of the profile and slow in the lower part. Slopes range from 3 to 35 percent.

Typical pedon of Ocie cherty silt loam, in an area of Ocie-Gepp-Gatewood complex, 3 to 9 percent slopes; 2,300 feet north and 550 feet west of the southeast corner of sec. 20, T. 32 N., R. 17 W.

A—0 to 3 inches; dark grayish brown (10YR 4/2) cherty silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine granular structure; friable; common fine roots; about 25 percent chert fragments, 10 percent more than 3 inches in size; strongly acid; clear smooth boundary.

E—3 to 7 inches; pale brown (10YR 6/3) cherty silt loam; moderate very fine and fine granular structure; friable; common fine roots; about 25 percent chert fragments, 10 percent more than 3 inches in size; strongly acid; clear smooth boundary.

Bt1—7 to 14 inches; light yellowish brown (10YR 6/4) very cherty silty clay loam; many fine distinct brownish yellow (10YR 6/6) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular blocky structure; friable; common fine roots; very few faint clay films on faces of peds; about 35 percent chert fragments; very strongly acid; clear wavy boundary.

2Bt2—14 to 19 inches; mixed yellowish brown (10YR 5/4), strong brown (7.5YR 5/6), and reddish brown (2.5YR 4/4) cherty clay; moderate very fine subangular blocky structure; firm; few fine and medium roots; few faint clay films on faces of peds; about 20 percent chert fragments; strongly acid; clear wavy boundary.

2Bt3—19 to 25 inches; mixed yellowish brown (10YR 5/4), strong brown (7.5YR 5/6), and red (2.5YR 4/6) clay; weak very fine angular blocky structure; very firm; few fine and coarse roots; common distinct clay films on faces of peds; strongly acid; gradual wavy boundary.

2Bt4—25 to 39 inches; yellowish brown (10YR 5/4) clay; weak very fine angular blocky structure; very firm; few fine roots; common faint clay films on faces of peds; strongly acid; clear wavy boundary.

2Bt5—39 to 48 inches; mixed yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/6), and grayish brown (10YR 5/2) cherty clay; moderate fine angular blocky structure; very firm; few fine roots; common faint and distinct clay films on faces of peds; about 20 percent chert and sandstone fragments; slightly acid; abrupt smooth boundary.

2Cr—48 to 53 inches; weathered dolomite bedrock.

2R—53 inches; hard dolomite bedrock.

The depth to bedrock ranges from 40 to 60 inches. The A or Ap horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. It typically is cherty silt loam, but the range includes silt loam, loam, and fine sandy loam. The Bt1 horizon has hue of 10YR to 5YR, value of 3 to 6, and chroma of 4 to 8. It typically is the very cherty or cherty analogs of silt loam, silty clay loam, or loam. The 2Bt horizon has hue of 10YR to 2.5YR, value of 4 to 7, and chroma of 2 to 8.

Peridge Series

The Peridge series consists of deep, well drained soils on terraces and uplands. These soils formed in a thin layer of loess or other silty sediments and in the underlying limestone or dolomite residuum. Permeability is moderate. Slopes range from 2 to 5 percent.

Typical pedon of Peridge silt loam, 2 to 5 percent slopes; 400 feet east and 150 feet north of the southwest corner of sec. 7, T. 31 N., R. 16 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak very fine and fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

BE—10 to 18 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine and fine subangular blocky structure; friable; common fine roots; slightly acid; gradual smooth boundary.

2Bt1—18 to 32 inches; yellowish red (5YR 4/6) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; slightly acid; gradual smooth boundary.

2Bt2—32 to 52 inches; red (2.5YR 4/6) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; common faint clay films on faces of peds; medium acid; clear smooth boundary.

2Bt3—52 to 60 inches; mixed red (2.5YR 4/6), yellowish red (5YR 5/6), and reddish yellow (5YR 6/6) silty clay loam; weak fine subangular blocky structure; firm; common distinct clay films on faces of peds; about 10 percent chert fragments; strongly acid.

The A or Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. The 2Bt horizon has hue of 7.5YR to 2.5YR, value of 3 to 5, and chroma of 4 to 6. It typically is silt loam or silty clay loam, but in some pedons the lower part is silty clay or clay.

Plato Series

The Plato series consists of deep, somewhat poorly drained soils on uplands. These soils formed in a thin layer of loess and in the underlying cherty dolomite residuum. They have a fragipan. Permeability is moderately slow in the upper part of the profile, very slow in the fragipan, and moderate below the fragipan. Slopes range from 2 to 5 percent.

Typical pedon of Plato silt loam, 2 to 5 percent slopes; 2,110 feet north and 1,715 feet west of the southeast corner of sec. 30, T. 32 N., R. 19 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

Bt1—6 to 13 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint light yellowish brown (10YR 6/4) and few fine distinct yellowish brown (10YR 5/6) mottles; weak very fine and fine subangular blocky structure; firm; common fine roots; few faint clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—13 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct grayish brown (10YR 5/2) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; common fine roots; common faint clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—18 to 24 inches; dark gray (10YR 4/1) silty clay; common fine faint light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/6) mottles; weak very fine and fine subangular blocky structure; firm; many fine roots; common distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

2Btx1—24 to 29 inches; mottled yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and reddish brown (5YR 4/4) cherty silty clay loam; moderate thick platy structure parting to weak very fine and fine subangular blocky; very firm; brittle; few distinct clay flows in cracks; about 20 percent chert fragments; very strongly acid; gradual smooth boundary.

2Btx2—29 to 40 inches; mottled dark brown (7.5YR 4/4), brown (7.5YR 5/4), and pinkish gray (7.5YR 6/2) cherty silty clay loam; moderate medium platy structure parting to weak fine subangular blocky; very firm; brittle; few distinct clay flows in cracks; about 20 percent chert fragments; extremely acid; gradual smooth boundary.

2Btx3—40 to 53 inches; mottled red (2.5YR 4/6), reddish brown (5YR 4/4), and reddish gray (5YR 5/2) cherty silty clay loam; moderate medium platy structure parting to weak fine subangular blocky; very firm; brittle; few distinct clay flows in cracks; about 20 percent chert fragments; extremely acid; gradual smooth boundary.

3Bt—53 to 60 inches; dark red (2.5YR 3/6) very cherty clay; common medium prominent reddish gray (5YR 5/2) mottles; moderate very fine and fine angular blocky structure; very firm; common faint clay films on faces of peds; about 40 percent chert fragments; medium acid.

Depth to the fragipan ranges from 20 to 36 inches. The A or Ap horizon has value of 4 to 6 and chroma of 2 to 5. The upper part of the Bt horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 6. The lower part has chroma of 1 or 2. This horizon is silty clay loam, silty clay, or clay. The 2Btx horizon is the cherty, very cherty, or extremely cherty analogs of silt loam or silty clay loam. The 3Bt horizon has hue of 10R to 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is the cherty or very cherty analogs of silty clay loam, silty clay, or clay.

Scholten Series

The Scholten series consists of deep, moderately well drained soils on uplands. These soils formed in cherty limestone residuum. They have a fragipan. Permeability is moderate in the upper part of the profile, very slow in the fragipan, and moderate below the fragipan. Slopes range from 2 to 9 percent.

Typical pedon of Scholten very cherty silt loam, in an area of Noark-Scholten very cherty silt loams, 2 to 9 percent slopes; 925 feet east and 990 feet north of the southwest corner of sec. 30, T. 28 N., R. 18 W.

Ap—0 to 6 inches; brown (10YR 4/3) very cherty silt loam, pale brown (10YR 6/3) dry; moderate very fine and fine granular structure; friable; common fine roots; about 40 percent chert fragments; slightly acid; clear smooth boundary.

E—6 to 11 inches; pale brown (10YR 6/3) and brown (10YR 5/3) very cherty silt loam; moderate fine granular structure; friable; common fine roots; about 35 percent chert fragments; medium acid; gradual wavy boundary.

BE—11 to 16 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) very cherty silty clay loam; moderate fine and very fine subangular blocky structure; friable; common fine roots; about 40 percent chert fragments; strongly acid; gradual wavy boundary.

Bt—16 to 23 inches; yellowish brown (10YR 5/4) very cherty silty clay loam; few fine faint pale brown (10YR 6/3) mottles; moderate fine subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; about 45 percent chert fragments; very strongly acid; clear smooth boundary.

2Btx—23 to 32 inches; pale brown (10YR 6/3) and yellowish brown (10YR 5/4 and 5/6) extremely cherty silty clay loam; massive; very firm; brittle; few fine roots in cracks; few faint clay flows in cracks; about 70 percent chert fragments, 15 percent more than 3 inches in size; very strongly acid; clear wavy boundary.

3Bt—32 to 60 inches; red (2.5YR 4/6) extremely cherty silty clay; common fine prominent light brownish gray (10YR 6/2) mottles; moderate fine angular blocky structure; firm; common distinct clay films on faces of peds; about 70 percent chert fragments, 15 percent more than 3 inches in size; very strongly acid.

Depth to the fragipan ranges from 18 to 27 inches. The content of chert ranges from 15 to 40 percent in the A and E horizons, from 35 to 65 percent in the Bt horizon, and from 15 to 70 percent in the 2Btx and 3Bt horizons.

The Ap or A horizon has value of 3 to 5 and chroma of 2 or 3. The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 to 6. It is very cherty silty clay loam or very cherty silt loam. The 2Btx horizon is mottled with pale brown, yellowish brown, yellowish red, and gray. It is the very cherty or extremely cherty analogs of silty clay loam or silt loam. The 3Bt horizon has hue of 2.5YR or 5YR and value of 3 or 4. It is the very cherty or extremely cherty analogs of silty clay or clay.

Tonti Series

The Tonti series consists of deep, moderately well drained soils on uplands. These soils formed in loess and in the underlying cherty limestone residuum. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 2 to 5 percent.

Typical pedon of Tonti silt loam, 2 to 5 percent slopes; 2,180 feet south and 30 feet west of the northeast corner of sec. 17, T. 28 N., R. 16 W.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine and medium roots; about 10 percent chert fragments; slightly acid; clear smooth boundary.

E—5 to 9 inches; brown (10YR 5/3) silt loam; weak very fine and fine granular structure; friable; common fine roots; about 10 percent chert fragments; strongly acid; clear smooth boundary.

Bt1—9 to 16 inches; yellowish brown (10YR 5/6) cherty silty clay loam; weak fine subangular blocky structure; friable; common fine roots; few faint clay films on faces of peds; about 20 percent chert fragments; very strongly acid; clear smooth boundary.

Bt2—16 to 23 inches; yellowish brown (10YR 5/6) cherty silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate fine subangular structure; firm; common fine roots; few faint clay films on faces of peds; about 25 percent chert fragments; very strongly acid; clear smooth boundary.

2Btx—23 to 40 inches; mottled pale brown (10YR 6/3), light gray (10YR 7/1), and yellowish brown (10YR 5/6) very cherty silty clay loam; massive; very firm; brittle; few distinct clay flows in cracks; about 60 percent chert fragments, 5 percent more than 3 inches in size; very strongly acid; clear wavy boundary.

2Bt—40 to 60 inches; red (2.5YR 4/6) extremely cherty silty clay; common medium prominent light brownish gray (10YR 6/2) and many fine prominent pale brown (10YR 6/3) mottles; moderate fine angular blocky structure; firm; common distinct clay films on faces of peds; about 65 percent chert fragments, 5 percent more than 3 inches in size; very strongly acid.

Depth to the fragipan ranges from 15 to 25 inches. The A or Ap horizon has value of 4 or 5 and chroma of 2 or 3. It typically is silt loam, but the range includes cherty silt loam. The part of the Bt horizon above the fragipan has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. It is silt loam, silty clay loam, or the cherty analogs of those textures. The 2Btx horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 1 to 6. It is the cherty, very cherty, and extremely cherty analogs of silt loam or silty clay loam. The 2Bt horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 4 to 6. It is the cherty to extremely cherty analogs of silty clay or clay.

Viraton Series

The Viraton series consists of deep, moderately well drained soils on uplands. These soils formed in loess or loamy sediments and in the underlying cherty dolomite residuum. They have a fragipan. Permeability is moderate above the fragipan and very slow in the fragipan. Slopes range from 2 to 5 percent.

Typical pedon of Viraton silt loam, 2 to 5 percent slopes; 1,850 feet east and 265 feet north of the southwest corner of sec. 5, T. 31 N., R. 17 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common fine and medium and few coarse roots; about 5 percent chert fragments; strongly acid; clear smooth boundary.

Bt1—6 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak very fine and fine subangular blocky structure; friable; common fine and few medium roots; few faint clay films on faces of peds; about 10 percent chert fragments; strongly acid; clear smooth boundary.

Bt2—15 to 21 inches; dark yellowish brown (10YR 4/4) cherty silty clay loam; few fine faint brown (10YR 5/3) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; few fine roots; common faint clay films on faces of peds; about 20 percent chert fragments; very strongly acid; clear smooth boundary.

2Btx—21 to 33 inches; mottled grayish brown (10YR 5/2), light yellowish brown (10YR 6/4), and dark yellowish brown (10YR 4/4) very cherty silt loam; massive; very firm; brittle; few prominent clay flows in cracks; about 50 percent chert fragments; very strongly acid; clear wavy boundary.

3Bt1—33 to 40 inches; yellowish red (5YR 4/6) very cherty silty clay; moderate fine subangular blocky structure; firm; few faint clay films on faces of peds; about 55 percent chert fragments; very strongly acid; clear smooth boundary.

3Bt2—40 to 60 inches; dark reddish brown (2.5YR 3/4) and dark red (2.5YR 3/6) very cherty silty clay; few fine prominent light brownish gray (10YR 6/2) mottles; strong very fine and fine angular blocky structure; firm; many faint clay films on faces of peds; about 50 percent chert fragments; very strongly acid.

Depth to the fragipan ranges from 16 to 33 inches. The A or Ap horizon has value of 3 to 5 and chroma of 2 to 4. It typically is silt loam, but the range includes cherty silt loam. The part of the Bt horizon above the fragipan has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is silt loam, silty clay loam, or the cherty analogs of those textures. The 2Btx horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 1 to 6. It typically is the cherty to extremely cherty analogs of silt loam and silty clay loam. The 3Bt horizon has hue of 7.5YR to 2.5YR, value of 3 to 6, and chroma of 3 to 8. It is the cherty or very cherty analogs of clay or silty clay.

Wilderness Series

The Wilderness series consists of deep, moderately well drained soils on uplands. These soils formed in cherty dolomite residuum. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 2 to 9 percent.

Typical pedon of Wilderness very cherty silt loam, in an area of Wilderness-Gepp very cherty silt loams, 2 to 9 percent slopes; 1,700 feet east and 660 feet north of the southwest corner of sec. 5, T. 31 N., R. 17 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) very cherty silt loam, light brownish gray (10YR 6/2) dry; moderate fine and very fine granular structure; friable; common fine and medium and few coarse roots; about 40 percent chert fragments; strongly acid; clear smooth boundary.

E—4 to 9 inches; light yellowish brown (10YR 6/4) very cherty silt loam; moderate fine and very fine granular structure; friable; common fine and medium and few coarse roots; about 35 percent chert fragments; strongly acid; gradual smooth boundary.

Bt—9 to 20 inches; yellowish brown (10YR 5/4) very cherty silty clay loam; few fine prominent strong brown (7.5YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; few fine, common medium, and few coarse roots; few faint clay films on faces of peds; about 60 percent chert fragments, 10 percent more than 3 inches in size; strongly acid; clear wavy boundary.

2Btx—20 to 30 inches; mottled light yellowish brown (10YR 6/4), brownish yellow (10YR 6/6), and light brownish gray (10YR 6/2) extremely cherty silt loam; massive; very firm; brittle; few fine roots in cracks; few faint clay flows in cracks; about 70 percent chert fragments, 15 percent more than 3 inches in size; very strongly acid; clear wavy boundary.

3Bt—30 to 60 inches; mixed red (2.5YR 4/6) and yellowish red (5YR 5/6 and 5/8) extremely cherty silty clay; moderate fine and very fine subangular blocky structure; firm; few distinct clay films on faces of peds; about 65 percent chert fragments, 15 percent more than 3 inches in size; medium acid.

Depth to the fragipan ranges from 15 to 29 inches. The A or Ap horizon has value of 3 to 5 and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. It is very cherty silty clay loam or very cherty silt loam. The Btx horizon is the very cherty or extremely cherty analogs of silt loam or silty clay loam. The 3Bt horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 6 to 8. It is the very cherty or extremely cherty analogs of silty clay or clay.

Geology and Physiography

Prepared by John W. Whitfield, geologist, Engineering Geology Section, Geology and Land Survey, Missouri Department of Natural Resources.

Webster County is situated in the Ozarks Plateau Province. The county can be further divided into two plateaus. The southern half of the county is on the Springfield Plateau, and the northern half is on the Salem Plateau. The two provinces are separated by the northwest-southeast trending Eureka Springs escarpment.

Bedrock in the county consists of sedimentary rocks ranging from Ordovician Gasconade Dolomite to Pennsylvanian sandstones. A layer of loess generally 1 foot or less thick overlies the residual soil.

Although the rock appears to be horizontal, there is a gentle regional dip of approximately 6 feet to the mile toward the northwest. The direction of the dip is influenced by several geologic events, but the principal factor is the Ozark uplift. The apex of the uplift is in southeast Missouri, and the bedrock dips away from the uplift in all directions. Webster County is on the western edge of the uplift.

Several faults are located within the county. The most prominent is the Bolivar-Mansfield fault system, which crosses the county in a northwest-southeast direction. This system consists of a series of parallel faults with throws of as much as 300 feet. There are several smaller faults in the southern half of the county, such as the Fordland, Diggins, and Sarvis Point faults, which influence the rock stratigraphy. Fault displacement seldom exceeds 150 feet. These faults are geologically old and inactive and are not considered a seismic risk. Information about the location of several of the faults can be obtained from the Department of Natural Resources, Division of Geology and Land Survey. Sinkholes positioned in a straight line generally indicate a fault or fracture line, which contributed to sinkhole development.

Most of the bedrock exposed in the county consists of cherty dolomite and cherty limestone. These formations overlie thick sequences of dolomite, cherty dolomite, and sandstone, which in turn rest on Precambrian granite. The depth to granite bedrock in the county is 1,800 to 2,000 feet.

In Webster County, cherty dolomite, cherty limestone, and shale play a significant part in the development of soils. Physical and chemical weathering caused a slow disintegration of the bedrock until it was reduced to its least soluble components, that is, chert and clay. Weathering has altered the soluble carbonate portion of the limestone and dolomite into brown to red clay, but chert in the bedrock consists of crystalline silica, which is more resistant to weathering. The chert remains behind in the form of angular fragments or wavy horizontal beds sandwiched between layers of clay. Where there has not been significant movement of soil through downslope creep or vertical movement through the slumping of bedrock, the sequence of clay and chert retain a relict structure of the original unweathered bedrock. The clay and chert that remains after bedrock disintegration is called bedrock residuum.

Large areas in the county consist of rolling wooded hills and pastures. A more rugged topography is evident along the Eureka Springs escarpment and in the deep valleys formed by the James and Niangua Rivers, the Osage Fork of the Gasconade River, and Finley Creek. High bluffs of dolomite are in the deep valleys formed by the major rivers. Because of the effects of weathering, the bedrock surface is quite uneven. Areas of relatively shallow soils give way to areas of deep soils and deeply weathered bedrock. It is very difficult to predict soil depth without some type of drilling information.

From the oldest to the youngest, the bedrock formations in the county are Gasconade Dolomite, the Roubidoux Formation, Jefferson City Dolomite, Cotter Dolomite, the Compton Formation, the Northview Formation, the Pierson Formation, the Elsey Formation, Burlington-Keokuk Limestone, and a Pennsylvanian sandstone.

The Gasconade Dolomite is more than 200 feet thick. It consists of gray to light brown dolomite that has

Figure 23.—Cotter Dolomite in a road cut. This dolomite has a relatively small amount of chert.

numerous layers of chert. Some of these layers are more than 5 feet thick. Exposures of Gasconade Dolomite are limited to the northeast corner of the county, where outcrops form high bluffs along the valley of the Osage Fork of the Gasconade River. The soil cover varies in thickness and generally has the cherty residue left from weathering of the parent bedrock.

The Roubidoux Formation is 150 to 200 feet thick. It consists of sandy dolomite, cherty dolomite, and sandstone. Outcrops of this formation are confined to the more rugged landscape in the northern part of the county. Sandstone beds within the formation are 8 to 10 feet thick. They commonly crop out as bluffs along creeks in the watersheds of the Niangua River and the Osage Fork of the Gasconade River. These sandstones exhibit ripple marks, or mud cracks of cross bedding. In the outcrop area of the Roubidoux Formation, the land surface generally is covered by an abundance of chert and sandstone boulders. The soils show the influence of weathering from a bedrock having an abundance of sandstone.

The Jefferson City Dolomite is 150 to 200 feet thick. It consists of tan to brown dolomite. Thin sandstone and chert layers are within the dolomite sequence. The overlying Cotter Dolomite (fig. 23) is 100 to 200 feet thick. It consists of cherty dolomite and locally persistent sandstone. In Webster County, the sandstone crops out on the bottoms and banks of many of the upland creeks (fig. 24). The Cotter Dolomite and the Jefferson City Dolomite are difficult to tell apart. Except for the presence of several sandstone beds in the Cotter Dolomite, the two formations are very similar. They are evident in the northern half of the county and in the southeast corner. They have had a major influence on topography and soil development. Generally, the soils in areas of these formations are more clay rich and shallower than the soils that formed in material weathered from other rock formations.

The Compton Formation, which consists of bedded, light gray limestone, is 2 to 20 feet thick. It has fragments of small fossils. It crops out along the base of the Eureka Springs escarpment. Other than forming small bluffs on the hillsides, this formation has contributed very little to soil development or topography in the county.

The Northview Formation consists of 20 to 40 feet of green, silty shale. The upper part of this formation has several thick beds of greenish tan siltstone. The siltstone can be identified by the numerous wormlike holes and cauda-galli (rooster tails) cast on the stone surface. The shale can be easily identified by its greenish color and sticky clay texture. Its very slow

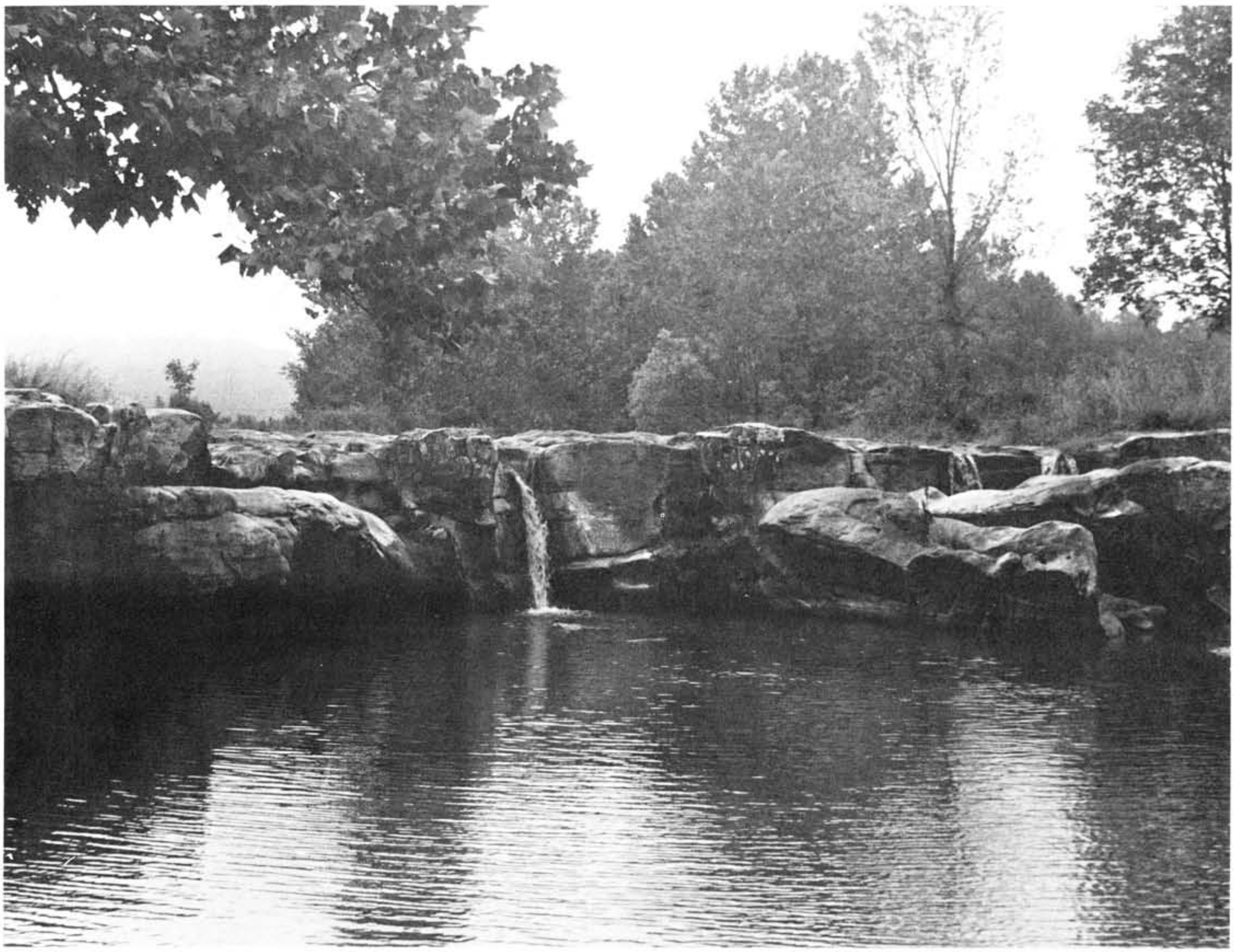

Figure 24.—Resistant sandstone bedrock at Finley Falls on Finley Creek.

Figure 25.—Exposure of Elsey limestone and chert in an area of the Noark-Alsup association.

permeability retards the downward percolation of ground water. The water moves laterally along the top of the shale and commonly resurfaces as a spring on a valley slope or in a gulley that intersects the shale. The soil cover on the Northview Formation generally is thin and retains some residue of the shale and siltstone bedrock.

The Pierson Formation crops out as a moderately thick to massive, bedded, brown dolomitic limestone. The contact between this formation and the underlying Northview Formation is not distinct because of the gradual lithologic change from shale to dolomitic limestone. The Pierson Formation is 10 to 35 feet thick. It crops out on hill slopes that border the James River and Finley Creek and in some of the deep sinkholes on the Springfield Plateau.

The Elsey Formation consists of thin, alternating layers of gray limestone and chert (fig. 25). The chert generally occurs as nodules or thin, wavy layers between the thin layers of limestone. The content of chert in the cherty clay residuum formed during the breakdown of this formation and ranges from 30 to 50 percent. In Webster County, the Elsey Formation is 20 to 35 feet thick. It crops out in valleys on the Springfield Plateau and near the top of the Eureka Springs escarpment.

The Burlington and Keokuk are recognized as separate formations. Because of their geological similarities in southwest Missouri, however, the two formations have been combined as a single unit. The Burlington-Keokuk Limestone consists of light gray, coarse crystalline limestone that generally is less than 50 feet thick. The formation is thin to massive, bedded limestone that has discontinuous bands of chert and isolated chert nodules.

In the southern part of the county, there are a number of sinkholes in the Burlington-Keokuk and Elsey Formations. Infiltration of surface water through stony residuum and through cracks and fractures in the bedrock has slowly dissolved the calcium in the limestone and formed a network of underground openings. Sinkholes are formed when the ceiling of an underground opening begins to "stope" or enlarge in an upward direction. The soil and rock forming the ceiling of the underground opening continue to collapse until the roof becomes so weak that there is a complete collapse reaching to the surface. The cherty clay residual soil varies in thickness.

The youngest bedrock in the county is a Pennsylvanian sandstone. The sandstone is evident in very limited areas of the county, generally occurring as isolated, amorphous exposures that show little evidence of bedding or structure. The sandstone is 5 to 10 feet thick. Because of a similar appearance, Cotter sandstone can be mistaken for Pennsylvanian sandstone. Outcrops of Cotter sandstone are traceable over a wide area, whereas Pennsylvanian sandstone is limited to single isolated exposures. Close examination shows that the Pennsylvanian sandstone has small flakes of mica, which are not evident in the Cotter sandstone. The soil cover on the Pennsylvanian sandstone generally is thin, and the residual material shows the marked influence of sandstone.

The bedrock formations exposed in the county produce small amounts of ground water. The Burlington-Keokuk, Elsey, Reed Springs, and Pierson Formations produce 1 to 10 gallons per minute in shallow wells.

The Northview Formation is a silty shale that acts as an aquitard. As such, it retards the downward percolation of ground water. The silty shale does not produce any ground water, but numerous springs are along the top of the shale.

The Compton-Bachelor, Cotter, Jefferson City, and Roubidoux Formations provide small quantities of water for homes and farms but are not major sources of ground water. Swan Creek sandstone, which is in the central portion of the Cotter Formation, has produced small amounts of ground water. The quality of the water has deteriorated, however, because of contamination from the surface and poorly constructed and cased wells.

The major high-yielding source of ground water in the county is the dolomites in the lower Ordovician-Cambrian Formations. Several cities obtain water from wells in these formations. The wells are more than 1,000 feet deep. They produce 300 to more than 600 gallons of water per minute.

Formation of the Soils

Joseph E. Blaine, soil scientist, Webster County Soil and Water Conservation District, prepared this section.

Soils are continually changing. The characteristics of a soil at any given point are determined by the physical and mineralogical composition of the parent material; the living organisms on and in the soil; the climate under which the soil material accumulated and has existed since accumulation; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Parent Material

Parent material is the weathered mass in which a soil forms. The soils in Webster County formed in material weathered from limestone, dolomite, shale, and sandstone, in alluvium, in loess, or in a combination of these.

Most of the soils formed in material weathered from limestone or dolomite, both of which tend to weather to clays. In Webster County, the most significant difference between the dolomite formations and the Elsey Formation, which is the predominant limestone formation, involves the content of chert in the bedrock. The Elsey Formation has considerably more chert than the dolomite formations. The chert is relatively weather resistant and is left in the soil after the bedrock is weathered. Thus, the soils that formed in material weathered from this limestone have more chert than those that formed in material weathered from the dolomite formations. Also, the soils in Webster County that formed in material weathered from the upper limestone formations have been exposed to less geological erosion and therefore are considerably older and deeper than the soils that formed in material weathered from all other formations.

The kind of bedrock and rate of geological erosion have affected soil formation to the extent that most of the soils can be divided between those on the Mississippian formations and those on the Ordovician formations. Peridge and Bado were the only soils mapped to any extent on both geological systems. The Mississippian rocks consist of limestone and shale formations at the higher elevations in the southern half of the county. The Ordovician rocks consist mainly of dolomite formations directly below the soils in the northern half of the county and at the lower elevations in the southern half.

Tonti, Captina, Needleye, Sholten, and Noark are the dominant soils on ridgetops in areas of the Mississippian formations. Noark and Alsup are the dominant soils on side slopes in areas of the Mississippian formations. The location of these soils on side slopes is very predictable because of the good correlation between the soils and the kind of bedrock. In Webster County, Alsup soils formed in material weathered from the Northview Shale Formation. They are the only soils on this formation. Noark soils formed entirely in material weathered from the limestone above the Northview Shale. They are the only soils mapped on the side slopes above the Alsup soils in the county. Like the two soils, the limestone and shale formations occur in a predictable pattern.

Viraton, Plato, Hobson, Wilderness, and Gepp are the dominant soils on ridgetops in areas of the Ordovician formations, and Gepp, Ocie, and Gatewood are the main soils on side slopes in these areas. These formations are always below the Mississippian formations. As a result, all of these soils are in areas below the soils that formed in material weathered from the Mississippian formations.

Climate

Climate has been a significant factor in the formation of soils in Webster County. The amount of precipitation has been high enough to leach nutrients, lowering the natural fertility level and increasing the acidity of the soils. Climate has had a limited effect on soil diversity in the county. Some differences, however, are the result of variations in the micro-climate. An example is the differences in temperature caused by aspect. South- and west-facing slopes are warmer and drier than north-and east-facing slopes. These climatic conditions affect the rate of soil formation and geologic erosion, which determine soil depth. Thus, soils on south- and west-facing slopes are likely to be less deep than those on north- and east-facing slopes.

Living Organisms

Living organisms both in and on the soil have contributed to the alteration of parent material and the properties of the soils. Plants can greatly influence soil formation; however, on almost all of the soils in Webster County, trees were the dominant vegetative cover during soil formation. This kind of plant cover results in less soil diversity than prairie grasses. Therefore, plants have had a limited effect on the diversity of soils in the county. Early records estimate that 3 percent of the county was native grassland at time of settlement. The dark layers in the Gasconade soils are characteristic of the effects of native grass on soil formation.

Relief

The relief and landforms in Webster County are mainly the result of geologic water erosion, which dissected the original plateau, creating numerous narrow ridges and valleys. The Tonti-Noark-Captina association is a remnant of this original plateau. The gentle topography of this association is attributed to the similar topography of the original plateau and a lack of extensive geologic erosion, which would have resulted in dissection and a steeper topography.

Relief affects soil formation through its effect on erosion, climate, and other soil-forming factors. Slope influences the amount of runoff and the rate of water infiltration, which affects the rate of leaching, clay movement, and the thickness of the soil horizons. Slope and aspect affect soil temperature.

Relief has contributed significantly to the diversity of soils in the county. The Viraton-Gepp-Wilderness and Tonti-Noark-Captina associations have the least relief of the soil associations on uplands. Because of this gentle topography, these soils have retained a thin layer of loess over residual material. As a result, they have fewer chert fragments in the surface layer than other soils on uplands. Relief also has affected the formation of soils that have a fragipan. Nearly all of the gently sloping soils on uplands have a fragipan.

Time

Time is important only as it allows climate, living organisms, and relief to exert their influence on the parent material. The degree to which soil-forming processes have changed the parent material determines the age of a soil. Thus, the age of a soil is relative, depending on the degree of soil development rather than the number of years that the soil material has existed.

Some soil properties that are used to determine the age of the soils of the county include the development of an argillic horizon or a fragipan and the depth of weathering. Gepp, Ocie, Noark, and Alsup are examples of soils that have a distinct argillic horizon, which is high in content of translocated clays.

The youngest soils in the county formed in alluvial deposits. Nolin, Dameron, and Cedargap soils are examples.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols., illus.

(2) American Society for Testing and Materials. 1985. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Drake, J.A., and A.T. Strahon. 1904. Soil survey of Webster County, Missouri.

(4) Goodspeed Publishing Company. 1974 (reprint). History of Laclede, Camden, Dallas, Webster, Wright, Texas, Pulaski, Phelps, and Dent Counties. 1,219 pp., illus.

(5) Lewis, Clyde E. 1955. Agriculture, yesterday and today. *In* Floy Watters George, History of Webster County, 1855-1955, chap. 22.

(6) McGrath, Martha. 1976. Tomato canning in the Ozarks. The Webster Cty. Hist. Soc. J. 4: 20.

(7) Missouri Agricultural Statistics Office. 1986. Missouri farm facts. 63 pp., illus.

(8) Missouri Crop and Livestock Reporting Service. 1985. Webster County agri-facts. 4 pp., illus.

(9) Missouri Department of Conservation. 1987. Fur harvest tabulations. 3 pp.

(10) Missouri Department of Natural Resources, Division of Parks and Recreation. 1976. Missouri statewide comprehensive outdoor recreation plan.

(11) National Association of Conservation Districts. NACD nationwide outdoor recreation inventory—Missouri. (Unpublished data assembled in 1974; available in field offices of the Soil Conservation Service)

(12) Rafferty, Milton D. April 27, 1975. Times changed on Ozark farms. Springfield, Missouri Sunday News and Leader, section D, p. 6.

(13) Schroeder, Walter A. 1981. Presettlement prairie of Missouri. Missouri Dep. Conserv., Nat. Hist. Ser. 2, 37 pp., illus.

(14) State Interagency Council for Outdoor Recreation. 1980. Missouri statewide comprehensive outdoor recreation plan. 127 pp., illus.

(15) Thom, Richard H., and James H. Wilson. 1980. The natural divisions of Missouri. Trans. Missouri Acad. of Sci. 14: 9-23.

(16) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(17) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(18) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(19) University of Missouri Extension Office of Social and Economic Data Analysis. 1986. County profile for Webster County. 24 pp., illus.

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—

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.

Cement rock. Shaly limestone used in the manufacture of cement.

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 channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

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.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

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.

Congeliturbate. Soil material disturbed by frost action.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

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.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth 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 frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

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.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not 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.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

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.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

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.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

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.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of 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.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

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 degrees of acidity or alkalinity, expressed as pH values, are—

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.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

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.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

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.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

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 surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

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.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

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.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) 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 about 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Till plain. An extensive flat to undulating area underlain by glacial till.

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.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-84 at Marshfield, Missouri)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	41.6	21.1	31.4	70	0	12	1.80	0.66	2.73	4	4.0
February----	47.0	25.8	36.4	74	0	19	2.04	.93	2.98	4	4.3
March-------	55.7	33.6	44.7	83	9	82	3.45	1.98	4.75	7	2.7
April-------	67.9	44.9	56.4	87	24	225	3.79	2.31	5.10	7	.3
May---------	76.1	54.0	65.1	90	33	468	4.62	2.50	6.48	8	.0
June--------	84.1	62.8	73.5	95	46	705	4.41	1.70	6.67	7	.0
July--------	89.2	67.4	78.3	100	52	877	3.65	1.46	5.48	6	.0
August------	88.3	65.9	77.1	99	51	840	3.01	1.41	4.37	5	.0
September---	80.8	58.5	69.7	96	39	591	3.93	1.27	6.10	6	.0
October-----	69.9	47.3	58.6	89	26	285	3.76	1.40	5.72	6	.0
November----	55.6	35.2	45.4	77	11	43	3.06	1.20	4.60	5	1.5
December----	45.4	26.4	35.9	71	11	20	2.80	1.18	4.17	5	2.4
Yearly:											
Average----	66.8	45.2	56.0	---	---	---	---	---	---	---	---
Extreme----	---	---	---	101	11	---	---	---	---	---	---
Total------	---	---	---	---	---	4,167	40.32	32.17	47.98	70	15.2

* 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 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-84 at Marshfield, 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--	Apr. 9	Apr. 17	May 1
2 years in 10 later than--	Apr. 3	Apr. 12	Apr. 25
5 years in 10 later than--	Mar. 24	Apr. 4	Apr. 15
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 27	Oct. 18	Oct. 7
2 years in 10 earlier than--	Nov. 2	Oct. 23	Oct. 12
5 years in 10 earlier than--	Nov. 12	Nov. 1	Oct. 20

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-84 at Marshfield, 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	207	191	170
8 years in 10	216	198	176
5 years in 10	233	210	188
2 years in 10	249	223	199
1 year in 10	258	230	205

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
04C	Wilderness-Gepp very cherty silt loams, 2 to 9 percent slopes	41,060	10.8
05C	Noark-Scholten very cherty silt loams, 2 to 9 percent slopes	27,660	7.3
08B	Tonti silt loam, 2 to 5 percent slopes	36,150	9.5
09B	Captina-Needleye silt loams, 1 to 3 percent slopes	9,330	2.5
10	Bado silt loam	1,060	0.3
21B	Peridge silt loam, 2 to 5 percent slopes	5,450	1.4
23B	Hartville silt loam, 1 to 5 percent slopes	5,030	1.3
24F	Basehor fine sandy loam, 9 to 35 percent slopes, extremely bouldery	1,500	0.4
26F	Ocie-Gatewood-Gasconade complex, 5 to 35 percent slopes	4,860	1.3
32C2	Alsup cherty silt loam, 3 to 9 percent slopes, eroded	8,230	2.2
40F	Alsup-Noark complex, 9 to 35 percent slopes	31,180	8.2
42C	Gepp-Ocie very cherty silt loams, 3 to 9 percent slopes	8,320	2.2
42D	Gepp-Ocie very cherty silt loams, 9 to 14 percent slopes	23,120	6.1
42F	Gepp-Ocie very cherty silt loams, 14 to 35 percent slopes	14,950	3.9
43C	Noark very cherty silt loam, 3 to 9 percent slopes	2,550	0.7
43D	Noark very cherty silt loam, 9 to 14 percent slopes	7,710	2.0
43F	Noark very cherty silt loam, 14 to 35 percent slopes	25,780	6.8
44F	Ocie-Gepp-Gatewood cherty silt loams, 3 to 35 percent slopes, extremely stony	3,000	0.8
48C	Ocie-Gepp-Gatewood complex, 3 to 9 percent slopes	6,900	1.8
48D	Ocie-Gepp-Gatewood complex, 9 to 14 percent slopes	11,600	3.1
48F	Ocie-Gepp-Gatewood complex, 14 to 35 percent slopes	12,840	3.4
55A	Nolin silt loam, 0 to 3 percent slopes	4,280	1.1
57C	Britwater silt loam, 3 to 9 percent slopes	8,920	2.3
76A	Moniteau silt loam, 0 to 3 percent slopes	1,140	0.3
81B	Viraton silt loam, 2 to 5 percent slopes	35,970	9.5
82C	Hobson loam, 3 to 9 percent slopes	5,970	1.6
83F	Gasconade-Rock outcrop complex, 2 to 35 percent slopes	740	0.2
84	Pits, quarries	60	*
85	Udorthents, shallow	71	*
91B	Plato silt loam, 2 to 5 percent slopes	5,750	1.5
94A	Cedargap cherty silt loam, clayey substratum, 0 to 3 percent slopes	17,240	4.5
95A	Dameron silt loam, 0 to 3 percent slopes	11,560	3.0
	Total	379,981	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
09B	Captina-Needleye silt loams, 1 to 3 percent slopes
21B	Peridge silt loam, 2 to 5 percent slopes
23B	Hartville silt loam, 1 to 5 percent slopes
55A	Nolin silt loam, 0 to 3 percent slopes
76A	Moniteau silt loam, 0 to 3 percent slopes (where drained)
91B	Plato silt loam, 2 to 5 percent slopes
95A	Dameron silt loam, 0 to 3 percent slopes (where protected from flooding or not frequently flooded during the growing season)

TABLE 6.--LAND CAPABILITY CLASSES AND 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	Land capability	Corn silage	Sorghum hay	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue hay	Tall fescue (pasture)	Caucasian bluestem (pasture)
		Tons	Tons	Bu	Tons	Tons	Tons	Tons
04C------------- Wilderness-Gepp	IVe	5	3.0	25	3.0	2.0	2.0	4.0
05C------------- Noark-Scholten	IVe	5	3.5	30	3.5	2.0	2.0	4.5
08B------------- Tonti	IIIe	10	5.0	35	4.0	2.5	2.5	4.5
09B------------- Captina-Needleye	IIe	11	5.5	35	4.0	2.5	2.5	4.5
10-------------- Bado	IIIw	7	3.5	25	---	2.0	2.0	3.5
21B------------- Peridge	IIe	14	7.0	45	5.0	3.0	3.0	6.0
23B------------- Hartville	IIe	12	6.0	30	---	2.5	2.5	5.0
24F------------- Basehor	VIIs	---	---	---	---	---	1.0	1.5
26F------------- Ocie-Gatewood-Gasconade	VIIe	---	---	---	---	---	1.0	3.0
32C2------------ Alsup	IVe	10	5.5	30	3.5	2.5	2.5	5.0
40F------------- Alsup-Noark	VIIe	---	---	---	3.5	---	1.8	4.0
42C------------- Gepp-Ocie	IVe	7	4.0	30	3.5	2.0	2.0	4.5
42D------------- Gepp-Ocie	VIe	---	---	---	---	2.0	2.0	4.0
42F------------- Gepp-Ocie	VIIe	---	---	---	---	---	1.7	3.5
43C------------- Noark	IVe	5	3.5	30	3.5	2.0	2.0	4.5
43D------------- Noark	VIe	---	---	---	3.0	2.0	2.0	4.0
43F------------- Noark	VIIe	---	---	---	---	---	1.7	3.5
44F------------- Ocie-Gepp-Gatewood	VIIe	---	---	---	---	---	1.7	3.5

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn silage	Sorghum hay	Winter wheat	Orchard-grass-alfalfa hay	Tall fescue hay	Tall fescue (pasture)	Caucasian bluestem (pasture)
		Tons	Tons	Bu	Tons	Tons	Tons	Tons
48C------------- Ocie-Gepp-Gatewood	IVe	---	---	---	---	2.0	2.0	4.0
48D------------- Ocie-Gepp-Gatewood	VIe	---	---	---	---	2.0	2.0	3.5
48F------------- Ocie-Gepp-Gatewood	VIIe	---	---	---	---	---	1.5	3.0
55A------------- Nolin	IIw	16	8.0	50	6.0	3.0	3.0	8.0
57C------------- Britwater	IIIe	11	6.0	35	4.5	2.5	2.5	5.0
76A------------- Moniteau	IIIw	15	7.0	35	---	2.5	2.5	6.0
81B------------- Viraton	IIIe	10	5.0	35	4.0	2.5	2.5	4.5
82C------------- Hobson	IIIe	10	5.0	35	4.0	2.5	2.5	4.5
83F*------------ Gasconade-Rock outcrop	VIIs	---	---	---	---	---	0.5	1.5
84*. Pits								
85. Udorthents								
91B------------- Plato	IIe	11	5.0	30	3.5	2.5	2.5	4.5
94A------------- Cedargap	IIIw	10	5.0	35	4.5	2.5	2.5	5.0
95A------------- Dameron	IIw	12	6.0	45	5.0	3.0	3.0	6.0

* See description of the map unit for composition and behavior characteristics of the map unit.

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
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
04C**:									
Wilderness	3D	Slight	Slight	Moderate	Moderate	White oak	55	38	White oak, shortleaf pine, black oak.
						Black oak	---	---	
Gepp	3A	Slight	Slight	Slight	Slight	White oak	60	43	Black walnut, shortleaf pine, northern red oak.
						Black oak	70	52	
						Northern red oak	60	43	
05C**:									
Noark	3F	Slight	Slight	Moderate	Slight	Northern red oak	60	43	Shortleaf pine, northern red oak, black oak, white oak.
						White oak	60	43	
						Black oak	70	52	
Scholten	2D	Slight	Slight	Moderate	Moderate	Post oak	45	30	White oak, shortleaf pine, black oak.
						Black oak	45	30	
08B Tonti	3D	Slight	Slight	Slight	Moderate	Black oak	60	43	Black oak, white ash.
						Post oak	---	---	
09B**:									
Captina	3D	Slight	Slight	Slight	Moderate	Black oak	60	43	Black oak, white ash.
						Post oak	---	---	
						Blackjack oak	---	---	
Needleye	3D	Slight	Slight	Moderate	Moderate	Black oak	60	43	Black oak, pin oak, white ash.
						Post oak	---	---	
						Blackjack oak	---	---	
10 Bado	2W	Slight	Severe	Moderate	Moderate	Black oak	52	36	Black oak, pin oak, white ash, American sycamore.
						Post oak	50	34	
						Blackjack oak	---	---	
21B Peridge	3A	Slight	Slight	Slight	Slight	Northern red oak	60	43	Shortleaf pine, northern red oak, white ash.
						Black walnut	---	---	
						White oak	---	---	
23B Hartville	3C	Slight	Slight	Severe	Severe	White oak	55	38	Yellow poplar, white oak, pin oak.
24F Basehor	2R	Severe	Moderate	Moderate	Severe	White oak	35	23	Black oak, white oak, pin oak, hackberry.
						Hackberry	45	---	
						Northern red oak	40	26	
26F**:									
Ocie	3R	Moderate	Moderate	Slight	Slight	White oak	57	40	Shortleaf pine, northern red oak.
						Black oak	58	40	
						Northern red oak	---	---	

See footnotes 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
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
26F**:									
Gatewood	2R	Moderate	Moderate	Moderate	Slight	White oak	45	30	Eastern redcedar, shortleaf pine.
						Chinkapin oak	---	---	
						Eastern redcedar	---	---	
						Sugar maple	---	---	
						White ash	---	---	
Gasconade	2R	Slight	Moderate	Severe	Severe	Chinkapin oak	40	26	
						Eastern redcedar	30	---	
						White ash	---	---	
						Post oak	---	---	
						Blackjack oak	---	---	
32C2 Alsup	3A	Slight	Slight	Slight	Slight	Northern red oak	60	43	Northern red oak, white oak, black oak.
						White oak	---	---	
						Black oak	---	---	
40F**:									
Alsup	3R	Moderate	Moderate	Moderate	Slight	Northern red oak	60	43	Northern red oak, white oak, black oak.
						White oak	---	---	
						Black oak	---	---	
Noark	3R	Moderate	Moderate	Moderate	Slight	Northern red oak	60	43	Shortleaf pine, northern red oak, black oak, white oak.
						White oak	60	43	
						Black oak	70	52	
42C**, 42D**:									
Gepp	3A	Slight	Slight	Slight	Slight	White oak	60	43	Shortleaf pine, northern red oak.
						Black oak	70	52	
						Northern red oak	60	43	
Ocie	3A	Slight	Slight	Slight	Slight	White oak	57	40	Shortleaf pine, northern red oak.
						Black oak	58	41	
						Northern red oak	---	---	
42F**:									
Gepp	3R	Moderate	Moderate	Slight	Slight	White oak	66	43	Shortleaf pine, northern red oak.
						Black oak	70	52	
						Northern red oak	60	43	
Ocie	3R	Moderate	Moderate	Slight	Slight	White oak	57	40	Shortleaf pine, northern red oak.
						Black oak	58	41	
						Northern red oak	---	---	
43C, 43D Noark	3F	Slight	Slight	Moderate	Slight	Northern red oak	60	43	Shortleaf pine, northern red oak, black oak, white oak.
						White oak	60	43	
						Black oak	70	52	
43F Noark	3R	Moderate	Moderate	Moderate	Slight	Northern red oak	60	43	Shortleaf pine, northern red oak, black oak, white oak.
						White oak	60	43	
						Black oak	70	52	

See footnotes 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
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
44F**:									
Ocie-----------	3R	Moderate	Moderate	Slight	Slight	White oak-----------	57	40	Northern red oak, shortleaf pine.
						Black oak-----------	58	41	
						Northern red oak----	---	---	
Gepp-----------	3R	Moderate	Moderate	Slight	Slight	White oak-----------	60	43	Northern red oak, shortleaf pine.
						Black oak-----------	70	52	
						Northern red oak----	60	43	
Gatewood-------	2R	Moderate	Moderate	Slight	Moderate	White oak-----------	45	30	Northern red oak, shortleaf pine.
						Chinkapin oak-------	---	---	
						Eastern redcedar----	---	---	
						White ash-----------	---	---	
48C**, 48D**:									
Ocie-----------	3A	Slight	Slight	Slight	Slight	White oak-----------	57	40	Shortleaf pine, northern red oak.
						Black oak-----------	58	41	
						Northern red oak----	---	---	
Gepp-----------	3A	Slight	Slight	Slight	Slight	White oak-----------	60	43	Northern red oak, shortleaf pine.
						Black oak-----------	70	52	
						Northern red oak----	60	43	
Gatewood-------	2A	Slight	Slight	Moderate	Slight	White oak-----------	45	30	Eastern redcedar, shortleaf pine.
						Chinkapin oak-------	---	---	
						Eastern redcedar----	---	---	
						Sugar maple---------	---	---	
						White ash-----------	---	---	
48F**:									
Ocie-----------	3R	Moderate	Moderate	Slight	Slight	White oak-----------	57	40	Shortleaf pine, northern red oak.
						Black oak-----------	58	41	
						Northern red oak----	---	---	
Gepp-----------	3R	Moderate	Moderate	Slight	Slight	White oak-----------	60	43	Northern red oak, shortleaf pine.
						Black oak-----------	70	52	
						Northern red oak----	60	43	
Gatewood-------	2R	Moderate	Moderate	Moderate	Slight	White oak-----------	45	30	Eastern redcedar, shortleaf pine.
						Chinkapin oak-------	---	---	
						Eastern redcedar----	---	---	
						White ash-----------	---	---	
55A------------- Nolin	11A	Slight	Slight	Slight	Slight	Eastern cottonwood--	108	150	Yellow poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak, sweetgum, black walnut.
						Black walnut--------	---	---	
						American sycamore---	---	---	
						River birch---------	---	---	
57C------------- Britwater	3A	Slight	Slight	Slight	Slight	Northern red oak----	60	42	Shortleaf pine, northern red oak, white oak.
						Eastern redcedar----	50	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
76A------------ Moniteau	4W	Slight	Severe	Moderate	Moderate	Pin oak------------	70	52	White oak, pin oak, green ash, eastern cottonwood, silver maple, sweetgum.
81B------------ Viraton	3D	Slight	Slight	Moderate	Moderate	White oak-----------	55	38	White oak, black oak, shortleaf pine.
						Black oak-----------	60	43	
82C------------ Hobson	3D	Slight	Slight	Moderate	Moderate	White oak-----------	55	38	Shortleaf pine, white oak, black oak.
						Black oak-----------	60	43	
83F**:									
Gasconade------	2R	Slight	Moderate	Severe	Severe	Chinkapin oak-------	40	26	
						Eastern redcedar----	30	---	
						White ash-----------	---	---	
						Mockernut hickory---	---	---	
						Post oak------------	---	---	
						Blackjack oak-------	---	---	
Rock outcrop.									
91B------------ Plato	3D	Slight	Slight	Slight	Moderate	White oak-----------	55	38	Shortleaf pine, post oak, black oak.
						Black oak-----------	60	45	
94A------------ Cedargap	3F	Slight	Slight	Moderate	Slight	Black oak-----------	66	48	Black oak, shortleaf pine.
95A------------ Dameron	5A	Slight	Slight	Slight	Slight	Green ash-----------	70	66	Black walnut.
						Black walnut--------	72	---	
						American sycamore---	---	---	
						White oak-----------	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** 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 height, in feet, of--				
	<8	8-15	16-25	26-35	>35
04C*:					
Wilderness	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive	Honeylocust, Austrian pine, hackberry, eastern redcedar, green ash, bur oak, Russian olive.	Siberian elm	---
Gepp	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---
05C*:					
Noark	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---
Scholten	Lilac	Autumn olive, Manchurian crabapple, Amur honeysuckle, Amur maple.	Austrian pine, hackberry, eastern redcedar, green ash, Russian olive.	Honeylocust	---
08B Tonti	Lilac	Amur honeysuckle, Amur maple, autumn olive, Manchurian crabapple.	Russian olive, Austrian pine, eastern redcedar, hackberry, green ash.	Honeylocust	---
09B*:					
Captina	Lilac	Amur honeysuckle, Amur maple, autumn olive, Manchurian crabapple.	Russian olive, Austrian pine, eastern redcedar, hackberry, green ash.	Honeylocust	---
Needleye	Lilac	Amur honeysuckle, Amur maple, autumn olive, Manchurian crabapple.	Russian olive, Austrian pine, eastern redcedar, hackberry, green ash.	Honeylocust	---
10 Bado	Lilac	Manchurian crabapple, autumn olive, Amur honeysuckle, Amur maple.	Hackberry, Austrian pine, green ash, Russian olive, eastern redcedar.	Honeylocust	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
21B Peridge	---	Amur honeysuckle, lilac, Amur maple, autumn olive.	Eastern redcedar, Russian olive, hackberry.	Norway spruce, green ash, honeylocust, pin oak, eastern white pine.	---
23B Hartville	Lilac	Amur honeysuckle, Amur maple, autumn olive, Manchurian crabapple.	Austrian pine, hackberry, green ash, Russian olive, eastern redcedar.	Honeylocust	---
24F. Basehor					
26F*:					
Ocie	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---
Gatewood	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive	Russian olive, eastern redcedar, hackberry, bur oak, green ash, Austrian pine.	Honeylocust, Siberian elm.	---
Gasconade.					
32C2 Alsup	---	Amur maple, lilac, autumn olive, Amur honeysuckle.	Eastern redcedar, Russian olive, hackberry.	Eastern white pine, honeylocust, pin oak, green ash, Norway spruce.	---
40F*:					
Alsup	---	Amur maple, lilac, autumn olive, Amur honeysuckle.	Eastern redcedar, Russian olive, hackberry.	Eastern white pine, honeylocust, pin oak, green ash, Norway spruce.	---
Noark.					
42C*, 42D*, 42F*:					
Gepp	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
42C*, 42D*, 42F*:					
Ocie	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---
43C, 43D, 43F Noark	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive	Eastern redcedar, Austrian pine, honeylocust, hackberry, green ash, bur oak, Russian olive.	Siberian elm	---
44F*:					
Ocie	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---
Gepp	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---
Gatewood	Amur honeysuckle, fragrant sumac.	Autumn olive	Lilac, Russian olive, eastern redcedar, hackberry, bur oak, green ash, Austrian pine.	Honeylocust, Siberian elm.	---
48C*, 48D*, 48F*:					
Ocie	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---
Gepp	Lilac, Amur honeysuckle, fragrant sumac.	Autumn olive	Russian olive, green ash, honeylocust, bur oak, eastern redcedar, hackberry, Austrian pine.	Siberian elm	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
48C*, 48D*, 48F*: Gatewood	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive	Russian olive, eastern redcedar, hackberry, bur oak, green ash, Austrian pine.	Honeylocust, Siberian elm.	---
55A. Nolin	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, blue spruce, northern whitecedar, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
57C. Britwater	Amur honeysuckle, fragrant sumac, lilac.	Autumn olive	Russian olive, eastern redcedar, hackberry, bur oak, green ash, Austrian pine, honeylocust.	Siberian elm	---
76A. Moniteau	Redosier dogwood	American plum, common chokecherry.	Eastern redcedar, hackberry.	Norway spruce, green ash, golden willow, honeylocust, northern red oak, silver maple.	Eastern cottonwood.
81B. Viraton	Lilac	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn olive.	Eastern redcedar, Austrian pine, hackberry, green ash, Russian olive.	Honeylocust	---
82C. Hobson	Lilac	Amur honeysuckle, Amur maple, Manchurian crabapple, autumn olive.	Hackberry, Russian olive, Austrian pine, eastern redcedar, green ash.	Honeylocust	---
83F*: Gasconade.					
Rock outcrop.					
84*. Pits					
85. Udorthents					
91B. Plato	Lilac	Amur honeysuckle, Amur maple, autumn olive, Manchurian crabapple.	Russian olive, Austrian pine, eastern redcedar, hackberry, green ash.	Honeylocust	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
94A---------------- Cedargap	---	Amur honeysuckle, lilac, Amur maple, autumn olive.	Eastern redcedar	Hackberry, eastern white pine, Austrian pine, green ash, honeylocust, pin oak.	Eastern cottonwood.
95A---------------- Dameron	---	Amur honeysuckle, lilac, Amur maple, autumn olive.	Eastern redcedar	Austrian pine, hackberry, green ash, pin oak, honeylocust, eastern white pine.	Eastern cottonwood.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
04C*:					
Wilderness	Severe: wetness.	Moderate: wetness, small stones.	Severe: small stones, wetness.	Moderate: wetness.	Severe: droughty.
Gepp	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
05C*:					
Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
Scholten	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Severe: small stones, percs slowly.	Moderate: wetness.	Severe: small stones.
08B Tonti	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, small stones, wetness.	Severe: erodes easily.	Moderate: wetness, droughty.
09B*:					
Captina	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
Needleye	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
10 Bado	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
21B Peridge	Slight	Slight	Moderate: slope.	Slight	Slight.
23B Hartville	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
24F Basehor	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Moderate: large stones, slope.	Severe: large stones, slope, thin layer.
26F*:					
Ocie	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
Gatewood	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe: slope.

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
26F*:					
Gasconade	Severe: slope, thin layer.	Severe: slope, thin layer.	Severe: large stones, slope, thin layer.	Moderate: large stones, slope.	Severe: large stones, slope, thin layer.
32C2 Alsup	Moderate: small stones, percs slowly.	Moderate: small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: small stones.
40F*:					
Alsup	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: erodes easily.	Severe: slope.
Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
42C*, 42D*:					
Gepp	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
Ocie	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
42F*:					
Gepp	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
Ocie	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
43C, 43D Noark	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
43F Noark	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
44F*:					
Ocie	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Severe: slope.
Gepp	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Severe: slope.
Gatewood	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.	Severe: slope.

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
48C*:					
Ocie	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
Gepp	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
Gatewood	Moderate: large stones.	Moderate: large stones.	Severe: slope, large stones.	Slight	Moderate: small stones.
48D*:					
Ocie	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
Gepp	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
Gatewood	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope, large stones.	Slight	Moderate: small stones.
48F*:					
Ocie	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
Gepp	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
Gatewood	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe: slope.
55A Nolin	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
57C Britwater	Slight	Slight	Severe: slope.	Slight	Slight.
76A Moniteau	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
81B Viraton	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.
82C Hobson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness.
83F*:					
Gasconade	Severe: slope, thin layer.	Severe: slope, thin layer.	Severe: large stones, slope, thin layer.	Moderate: large stones, slope.	Severe: large stones, slope, 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
83F*: Rock outcrop.					
84*. Pits					
85. Udorthents					
91B-------------------- Plato	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
94A-------------------- Cedargap	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones, flooding.	Severe: small stones.	Severe: small stones, flooding.
95A-------------------- Dameron	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.

* 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
04C*:										
Wilderness	Poor	Poor	Very poor.	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
Gepp	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
05C*:										
Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Scholten	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
08B Tonti	Fair	Good	Good	Fair	Fair	Poor	Poor	Good	Fair	Very poor.
09B*:										
Captina	Good	Good	Good	Good	Good	Poor	Poor	Good	Poor	Poor.
Needleye	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
10 Bado	Fair	Fair	Good	Fair	Fair	Good	Fair	Fair	Fair	Fair.
21B Peridge	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
23B Hartville	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
24F Basehor	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
26F*:										
Ocie	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Gatewood	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
32C2 Alsup	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
40F*:										
Alsup	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Noark	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
42C*:										
Gepp	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ocie	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
42D*:										
Gepp	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ocie	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
42F*:										
Gepp	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ocie	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
43C, 43D Noark	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
43F Noark	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
44F*:										
Ocie	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gepp	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gatewood	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
48C*:										
Ocie	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Gepp	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gatewood	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
48D*:										
Ocie	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Gepp	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gatewood	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
48F*:										
Ocie	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	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 herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
48F*:										
Gepp	Very poor.	Poor	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gatewood	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
55A: Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
57C: Britwater	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
76A: Moniteau	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
81B: Viraton	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
82C: Hobson	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
83F*:										
Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
84*. Pits										
85. Udorthents										
91B: Plato	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
94A: Cedargap	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
95A: Dameron	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	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. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
04C*:						
Wilderness	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: droughty.
Gepp	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: small stones.
05C*:						
Noark	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Slight	Severe: small stones.
Scholten	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Severe: small stones.
08B Tonti	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
09B*:						
Captina	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Slight.
Needleye	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness, droughty.
10 Bado	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
21B Peridge	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
23B Hartville	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
24F Basehor	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, thin layer.
26F*:						
Ocie	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: small stones, slope.

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
26F*:						
Gatewood	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
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.
32C2 Alsup	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: small stones.
40F*:						
Alsup	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Noark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
42C*:						
Gepp	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: small stones.
Ocie	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: small stones.
42D*:						
Gepp	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Severe: small stones.
Ocie	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: small stones.
42F*:						
Gepp	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: small stones, slope.
Ocie	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: small stones, slope.
43C Noark	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Slight	Severe: small stones.
43D Noark	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones.

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
43F Noark	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
44F*:						
Ocie	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Gepp	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Gatewood	Severe: depth to rock, slope.	Severe: slope, shrink-swell.	Severe: depth to rock, shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
48C*:						
Ocie	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Severe: small stones.
Gepp	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Severe: small stones.
Gatewood	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: small stones.
48D*:						
Ocie	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Severe: small stones.
Gepp	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Severe: small stones.
Gatewood	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: small stones.
48F*:						
Ocie	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: small stones, slope.
Gepp	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: small stones, slope.
Gatewood	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.

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
55A--------------- Nolin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
57C--------------- Britwater	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
76A--------------- Moniteau	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
81B--------------- Viraton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: wetness.
82C--------------- Hobson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness.
83F*:						
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.
Rock outcrop.						
84*. Pits						
85. Udorthents						
91B--------------- Plato	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness, droughty.
94A--------------- Cedargap	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: small stones, flooding.
95A--------------- Dameron	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.

* 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," "poor," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
04C*:					
Wilderness	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, small stones.
Gepp	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
05C*:					
Noark	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, small stones.
Scholten	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack, small stones.
08B Tonti	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack, small stones.
09B*:					
Captina	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, small stones.
Needleye	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, small stones, hard to pack.
10 Bado	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness, small stones.
21B Peridge	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
23B Hartville	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: flooding, wetness.	Poor: too clayey, hard to pack.
24F Basehor	Severe: thin layer, seepage, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, large stones, slope.

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
26F*:					
Ocie	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Gatewood	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, slope, seepage.	Severe: slope.	Poor: area reclaim, too clayey, hard to pack.
Gasconade	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, too clayey, large stones.
32C2 Alsup	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness.	Poor: too clayey, hard to pack.
40F*:					
Alsup	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Noark	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
42C*:					
Gepp	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Ocie	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
42D*:					
Gepp	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Ocie	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
42F*:					
Gepp	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Ocie	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.

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
43C----------------- Noark	Moderate: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, small stones.
43D----------------- Noark	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.
43F----------------- Noark	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
44F*:					
Ocie---------------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, small stones.
Gepp---------------	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Gatewood-----------	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Severe: slope.	Poor: area reclaim, too clayey, hard to pack.
48C*:					
Ocie---------------	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Gepp---------------	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
Gatewood-----------	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Moderate: seepage.	Poor: area reclaim, too clayey, hard to pack.
48D*:					
Ocie---------------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Gepp---------------	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Gatewood-----------	Severe: thin layer, seepage, percs slowly.	Severe: slope.	Severe: depth to rock, seepage.	Moderate: seepage, slope.	Poor: area reclaim, too clayey, hard to pack.

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
48F*:					
Ocie	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Gepp	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Gatewood	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, slope, seepage.	Severe: slope.	Poor: area reclaim, too clayey, hard to pack.
55A Nolin	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey.
57C Britwater	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
76A Moniteau	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
81B Viraton	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, small stones.
82C Hobson	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, small stones.
83F*:					
Gasconade	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, too clayey, large stones.
Rock outcrop.					
91B Plato	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
94A Cedargap	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, small stones.
95A Dameron	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: 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," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
04C*:				
Wilderness	Fair: large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Gepp	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
05C*:				
Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Scholten	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
08B Tonti	Fair: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
09B*:				
Captina	Fair: wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Needleye	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
10 Bado	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
21B Peridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
23B Hartville	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
24F Basehor	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, thin layer.
26F*:				
Ocie	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
26F*:				
Gatewood	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Gasconade	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, thin layer.
32C2 Alsup	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, area reclaim, small stones.
40F*:				
Alsup	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, area reclaim, small stones.
Noark	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
42C*, 42D*:				
Gepp	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Ocie	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
42F*:				
Gepp	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Ocie	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
43C, 43D Noark	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
43F Noark	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
44F*:				
Ocie	Poor: shrink-swell, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
44F*:				
Gepp	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Gatewood	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, slope.
48C*, 48D*:				
Ocie	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Gepp	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Gatewood	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
48F*:				
Ocie	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
Gepp	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Gatewood	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, slope.
55A Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
57C Britwater	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
76A Moniteau	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
81B Viraton	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
82C Hobson	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
83F*:				
Gasconade	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, thin layer.
Rock outcrop.				
84*. Pits				
85. Udorthents				
91B Plato	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
94A Cedargap	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
95A Dameron	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
04C*:						
Wilderness	Moderate: slope, seepage.	Moderate: large stones, wetness.	Large stones, slope, percs slowly.	Slope, large stones, wetness.	Large stones, wetness, rooting depth.	Large stones, wetness, rooting depth.
Gepp	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Droughty, slope.	Favorable	Droughty.
05C*:						
Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Favorable	Droughty.
Scholten	Severe: seepage.	Severe: seepage.	Percs slowly, large stones, slope.	Slope, wetness, droughty.	Large stones, wetness.	Large stones, droughty.
08B Tonti	Moderate: seepage, slope.	Severe: hard to pack.	Percs slowly, slope.	Wetness, droughty, percs slowly.	Large stones, erodes easily.	Large stones, erodes easily.
09B*:						
Captina	Moderate: seepage.	Moderate: piping, wetness.	Percs slowly	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Needleye	Moderate: seepage.	Severe: hard to pack.	Percs slowly	Wetness, droughty, percs slowly.	Erodes easily, wetness, rooting depth.	Erodes easily, droughty, rooting depth.
10 Bado	Moderate: seepage.	Severe: thin layer, wetness.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Wetness, erodes easily, rooting depth.	Wetness, erodes easily, rooting depth.
21B Peridge	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
23B Hartville	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
24F Basehor	Severe: depth to rock, seepage, slope.	Severe: piping, large stones, thin layer.	Deep to water	Slope, large stones, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
26F*:						
Ocie	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones.	Large stones, slope.
Gatewood	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
26F*: Gasconade	Severe: depth to rock, seepage, slope.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
32C2 Alsup	Moderate: seepage, slope.	Moderate: thin layer, hard to pack, wetness.	Slope	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
40F*: Alsup	Severe: slope.	Moderate: thin layer, hard to pack, wetness.	Slope	Slope, wetness.	Slope, erodes easily, wetness.	Slope, erodes easily.
Noark	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
42C*: Gepp	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Droughty, slope.	Favorable	Droughty.
Ocie	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Slope, droughty, percs slowly.	Large stones	Large stones.
42D*, 42F*: Gepp	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, slope.	Slope	Slope, droughty.
Ocie	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones.	Large stones, slope.
43C Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Favorable	Droughty.
43D Noark	Moderate: seepage.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
43F Noark	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
44F*: Ocie	Severe: slope.	Severe: thin layer.	Deep to water	Slope, droughty, percs slowly.	Slope, percs slowly.	Slope, droughty, percs slowly.
Gepp	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, droughty.	Slope	Slope, droughty.
Gatewood	Severe: depth to rock, seepage, slope.	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, area reclaim.	Slope, large stones, depth to rock.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
48C*:						
Ocie	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Slope, droughty, percs slowly.	Large stones	Large stones.
Gepp	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Droughty, slope.	Favorable	Droughty.
Gatewood	Moderate: depth to rock, seepage, slope.	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Large stones, depth to rock.	Large stones, depth to rock.
48D*, 48F*:						
Ocie	Severe: slope.	Moderate: thin layer, hard to pack, large stones.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones.	Large stones, slope.
Gepp	Severe: slope.	Severe: hard to pack.	Deep to water	Droughty, slope.	Slope	Slope, droughty.
Gatewood	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
55A Nolin	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
57C Britwater	Moderate: seepage.	Slight	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
76A Moniteau	Slight	Severe: wetness.	Flooding, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
81B Viraton	Moderate: seepage, slope.	Moderate: piping, wetness.	Percs slowly, slope.	Slope, wetness, droughty.	Erodes easily, wetness.	Erodes easily, droughty.
82C Hobson	Moderate: seepage, slope.	Moderate: wetness.	Percs slowly, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily, rooting depth.
83F*:						
Gasconade	Severe: depth to rock, seepage, slope.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
84*. Pits						
85. Udorthents						

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
91B----------------- Plato	Moderate: seepage, slope.	Severe: thin layer.	Percs slowly, slope.	Slope, wetness, droughty.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, droughty.
94A----------------- Cedargap	Moderate: seepage.	Slight---------	Deep to water	Droughty, flooding.	Favorable------	Droughty.
95A----------------- Dameron	Moderate: seepage.	Slight---------	Deep to water	Flooding-------	Favorable-------	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
04C*:											
Wilderness	0-9	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
	9-20	Very cherty silty clay loam, extremely cherty silty clay 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
	20-30	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
	30-60	Very cherty silty clay, very cherty clay, extremely cherty silty clay.	GC, GP-GC	A-2-6	10-40	30-60	10-45	10-40	5-35	25-40	15-25
Gepp	0-9	Very cherty silt loam.	GM, GC, SM-SC, SM	A-1, A-2	10-30	30-70	20-50	10-40	5-20	<30	NP-10
	9-15	Cherty silty clay loam, cherty silt loam, silty clay loam.	CL	A-6, A-4	0-15	65-100	65-100	55-95	51-90	25-40	8-20
	15-60	Clay, cherty clay	MH, CH	A-7	0-15	70-100	70-100	65-100	60-95	51-75	25-40
05C*:											
Noark	0-12	Very cherty silt loam.	GM	A-2, A-1, A-4	0-10	20-50	25-50	25-50	20-45	<20	NP-3
	12-21	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0-10	20-50	25-50	25-50	20-45	20-35	5-15
	21-30	Very cherty clay, very cherty silty clay.	GC	A-2, A-7	0-10	20-50	25-50	25-50	25-45	41-60	20-35
	30-60	Very cherty clay, extremely gravelly clay, very gravelly silty clay.	GC, GM-GC, GP-GC	A-2, A-7	0-15	10-50	10-50	10-50	10-45	41-60	20-35
Scholten	0-11	Very cherty silt loam.	GM-GC, GC, CL-ML, CL	A-4, A-2, A-6	0-10	45-80	40-75	40-75	30-70	18-30	4-16
	11-23	Very cherty silty clay loam, extremely cherty silty clay loam.	GC, CL, SC	A-2, A-6	0-15	30-75	25-65	25-65	25-65	30-40	11-20
	23-32	Extremely cherty silty clay loam, very cherty silt loam.	GC, CL	A-2, A-6, A-4	10-40	20-65	20-60	20-60	20-55	25-40	8-15
	32-60	Cherty clay, very cherty clay, extremely cherty silty clay.	GC, CL, CH, GM	A-2, A-7	10-40	20-65	20-60	20-60	15-55	45-80	20-40

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	
08B----------------- Tonti	0-9	Silt loam--------	CL-ML, CL	A-4	0-5	80-95	75-95	70-90	60-85	15-30	4-10
	9-23	Cherty silty clay loam, cherty silt loam.	CL-ML, CL	A-4, A-6	0-5	55-80	50-75	45-75	45-70	25-40	6-15
	23-40	Cherty silt loam, very cherty silt loam, very cherty silty clay loam.	GC, CL-ML, CL	A-2, A-4, A-6	5-35	35-75	30-70	25-65	20-60	25-40	6-15
	40-60	Extremely cherty silty clay, very cherty clay, very cherty silty clay.	GC, CL, CH	A-2, A-7	5-15	30-70	25-65	25-60	20-55	40-70	15-45
09B*: Captina----------	0-7	Silt loam--------	CL-ML, CL	A-4	0	95-100	90-100	85-100	75-90	25-40	4-10
	7-24	Silt loam, silty clay loam.	CL	A-4, A-6, A-7	0	95-100	90-100	85-100	80-95	30-45	8-25
	24-31	Silt loam, silty clay loam, cherty silty clay loam.	CL	A-4, A-6, A-7	0-5	60-95	55-95	55-95	55-90	30-45	8-25
	31-60	Very cherty silty clay loam, cherty silt loam, very cherty silt loam.	GC, CL	A-4, A-6, A-7	0-15	30-75	30-75	30-75	25-70	30-50	5-30
Needleye---------	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	95-100	90-100	85-100	80-90	25-35	4-12
	6-26	Silt loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	80-95	35-45	11-20
	26-50	Cherty silty clay loam, silty clay loam.	CL, SC, GC	A-6, A-7	0-5	65-75	60-100	55-75	45-55	35-45	11-20
	50-60	Extremely cherty silty clay loam, extremely cherty silt loam.	GC, SC, CL	A-2, A-4, A-6	5-25	30-75	25-65	20-65	20-60	25-35	8-15
10----------------- Bado	0-9	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	90-100	75-95	25-35	5-15
	9-17	Silty clay loam	CL, CH	A-7	0	95-100	95-100	90-100	80-100	45-55	20-30
	17-35	Clay, silty clay	CH	A-7	0	90-100	85-100	80-100	75-100	50-70	30-45
	35-50	Silty clay loam, silt loam, cherty silty clay loam.	CL, GC, SC	A-6, A-7	0-5	50-90	45-90	45-90	40-85	30-45	15-30
	50-60	Extremely cherty silty clay loam, very cherty silty clay loam.	CL, GC	A-6, A-7, A-2-6, A-2-7	0-20	30-60	25-60	25-60	20-55	30-45	15-30
	60-66	Very cherty silty clay, extremely cherty silty clay.	CH, GC	A-7, A-2-7	10-40	40-60	35-60	35-60	30-60	55-70	35-45

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
21B-------------- Peridge	0-10	Silt loam--------	ML, CL-ML	A-4	0	95-100	90-100	85-100	70-90	<20	NP-5
	10-52	Silty clay loam, silt loam.	CL	A-6	0	95-100	90-100	85-95	70-95	30-40	11-20
	52-60	Gravelly silty clay loam, silty clay loam.	CL	A-6	0	55-100	50-100	50-95	50-90	30-40	11-20
23B-------------- Hartville	0-13	Silt loam--------	ML, CL	A-4, A-6	0-5	95-100	95-100	80-95	70-90	30-40	7-15
	13-19	Silt loam, silty clay loam.	CL	A-6, A-7	0-10	95-100	95-100	90-98	85-95	35-45	20-25
	19-60	Silty clay, clay, silty clay loam.	CH	A-7	0-10	95-100	95-100	90-98	85-95	50-60	30-40
24F-------------- Basehor	0-17	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	5-40	80-100	75-95	70-90	40-75	<25	NP-6
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
26F*:											
Ocie------------	0-13	Cherty silt loam	CL-ML, CL, SC, SM-SC	A-4, A-1, A-2	0-15	40-75	40-70	30-65	20-60	<25	4-10
	13-19	Very cherty silt loam, very cherty loam, extremely cherty silt loam.	GC, GM-GC	A-2-4, A-2-6, A-1-b	5-20	40-55	20-50	20-45	15-35	20-30	5-15
	19-45	Cherty clay, clay, silty clay.	CH	A-7	0-15	70-95	65-90	65-90	60-80	50-70	30-40
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gatewood--------	0-8	Very cherty silt loam.	SC, GC	A-4, A-6, A-2	15-30	30-80	20-70	15-65	10-60	25-35	7-15
	8-30	Cherty silty clay, cherty clay, clay.	CH	A-7	0-10	80-95	60-90	55-90	50-85	55-75	30-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gasconade-------	0-8	Flaggy silty clay loam.	CL	A-6	20-50	75-90	70-85	60-75	55-65	30-40	15-25
	8-14	Flaggy silty clay, flaggy clay, very flaggy silty clay.	GC	A-2-7	20-70	45-55	40-50	30-40	20-35	55-65	35-45
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
32C2------------- Alsup	0-4	Cherty silt loam	CL	A-6	5-10	70-85	60-75	50-70	50-65	30-40	10-15
	4-16	Silty clay loam, silty clay.	CL	A-7	0-15	90-100	85-100	85-100	85-100	40-50	20-30
	16-50	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-15	90-100	85-100	85-100	85-100	40-60	25-40
	50-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

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	
40F*:											
Alsup	0-6	Cherty silt loam	CL	A-6	5-10	70-85	60-75	50-70	50-65	30-40	10-15
	6-18	Silty clay loam, silty clay.	CL	A-7	0-15	90-100	85-100	85-100	85-100	40-50	20-30
	18-40	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-15	90-100	85-100	85-100	85-100	40-60	25-40
	40-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Noark	0-12	Very cherty silt loam.	GM	A-2, A-1, A-4	0-10	20-50	25-50	25-50	20-45	<20	NP-3
	12-16	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0-10	20-50	25-50	25-50	20-45	20-35	5-15
	16-41	Very cherty clay, very cherty silty clay.	GC	A-2, A-7	0-10	20-50	25-50	25-50	25-45	41-60	20-35
	41-60	Very cherty clay, extremely gravelly clay, very gravelly silty clay.	GC, GM-GC, GP-GC	A-2, A-7	0-15	10-50	10-50	10-50	10-45	41-60	20-35
42C*, 42D*, 42F*:											
Gepp	0-7	Very cherty silt loam.	GM, GC, SM-SC, SM	A-1, A-2	10-30	30-70	20-50	10-40	5-20	<30	NP-10
	7-12	Cherty silty clay loam, cherty silt loam, silty clay loam.	CL	A-6, A-4	0-15	65-100	65-100	55-95	51-90	25-40	8-20
	12-32	Clay	MH, CH	A-7	0-5	90-100	90-100	85-100	80-95	51-75	25-40
	32-60	Clay, cherty clay	MH, CH	A-7	0-15	70-100	70-100	65-100	60-95	51-75	25-40
Ocie	0-10	Very cherty silt loam.	CL-ML, CL, SC, SM-SC	A-4, A-1, A-2	0-15	40-75	40-70	30-65	20-60	<25	4-10
	10-18	Very cherty silty clay loam, very cherty clay loam.	GC	A-2, A-6, A-7	10-30	40-55	20-50	20-45	15-40	35-50	15-30
	18-56	Cherty clay, clay, silty clay.	CH	A-7	0-15	70-95	65-90	65-90	60-80	50-70	30-40
	56	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
43C, 43D, 43F Noark	0-17	Very cherty silt loam.	GM	A-2, A-1, A-4	0-10	20-50	25-50	25-50	20-45	<20	NP-3
	17-24	Very cherty silt loam, very cherty silty clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1	0-10	20-50	25-50	25-50	20-45	20-35	5-15
	24-60	Very cherty clay, extremely gravelly clay, very gravelly silty clay.	GC, GM-GC, GP-GC	A-2, A-7	0-15	10-50	10-50	10-50	10-45	41-60	20-35

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	
44F*:											
Ocie-------------	0-4	Cherty silt loam	CL-ML, CL, GC, GM-GC	A-4	5-10	55-75	55-75	55-70	45-65	<25	4-10
	4-17	Cherty silt loam	CL-ML, CL, GC, GM-GC	A-4	0-10	55-75	55-75	55-70	45-65	<25	4-10
	17-27	Very cherty silty clay loam, very cherty silt loam.	GC, GM-GC	A-2, A-4, A-6	5-20	35-50	30-50	25-45	25-40	20-30	5-15
	27-45	Clay, cherty clay	CH	A-7	0-15	55-85	55-85	55-80	50-75	50-70	30-40
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gepp-------------	0-3	Cherty silt loam	CL-ML, CL, GM-GC, GC	A-4	10-25	45-70	40-70	45-65	35-60	<25	4-10
	3-10	Very cherty silt loam, cherty silt loam.	GC, GM-GC	A-2, A-4	0-15	30-50	30-50	25-45	25-40	<25	4-10
	10-16	Clay-------------	CH	A-7	0-10	80-95	75-95	70-95	65-95	51-70	25-40
	16-60	Cherty clay, clay	CH	A-7	0-5	65-85	65-85	60-80	50-75	51-70	25-40
Gatewood---------	0-7	Cherty silt loam	CL, CL-ML	A-4, A-6	5-30	90-100	85-100	75-100	60-95	20-35	5-15
	7-29	Cherty silty clay, cherty clay, clay.	CH, SC	A-7	5-30	80-95	50-90	40-85	40-85	55-75	30-45
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
48C*, 48D*, 48F*:											
Ocie-------------	0-7	Cherty silt loam	CL-ML, CL, SC, SM-SC	A-4, A-1, A-2	0-15	40-75	40-70	30-65	20-60	<25	4-10
	7-14	Very cherty silty clay loam, very cherty clay loam.	GC	A-2, A-6, A-7	10-30	40-55	20-50	20-45	15-40	35-50	15-30
	14-48	Cherty clay, clay, silty clay.	CH	A-7	0-15	70-95	65-90	65-90	60-80	50-70	30-40
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gepp-------------	0-7	Cherty silt loam	GM, GC, ML, CL	A-2, A-4	10-25	45-75	45-75	35-65	25-55	<30	NP-10
	7-15	Cherty silty clay loam, cherty silt loam, silty clay loam.	CL	A-6, A-4	0-15	65-100	65-100	55-95	51-90	25-40	8-20
	15-60	Clay-------------	MH, CH	A-7	0-5	90-100	90-100	85-100	80-95	51-75	25-40
Gatewood---------	0-7	Very cherty silt loam.	SC, GC	A-4, A-6, A-2	15-30	30-80	20-70	15-65	10-60	25-35	7-15
	7-27	Cherty silty clay, cherty clay, clay.	CH	A-7	0-10	80-95	60-90	55-90	50-85	55-75	30-45
	27-30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
55A-------------- Nolin	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
57C---------------- Britwater	0-10	Silt loam--------	ML, CL-ML	A-4	0	70-100	75-100	70-95	50-85	<25	NP-7
	10-24	Gravelly silty clay loam, gravelly clay loam, silty clay loam.	CL, GC, SC	A-6, A-4	0	50-95	50-95	50-90	40-80	25-40	8-18
	24-42	Very gravelly silty clay loam, very gravelly clay loam, gravelly silty clay.	GC, SC, CL	A-2, A-6, A-4	0-5	40-80	25-75	40-75	30-70	25-40	8-18
	42-60	Very gravelly silty clay, very gravelly clay, very gravelly clay loam.	GC, SC, CL	A-2, A-6, A-7, A-4	0-5	25-75	25-75	25-75	20-75	35-50	15-30
76A---------------- Moniteau	0-24	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	24-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	85-100	80-95	30-45	15-25
81B---------------- Viraton	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	90-100	75-100	70-95	60-75	20-30	5-11
	6-21	Silt loam, silty clay loam, cherty silty clay loam.	CL, GC, SC	A-4, A-6	0-5	55-100	50-100	50-95	45-75	25-35	8-15
	21-33	Very cherty silt loam, very cherty silty clay loam.	GC, CL, SC	A-2, A-4, A-6	0-15	25-70	20-70	20-65	20-55	25-35	8-15
	33-60	Very cherty silty clay, cherty silty clay, cherty clay.	GC, CL, SC	A-2, A-6, A-7	0-10	40-90	35-90	35-85	30-75	30-50	11-25
82C---------------- Hobson	0-6	Loam-------------	CL, CL-ML	A-4, A-6	0	90-100	90-100	70-100	65-90	20-30	5-12
	6-21	Sandy clay loam, clay loam, loam.	CL, SC	A-4, A-6	0	85-100	85-100	70-95	35-75	25-40	8-15
	21-26	Cherty clay loam, clay loam, fine sandy loam.	GM-GC, GC, CL, SM-SC	A-2, A-4, A-6, A-1	0-10	45-90	45-90	25-80	20-70	20-35	4-15
	26-40	Very cherty sandy clay loam, very cherty clay loam, very cherty loam.	GC, GM-GC, GP-GC	A-2, A-1	0-10	15-50	15-50	15-40	12-35	25-40	5-15
	40-60	Cherty clay, cherty clay loam, cherty sandy clay loam.	GC, GP-GC	A-2	0-10	20-50	20-50	20-45	12-35	35-65	11-35

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	
83F*:											
Gasconade-------	0-7	Flaggy silty clay loam.	CL	A-6	20-50	75-90	70-85	60-75	55-65	30-40	15-25
	7-14	Flaggy silty clay, flaggy clay, very flaggy silty clay.	GC	A-2-7	20-70	45-55	40-50	30-40	20-35	55-65	35-45
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
84*. Pits											
85. Udorthents											
91B------------- Plato	0-6	Silt loam--------	CL-ML, ML	A-4	0-5	100	95-100	90-100	70-90	<25	NP-6
	6-24	Silty clay loam, silty clay, clay.	CL, CH	A-7	0-5	85-100	80-100	75-95	65-85	40-55	20-35
	24-53	Silt loam, cherty silty clay loam, cherty silt loam.	CL, SC, GC	A-2, A-6, A-7	0-10	55-90	30-85	25-80	20-65	35-45	15-20
	53-60	Very cherty clay, cherty clay, cherty silty clay loam.	CL, CH, GC, SC	A-7	0-5	40-75	40-70	35-70	35-65	45-60	30-45
94A------------- Cedargap	0-6	Cherty silt loam	GM, GC, SM-SC	A-1, A-2-4, A-4	0-10	40-85	30-75	20-60	15-50	20-30	3-10
	6-19	Very cherty silty clay loam, very cherty silt loam.	GC, GM-GC	A-2, A-4, A-1-b, A-6	0-10	30-55	25-50	20-45	15-45	25-35	5-12
	19-34	Extremely cherty silty clay loam, extremely cherty silt loam.	GC, GP-GC	A-2-4, A-2-6	5-15	20-25	15-25	15-25	10-25	30-40	8-18
	34-60	Extremely cherty silty clay, very cherty silty clay, very cherty clay.	GC, GP-GC	A-2-7, A-7-6	5-15	20-50	15-45	15-45	10-40	40-50	15-25
95A------------- Dameron	0-35	Silt loam--------	CL	A-6	0-1	95-100	90-100	85-100	80-95	25-40	10-20
	35-60	Very cherty silty clay loam, cherty silty clay loam.	GC, SC, CL	A-2-6, A-6	5-15	35-75	25-70	25-70	20-65	30-40	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 "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 K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
04C*:										
Wilderness------	0-9	18-27	1.20-1.45	2.0-6.0	0.07-0.12	4.5-6.5	Low----------	0.28	2	.5-2
	9-20	25-35	1.30-1.50	0.6-2.0	0.03-0.10	4.5-6.0	Low----------	0.28		
	20-30	20-35	1.70-2.00	0.06-0.2	0.01-0.05	3.6-5.5	Low----------	0.28		
	30-60	40-70	1.50-1.70	0.6-2.0	0.02-0.06	4.5-6.0	Moderate-----	0.28		
Gepp------------	0-9	10-25	1.25-1.45	0.6-2.0	0.06-0.12	5.1-6.5	Low----------	0.24	4	.5-2
	9-15	25-40	1.20-1.40	0.6-2.0	0.10-0.22	4.5-6.0	Low----------	0.28		
	15-60	65-85	1.15-1.30	0.6-2.0	0.08-0.18	5.1-6.5	Moderate-----	0.28		
05C*:										
Noark-----------	0-12	10-25	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.28	3	1-3
	12-21	20-40	1.30-1.50	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.28		
	21-30	45-75	1.20-1.50	0.6-2.0	0.09-0.13	3.6-5.5	Low----------	0.24		
	30-60	45-75	1.15-1.45	0.6-2.0	0.06-0.09	3.6-5.5	Low----------	0.24		
Scholten--------	0-11	12-27	1.20-1.40	2.0-6.0	0.10-0.19	4.5-7.3	Low----------	0.28	2	.5-2
	11-23	27-40	1.30-1.50	0.6-2.0	0.07-0.14	3.6-6.0	Low----------	0.32		
	23-32	20-35	1.60-1.90	<0.06	0.01-0.05	3.6-5.0	Moderate-----	0.32		
	32-60	40-80	1.30-1.60	2.0-6.0	0.02-0.06	3.6-5.0	Moderate-----	0.20		
08B-------------	0-9	10-25	1.30-1.50	0.6-2.0	0.15-0.20	5.6-6.5	Low----------	0.37	3	1-3
Tonti	9-23	20-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-6.0	Low----------	0.32		
	23-40	18-35	1.60-1.90	0.06-0.2	0.02-0.08	3.6-5.0	Low----------	0.28		
	40-60	40-80	1.20-1.40	0.6-2.0	0.05-0.10	3.6-5.0	Moderate-----	0.32		
09B*:										
Captina---------	0-7	15-24	1.30-1.50	0.6-2.0	0.22-0.24	4.5-6.5	Low----------	0.43	3	1-3
	7-24	20-40	1.30-1.50	0.6-2.0	0.18-0.22	3.6-5.5	Low----------	0.43		
	24-31	20-35	1.60-1.90	0.06-0.2	0.04-0.10	3.6-5.5	Low----------	0.37		
	31-60	20-35	1.60-1.90	0.06-0.2	0.02-0.08	3.6-5.5	Low----------	0.32		
Needleye--------	0-6	15-25	1.20-1.40	0.6-2.0	0.18-0.24	4.5-7.3	Low----------	0.37	4	.5-2
	6-26	25-35	1.25-1.45	0.2-0.6	0.12-0.20	3.6-5.5	Low----------	0.37		
	26-50	27-40	1.60-1.90	<0.06	0.08-0.12	3.6-5.5	Low----------	0.37		
	50-60	20-30	1.60-1.90	<0.06	0.02-0.06	3.6-5.5	Low----------	0.20		
10--------------	0-9	15-25	1.20-1.40	0.6-2.0	0.22-0.24	3.6-6.0	Low----------	0.43	3	.5-2
Bado	9-17	30-40	1.30-1.50	0.2-0.6	0.18-0.20	3.6-5.5	Moderate-----	0.43		
	17-35	40-55	1.30-1.50	0.06-0.2	0.09-0.13	3.6-5.5	High---------	0.32		
	35-50	25-35	1.50-1.70	<0.06	0.05-0.10	3.6-5.5	Moderate-----	0.43		
	50-60	27-35	1.50-1.70	<0.06	0.05-0.10	3.6-5.5	Moderate-----	0.10		
	60-66	40-70	1.30-1.50	0.6-2.0	0.06-0.10	3.6-6.0	Moderate-----	0.10		
21B-------------	0-10	10-20	1.35-1.45	0.6-2.0	0.16-0.24	4.5-7.3	Low----------	0.37	5	1-3
Peridge	10-52	18-35	1.30-1.45	0.6-2.0	0.16-0.24	4.5-6.5	Low----------	0.32		
	52-60	30-40	1.30-1.45	0.6-2.0	0.10-0.22	4.5-6.0	Low----------	0.28		
23B-------------	0-13	20-27	1.10-1.30	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	1-3
Hartville	13-19	24-40	1.20-1.40	0.06-0.2	0.18-0.21	4.5-6.0	Moderate-----	0.43		
	19-60	35-60	1.20-1.50	0.06-0.2	0.10-0.12	4.5-6.5	High---------	0.32		
24F-------------	0-17	8-15	1.30-1.45	2.0-6.0	0.13-0.18	5.1-6.5	Low----------	0.24	2	<2
Basehor	17	---	---	---	---	---	-------------	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
26F*:										
Ocie------------	0-13	10-20	1.10-1.40	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.32	3	.5-2
	13-19	15-27	1.10-1.35	0.6-2.0	0.12-0.15	4.5-6.0	Low----------	0.32		
	19-45	50-80	1.10-1.30	0.06-0.2	0.07-0.10	5.1-7.3	High---------	0.32		
	45	---	---	---	---	---	-------------	----		
Gatewood--------	0-8	15-25	1.10-1.40	0.6-2.0	0.06-0.12	5.1-7.3	Low----------	0.28	3	.5-2
	8-30	60-85	1.10-1.30	0.06-0.2	0.09-0.12	5.1-7.3	High---------	0.32		
	30	---	---	---	---	---	-------------	----		
Gasconade-------	0-8	35-40	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate-----	0.20	2	2-4
	8-14	35-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20		
	14	---	---	---	---	---	-------------	----		
32C2------------ Alsup	0-4	20-27	1.20-1.40	0.6-2.0	0.12-0.16	5.1-7.3	Low----------	0.28	5	.5-2
	4-16	35-45	1.20-1.50	0.2-0.6	0.12-0.17	4.5-6.0	Moderate-----	0.37		
	16-50	35-50	1.30-1.50	0.2-0.6	0.10-0.17	3.6-6.0	High---------	0.37		
	50-60	---	---	---	---	---	-------------	----		
40F*:										
Alsup-----------	0-6	20-27	1.20-1.40	0.6-2.0	0.12-0.16	5.1-7.3	Low----------	0.28	5	.5-2
	6-18	35-45	1.20-1.50	0.2-0.6	0.12-0.17	4.5-6.0	Moderate-----	0.37		
	18-40	35-50	1.30-1.50	0.2-0.6	0.10-0.17	3.6-6.0	High---------	0.37		
	40-60	---	---	---	---	---	-------------	----		
Noark-----------	0-12	10-25	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.28	3	1-3
	12-16	20-40	1.30-1.50	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.28		
	16-41	45-75	1.20-1.50	0.6-2.0	0.09-0.13	3.6-5.5	Low----------	0.24		
	41-60	45-75	1.15-1.45	0.6-2.0	0.06-0.09	3.6-5.5	Low----------	0.24		
42C*, 42D*, 42F*:										
Gepp------------	0-7	10-25	1.25-1.45	0.6-2.0	0.06-0.12	5.1-6.5	Low----------	0.24	4	.5-2
	7-12	25-40	1.20-1.40	0.6-2.0	0.10-0.22	4.5-6.0	Low----------	0.28		
	12-32	65-85	1.15-1.30	0.6-2.0	0.10-0.18	4.5-6.0	Moderate-----	0.28		
	32-60	65-85	1.15-1.30	0.6-2.0	0.08-0.18	5.1-6.5	Moderate-----	0.28		
Ocie------------	0-10	10-20	1.10-1.40	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.32	3	.5-2
	10-18	25-35	1.10-1.30	0.2-0.6	0.09-0.12	4.5-6.0	Moderate-----	0.32		
	18-56	50-80	1.10-1.30	0.06-0.2	0.07-0.10	5.1-7.3	High---------	0.32		
	56	---	---	---	---	---	-------------	----		
43C, 43D, 43F---- Noark	0-17	10-25	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.5	Low----------	0.28	3	1-3
	17-24	20-40	1.30-1.50	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.28		
	24-60	45-75	1.15-1.45	0.6-2.0	0.06-0.09	3.6-5.5	Low----------	0.24		
44F*:										
Ocie------------	0-4	10-20	1.10-1.40	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.32	3	.5-2
	4-17	10-20	1.10-1.40	0.6-2.0	0.12-0.16	4.5-6.5	Low----------	0.32		
	17-27	18-30	1.10-1.40	0.6-2.0	0.09-0.12	4.5-6.5	Moderate-----	0.32		
	27-45	55-80	1.10-1.30	0.06-0.2	0.07-0.10	5.1-6.5	High---------	0.28		
	45	---	---	---	---	---	-------------	----		
Gepp------------	0-3	10-25	1.25-1.45	0.6-2.0	0.12-0.17	5.1-6.5	Low----------	0.28	5	.5-2
	3-10	10-25	1.25-1.45	0.6-2.0	0.06-0.12	5.1-6.5	Low----------	0.32		
	10-16	60-80	1.25-1.45	0.6-2.0	0.10-0.16	4.5-6.0	Moderate-----	0.32		
	16-60	55-80	1.15-1.35	0.6-2.0	0.07-0.11	4.5-6.5	Moderate-----	0.28		
Gatewood--------	0-7	15-25	1.10-1.40	0.6-2.0	0.14-0.20	5.6-7.3	Low----------	0.28	3	.5-2
	7-29	60-85	1.35-1.60	0.06-0.2	0.05-0.14	5.6-7.3	High---------	0.28		
	29	---	---	---	---	---	-------------	----		

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		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
48C*, 48D*, 48F*:										
Ocie------------	0-7	10-20	1.10-1.40	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.32	3	.5-2
	7-14	25-35	1.10-1.30	0.2-0.6	0.09-0.12	4.5-6.0	Moderate-----	0.32		
	14-48	50-80	1.10-1.30	0.06-0.2	0.07-0.10	5.1-7.3	High---------	0.32		
	48	---	---	---	---	---	-------------	----		
Gepp------------	0-7	10-25	1.25-1.45	0.6-2.0	0.08-0.18	5.1-6.5	Low----------	0.28	4	.5-2
	7-15	25-40	1.20-1.40	0.6-2.0	0.10-0.22	4.5-6.0	Low----------	0.28		
	15-60	65-85	1.15-1.30	0.6-2.0	0.10-0.18	4.5-6.0	Moderate-----	0.28		
Gatewood--------	0-7	15-25	1.10-1.40	0.6-2.0	0.06-0.12	5.1-7.3	Low----------	0.28	3	.5-2
	7-27	60-85	1.10-1.30	0.06-0.2	0.09-0.12	5.1-7.3	High---------	0.32		
	27-30	---	---	---	---	---	-------------	----		
55A-------------- Nolin	0-10	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43	5	2-4
	10-60	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.1-8.4	Low----------	0.43		
57C-------------- Britwater	0-10	15-25	1.30-1.50	0.6-2.0	0.15-0.24	4.5-6.0	Low----------	0.37	4	1-2
	10-24	18-34	1.40-1.60	0.6-2.0	0.12-0.15	4.5-6.0	Low----------	0.28		
	24-42	27-50	1.50-1.70	0.6-2.0	0.09-0.11	4.5-6.0	Low----------	0.28		
	42-60	27-60	1.40-1.60	0.6-2.0	0.07-0.09	4.5-6.0	Moderate-----	0.24		
76A-------------- Moniteau	0-24	25-35	1.20-1.40	0.6-2.0	0.21-0.23	5.1-6.5	Low----------	0.43	5	1-2
	24-60	27-35	1.30-1.50	0.2-0.6	0.18-0.20	4.5-6.0	Moderate-----	0.43		
81B-------------- Viraton	0-6	15-25	1.30-1.50	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.43	4	.5-2
	6-21	18-35	1.30-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low----------	0.43		
	21-33	18-30	1.60-1.90	<0.06	0.01-0.05	3.6-5.5	Low----------	0.32		
	33-60	30-60	1.10-1.40	0.2-0.6	0.02-0.06	4.5-7.3	Moderate-----	0.28		
82C-------------- Hobson	0-6	16-27	1.20-1.40	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.37	4	.5-2
	6-21	24-35	1.25-1.45	0.6-2.0	0.14-0.18	4.5-5.5	Moderate-----	0.37		
	21-26	16-32	1.60-1.90	0.06-0.2	0.06-0.10	4.5-5.5	Low----------	0.28		
	26-40	20-35	1.60-1.90	0.06-0.2	0.04-0.08	4.5-5.5	Low----------	0.28		
	40-60	30-70	1.20-1.40	0.2-0.6	0.04-0.08	4.5-5.5	Moderate-----	0.24		
83F*:										
Gasconade-------	0-7	35-40	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate-----	0.20	2	2-4
	7-14	35-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20		
	14	---	---	---	---	---	-------------	----		
Rock outcrop.										
84*. Pits										
85. Udorthents										
91B-------------- Plato	0-6	12-20	1.20-1.50	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.43	4	1-2
	6-24	27-45	1.30-1.50	0.2-0.6	0.10-0.18	3.6-5.5	Moderate-----	0.32		
	24-53	25-40	1.60-1.90	<0.06	0.01-0.05	4.5-5.5	Low----------	0.32		
	53-60	35-45	1.40-1.60	0.6-2.0	0.02-0.06	4.5-6.0	Moderate-----	0.24		
94A-------------- Cedargap	0-6	12-25	1.20-1.45	0.6-2.0	0.11-0.18	5.6-7.3	Low----------	0.24	5	1-4
	6-19	20-28	1.30-1.50	0.6-2.0	0.10-0.14	5.6-7.3	Low----------	0.32		
	19-34	25-35	1.30-1.50	0.6-2.0	0.06-0.10	5.6-7.3	Moderate-----	0.32		
	34-60	40-48	1.20-1.40	0.2-0.6	0.04-0.08	5.6-7.3	Moderate-----	0.20		
95A-------------- Dameron	0-35	20-27	1.25-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	4	2-4
	35-60	27-32	1.40-1.55	0.6-2.0	0.04-0.10	5.6-7.3	Low----------	0.10		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
04C*:												
Wilderness	C	None	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
Gepp	B	None	---	---	>6.0	---	---	>60	---	---	High	High.
05C*:												
Noark	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	High.
Scholten	C	None	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
08B Tonti	C	None	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	---	High	High.
09B*:												
Captina	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	---	Moderate	High.
Needleye	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
10 Bado	D	None	---	---	0-2.0	Perched	Dec-Apr	>60	---	High	High	High.
21B Peridge	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
23B Hartville	C	Rare	---	---	1.5-3.0	Perched	Nov-Apr	>60	---	High	Moderate	Moderate.
24F Basehor	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low	Moderate.
26F*:												
Ocie	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	High	Moderate.
Gatewood	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Moderate.
Gasconade	D	None	---	---	>6.0	---	---	4-20	Hard	Moderate	High	Low.
32C2 Alsup	C	None	---	---	2.5-4.0	Perched	Dec-Apr	>40	Soft	Moderate	High	Moderate.
40F*:												
Alsup	C	None	---	---	2.5-4.0	Perched	Dec-Apr	>40	Soft	Moderate	High	Moderate.
Noark	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	High.

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				
42C*, 42D*, 42F*:												
Gepp	B	None	---	---	>6.0	---	---	>60	---	---	High	High.
Ocie	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	High	Moderate.
43C, 43D, 43F Noark	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	High.
44F*:												
Ocie	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	High	Moderate.
Gepp	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	High.
Gatewood	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Moderate.
48C*, 48D*, 48F*:												
Ocie	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	High	Moderate.
Gepp	B	None	---	---	>6.0	---	---	>60	---	---	High	High.
Gatewood	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Moderate.
55A Nolin	B	Occasional	Brief to long.	Dec-May	3.0-6.0	Apparent	Feb-Apr	>60	---	---	Low	Moderate.
57C Britwater	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
76A Moniteau	C/D	Occasional	Brief	Nov-May	0-1.0	Apparent	Dec-Apr	>60	---	High	High	High.
81B Viraton	C	None	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
82C Hobson	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
83F*:												
Gasconade	D	None	---	---	>6.0	---	---	4-20	Hard	Moderate	High	Low.
Rock outcrop.												
84*. Pits												
85. Udorthents												

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				
91B--------------- Plato	C	None---------	---	---	1.0-2.5	Perched	Dec-Apr	>60	---	Moderate	High------	High.
94A--------------- Cedargap	B	Frequent----	Very brief	Nov-May	>6.0	---	---	>60	---	Moderate	Low-------	Low.
95A--------------- Dameron	B	Frequent----	Very brief	Nov-May	>6.0	---	---	>60	---	Moderate	Low-------	Low.

* 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
Bado	Fine, mixed, mesic Typic Fragiaqualfs
Basehor	Loamy, siliceous, mesic Lithic Dystrochrepts
Britwater	Fine-loamy, mixed, mesic Typic Paleudalfs
Captina	Fine-silty, siliceous, mesic Typic Fragiudults
Cedargap	Loamy-skeletal, mixed, mesic Cumulic Hapludolls
Dameron	Fine-loamy, mixed, mesic Cumulic Hapludolls
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
Gatewood	Very fine, mixed, mesic Typic Hapludalfs
Gepp	Very fine, mixed, mesic Typic Paleudalfs
Hartville	Fine, mixed, mesic Aquic Hapludalfs
Hobson	Fine-loamy, siliceous, mesic Typic Fragiudalfs
Moniteau	Fine-silty, mixed, mesic Typic Ochraqualfs
Needleye	Fine-silty, mixed, mesic Aquic Fragiudults
Noark	Clayey-skeletal, mixed, mesic Typic Paleudults
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Ocie	Loamy-skeletal over clayey, mixed, mesic Typic Hapludalfs
Peridge	Fine-silty, mixed, mesic Typic Paleudalfs
Plato	Fine, mixed, mesic Aquic Fragiudalfs
Scholten	Loamy-skeletal, siliceous, mesic Typic Fragiudults
Tonti	Fine-loamy, mixed, mesic Typic Fragiudults
Udorthents	Mixed, mesic Lithic Udorthents
Viraton	Fine-loamy, siliceous, mesic Typic Fragiudalfs
Wilderness	Loamy-skeletal, siliceous, mesic Typic Fragiudalfs

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