SOIL SURVEY OF

ST. FRANCOIS COUNTY, MISSOURI

United States Department of Agriculture
Soil Conservation Service and
Forest Service
In Cooperation with
Missouri Agricultural Experiment Station

How To Use This Soil Survey

General Soil Map

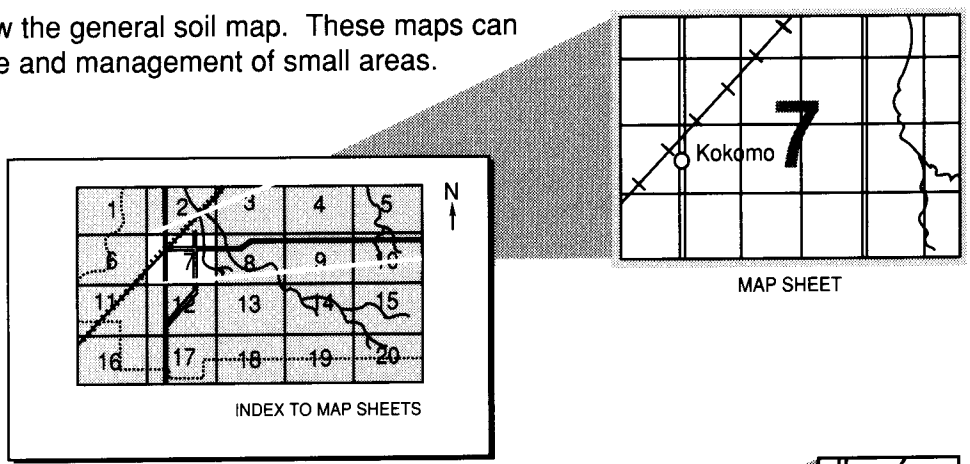
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

Detailed Soil Maps

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

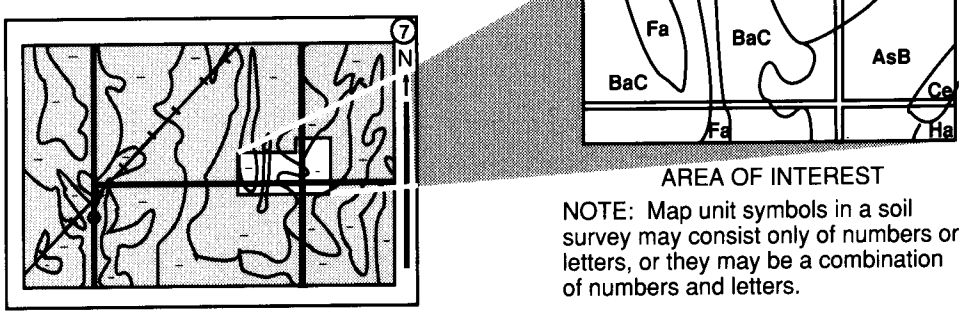
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

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



MAP SHEET

AREA OF INTEREST

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

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

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

This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Missouri Agricultural Experiment Station. The St. Francois County Court provided monetary support and personnel to assist in the survey. The Missouri Department of Natural Resources contributed funds to assist in map finishing. The survey is part of the technical assistance furnished to the St. Francois County Soil and Water Conservation District. Major fieldwork was performed in the period 1974-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978.

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

This survey supersedes the soil survey of St. Francois County published in 1921 (*22*).

Cover: From the Salem Plateau level (foreground) looking out over the Farmington Plain, one views a typical land use pattern for St. Francois County of forest and open fields.

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soil series

Issued August 1981

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foreword

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

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

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

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

Kenneth G. McManus

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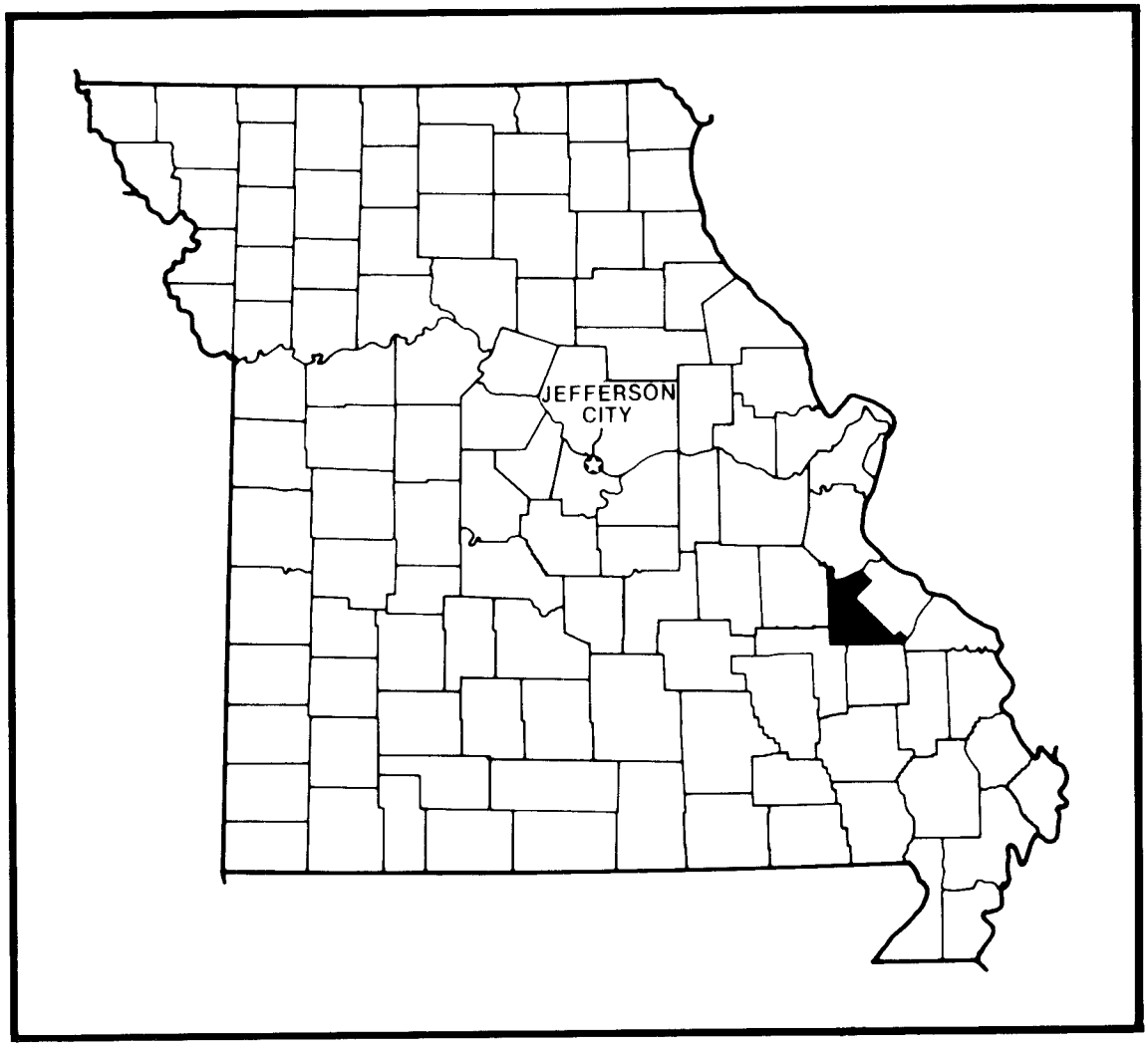
State Conservationist
Soil Conservation Service



Location of St. Francois County in Missouri.

Soil survey of
St. Francois County, Missouri

By Burton L. Brown, Soil Conservation Service

Fieldwork by Burton L. Brown, Party leader, and
James D. Childress and Dennis K. Potter, Soil Conservation Service, and
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St. Francois County Soil and Water Conservation District

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

St. Francois County is in the east-central part of Missouri, on the eastern fringe of the Ozark region. In area the county is 292,480 acres, or about 457 square miles. It is shaped roughly like a triangle. Its western border is about 29 miles long and its southern border is 29 miles wide. St. Francois County is bordered on the north by Jefferson County, on the east by Ste. Genevieve County, on the south by Madison County, on the southwest by Iron County, and on the northwest by Washington County. Farmington is the county seat. In 1970, the population of the county was 36,875.

Surface features of the county are mainly determined by differences in geological structures surrounding the Ozark Dome. About 20 percent of the county is made up of the St. Francois Mountains, where soils formed in residuum of igneous rocks. Another 52 percent of the county is on the Farmington Plain, where the soils are underlain by sandstone and dolomite. The remaining 28 percent of the area is on the old surface and the dissected topography of the Salem Plateau, where the major soil material is red cherty clay.

The highest elevation is 1,650 feet, on Brown Mountain near the southwest corner of the county. The main watershed divide runs from northeast to southwest through the middle of the county. The Big River flows through the northern part of the county in a general northerly course and the St. Francis River flows across the lower part of the county in a southerly direction. The lowest elevation in the county is approximately 565 feet, where Big River leaves the county in the northwest corner.

general nature of the survey area

In this section, climate, history and development, and physiography and geology are discussed.

climate

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Farmington, Missouri in the period 1951 to 1974. 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 Farmington on January 14, 1964, is -20 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 108 degrees.

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

Of the total annual precipitation, 23 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.95 inches at Farmington on June 30, 1957. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 12 inches. The greatest snow depth at any one time during the period of record was 17 inches. On an average, 5 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in March.

history and development

Early inhabitants of St. Francois County were agricultural village dwellers of the Mississippian culture (*15*). Small mounds along the valleys of the Big River and the St. Francis River are mute reminders of these people. Later, the Osage Indians roamed this area of the state. European settlement began in the late 1700's.

St. Francois County was first under French dominance as part of the Louisiana Territory, a French holding. France sold the territory to the United States as a part of the Louisiana Purchase in 1803.

The first communities, Murphy Settlement, Cook Settlement, and Alley's Mines, were established prior to 1803. These communities were mainly agricultural. Murphy Settlement, later named Farmington, was started about 1800 when William Murphy, a Baptist minister from Tennessee, built a log cabin. He chose the deep red (Crider) soils on the rolling Farmington Plain where a magnificent forest testified to the productivity of the soils. Cook settlement, near the present community of Libertyville, grew up in a similar manner. The area was chosen by Nathaniel Cook who came from Scott County, Kentucky in about 1797. Alley's Mines was located on or near Big River. It was named for Thomas Alley, who discovered and developed the lead mine there.

St. Francois became a county in 1821, the same year Missouri gained statehood. St. Francois was formed from parts of three other counties already established—Jefferson, Ste. Genevieve, and Washington.

Mining played an important part in the development of the county. Towns such as Bonne Terre, Flat River, Desloge, and Iron Mountain were established in rich mining areas. All of these with the exception of Iron Mountain were the sites of very rich lead deposits. Bonne Terre, meaning "good earth," was the name given to the area's lead-containing clay by the miners. Iron Mountain was first believed to be a mountain of pure iron by the Spanish. Presently there are no active lead or iron mines in the county.

The "Old Plank Road," running from Ste. Genevieve to Iron Mountain, was the first improved road in Missouri (*11*). This road was built of heavy timbers laid down lengthwise on which 8-foot oak planks were nailed crosswise. Wagons containing iron from Iron Mountain and Pilot Knob were pulled by oxen, horses, and mules east to the river and on the return trip brought back freight and supplies. Repairs of the Old Plank Road ceased about 1857, the year the St. Louis and Iron Mountain Railroad was built.

Most of the early settlers came in search of productive soils to farm (fig. 1). Their first task was to clear the land for cultivation. Trees were cut, burned, split into rails, or used to construct log houses and barns. Fields were planted to corn, cotton, tobacco, and garden vegetables. Livestock required little attention. Horses, cattle, mules, and hogs were turned out on open range to graze. Open grazing continued until about 1920.

Farming expanded throughout the rolling plain between Farmington and Libertyville and to the creeks and river valleys beyond. By 1978, about 50 percent of the county had been cleared and was being used for pasture, hay, and corn.

Despite a decline in cropland acreage, yields of most crops have steadily increased. About 19,200 acres of corn was harvested in St. Francois County in 1932 (*6*). Two years later, in 1934, the amount of land in corn declined to 8,800 acres, and it dropped to 1,700 acres in 1964. In 1977, this figure rose to 2,600 acres. The yield of corn, on the other hand, averaged 20.5 bushels per acre in 1928, 40 bushels per acre in 1946, and 85.2 bushels per acre in 1975.

The acreage of land in wheat has also declined rather steadily, from 16,900 acres in 1919 to 900 acres in 1977. Yields of wheat have risen more slowly than corn yields, from 14.5 bushels per acre in 1928 to 14.9 bushels per acre in 1946 and 34.3 bushels per acre in 1975.

Oats, a major crop of 93,200 acres in 1928, has dropped during the last 20 years to only a few hundred acres per year. Soybeans, introduced in the early 1940's,

Figure 1.—Early settlers often looked for impressive forest such as this to clear, reasoning that it must also be productive farmland. These trees are growing on Jonca silt loam, 2 to 5 percent slopes.

has continued to be a very minor crop, with only a few hundred acres grown each year. Hay acreages and yields have remained rather consistent for the past 60 years. In 1977, 27,500 acres of hay yielding an average of 1.4 tons per acre was grown.

The number of cattle in St. Francois County increased from 13,000 head in 1920 to 28,400 head in 1978. The number of hogs has fluctuated rather drastically in the past 60 years, from a high of 14,900 in 1944 to a low of 5,500 in 1966. Sheep numbers have declined from 3,300 head in 1938 to fewer than 100 today.

The population of the county is presently at an all time high of about 39,000. In 1830, the county had 2,366 people and by 1940 the number had grown to 35,950. The number of people in agricultural occupations has declined. In 1918, over 80 percent of the population was engaged in mining and most of the remainder was employed in agriculture. In 1966, out of a total work force of 10,380, only 420 people (4 percent) worked directly in agriculture and most of the rest worked in mining. Current trends are toward decreases in the number of farms, the acreage in farms, and the number of people actively engaged in farming.

physiography and geology

St. Francois County lies on the eastern side of the Ozark Highland (*4*). It has a variety of surface features. Major physical features are the St. Francois Mountains, the Farmington Plain, and the dissected topography of the Salem Plateau (fig. 2).

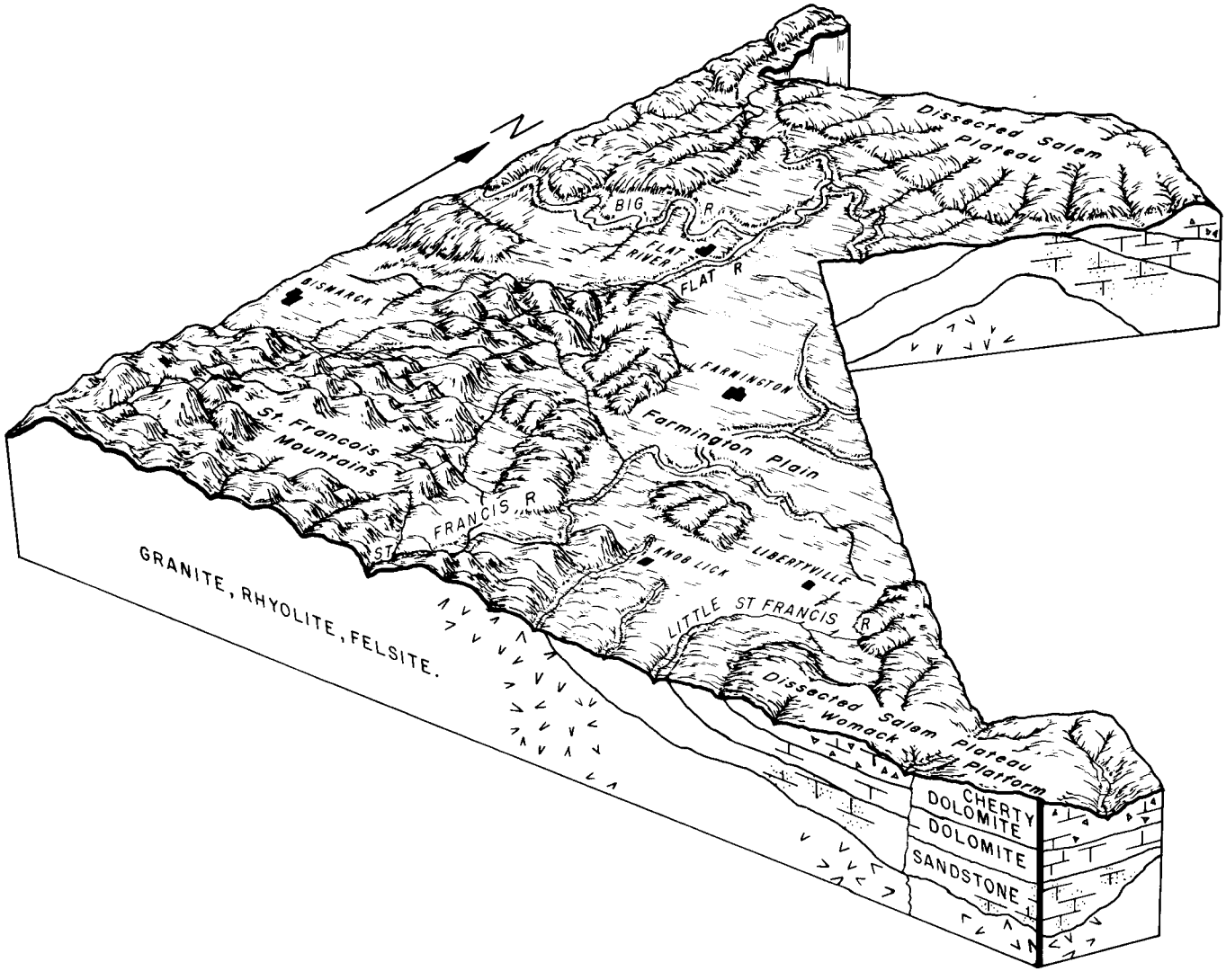

Figure 2.—Physiography, relief, and drainage of St. Francois County.

The St. Francois Mountains are a closely assembled group of peaks that rise islandlike above the surrounding area. Granites, rhyolites, and felsites are the principal rocks. The major peaks are made up of felsitic rocks or rhyolitic lava flows that apparently were ejected from volcanic vents and cracks in the earth's crust. These structures are thought to be essentially unaltered from their original form except for stream-cut narrows, talus slopes, and beach accumulations (*7*). The granites are on land surfaces that geologists consider to be denuded magmas responsible for large-scale crustal movements which caused the general faulting, folding, and tilting of the area. No evidence of the former overburden remains in areas of the intrusive rocks, indicating that extensive truncation has taken place. Such massive removal would seem to have required more than the normal erosion cycle, perhaps tsunamis. Irondale and Knobtop soils formed in thin residuum of rhyolitic and associated extrusives, and Syenite and Delassus soils are on the landscapes of granite and associated intrusives. The intermountain valleys are accidents. They have no relationship to present erosion cycles.

Below the mountains is a region of dissected topography deeply cut into the cherty red clay sediments of the upper Cambrian and the lower Paleozoic. This landscape is represented by the uplands that frame the north part of the county and the southeast corner and that are traceable across the county by numerous hills and monadnocks. The high ridges to the north and the summit of the Womack platform range in altitude from 1,100 to 1,200 feet. This plateau is also traceable through the St. Francois Mountains at the same altitude. Small platforms lie at the base of Stono, Buck, Brown, and Knob Lick Mountains. Loughboro soils are on the most stable parts of these platforms. The exposed magmas of Washita Mountaintop and the Flatwoods are of this same general elevation.

The Salem Plateau may well be a structural plain controlled by a former sea level. This base level, including the exposed magmas, may be the effect of marine denudation, especially by tsunamis. The immense erosive power of such forces is well documented (*21*). Not only could the tsunami theory explain the complete removal of the sedimentary overburden, but it could also explain the comparative absence of stones and boulders on the summits and their accumulation on the adjacent valley sides and ravines. Rounded stones and boulders cover as much as 50 percent of the surface of Syenite soils (fig. 3). The ruggedly incised Salem Plateau has steep side slopes of Goss soils. The more stable slopes, ridges, and divides are occupied by Hildebrecht, Lebanon, and Wilderness soils, all having well formed fragipans.

A still lower plain is much in evidence in St. Francois County—the Farmington Plain (also called the Jonca Plain). Except for the deep entrenchments of Big River and its tributaries, the Farmington Plain has a gently rolling to rolling surface. Its altitude is 900 to 1,000 feet. This structure is underlain by the Lamotte sandstone and the Bonneterre dolomite. Sandstone has been exposed as a result of tilting, folding, and subsequent erosion.

The Farmington Plain is difficult to explain in terms of a normal erosion cycle. It forms a major divide between the north-flowing Big River and the south-flowing St. Francis River. There is no evidence that it was formed by a through-flowing stream or by headward erosion. It appears more likely that this plain was a second major sea level position. The plain was truncated by wave action and the irregular pinnacled surface of the bedrock was sculpted by running water and afterward covered with clayey sediment. Contact between the soil and the dolomite bedrock is one of unconformity. Caneyville, Crider, and Fourche soils formed in clayey material over dolomite. Jonca, Lamotte, and Ramsey soils formed in loamy material over sandstone.

Later and more temporary base levels are evidenced by upland benches below the Farmington Plain and stream terraces along the major streams. Ashton and Auxvasse soils occupy these positions.

The drainage pattern of the county seems to have been fixed early in the geomorphic history of the county. Structural features of more recent origin have not changed the general direction of flow. The north part of the county is drained by Big River, and most of the south part is drained by the St. Francis River.

The three major structural and topographic divisions of the county—the mountains, the plain, and the hilly land in between—are incised by the St. Francis River enroute south. Shut-ins, cascades, and waterfalls over igneous rocks control the course, gradient, and flood plain features of this river. Big River, on the other hand, is a stream with incised meanders. Its early meandering across the Farmington Plain was followed by rejuvenation. Big River cut deeply into dolomite during the last rejuvenation, but the St. Francis River continued essentially unchanged due to the hardrock barriers. The difference in the nature of the two streams seems to lie in a relative resistance of the rocks to stream erosion.

how this survey was made

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

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places.

Figure 3.—Syenite extremely bouldery silt loam, 10 to 25 percent slopes, is commonly forested. It is not suited to cultivation, and surface boulders limit logging operations.

They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

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

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

management are assembled from farm records and from field or plot experiments on the same kinds of soil.

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

general soil map units

The general soil map at the back of this publication shows broad areas, called soil associations, that have a distinctive pattern of soils, relief, and drainage. Each association on the general soil map 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 other units 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.

This general soil map is generally consistent with the general soil map of Missouri (*1*).

soil descriptions

1. Caneyville-Crider-Gasconade association

Deep to shallow, gently sloping to steep, well drained and somewhat excessively drained soils that formed in loess and clayey material

This association is in the part of the Farmington Plain that is dissected by Big River and its tributaries (fig. 4). The slope range is 2 to 35 percent.

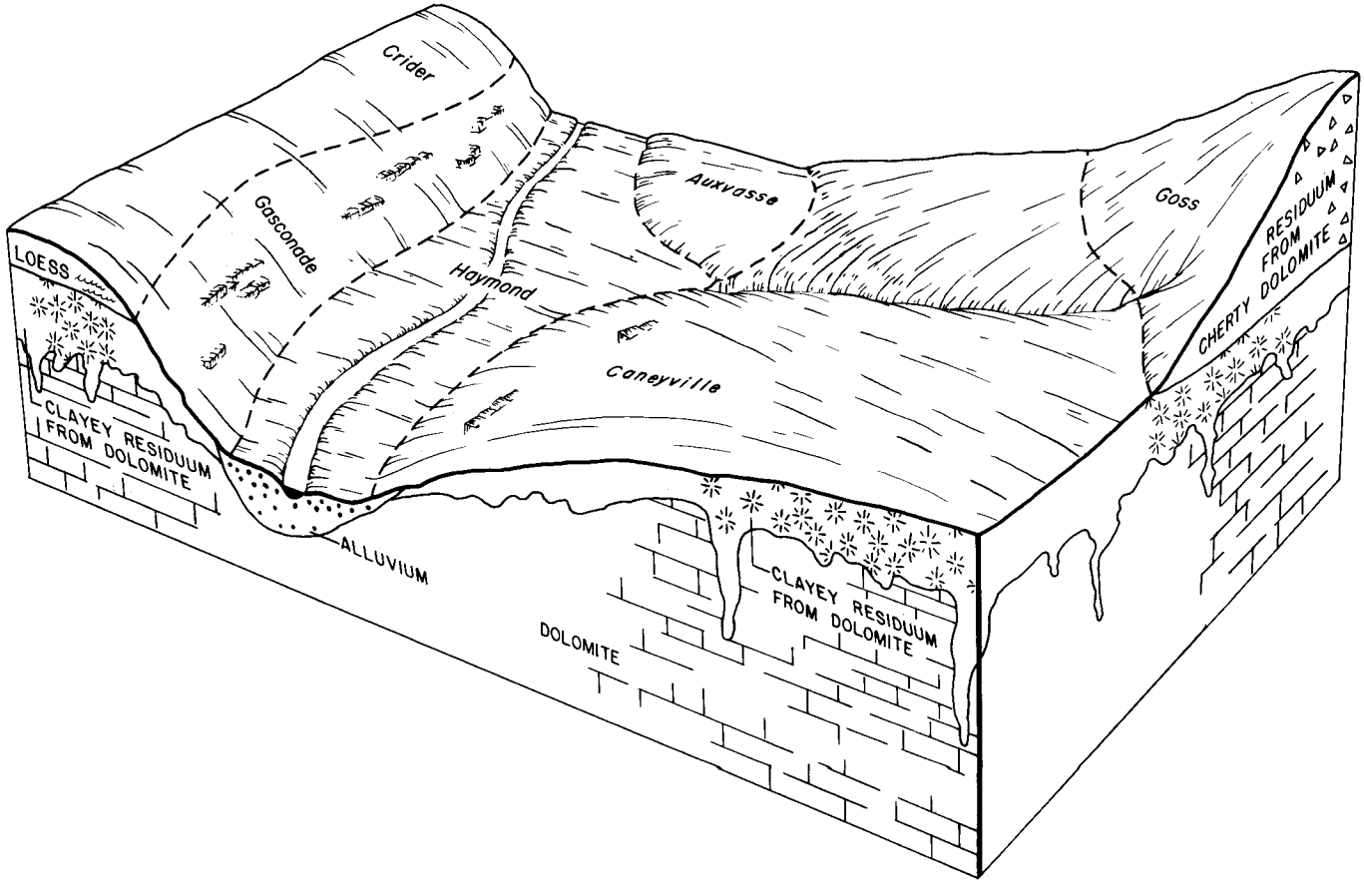

Figure 4.—Typical pattern of soils and parent material in the Caneyville-Crider-Gasconade association.

This association makes up about 23 percent of the county. It is about 49 percent Caneyville soils, 15 percent Crider soils, 8 percent Gasconade soils, and 28 percent soils of minor extent.

The Caneyville soils are moderately deep, gently sloping to moderately steep, and well drained. These soils are on uplands, commonly at a higher elevation than the Gasconade soils. They have a surface layer of dark brown silt loam and a subsoil of reddish brown and dark reddish brown silty clay and clay. They are underlain by hard dolomite at a depth of about 31 inches.

The Crider soils are deep, gently sloping to strongly sloping and well drained. These soils commonly are on ridges, but some areas are on side slopes or foot slopes. They have a surface layer of dark brown silt loam. The subsoil is brown silty clay loam in the upper part, reddish brown silty clay loam in the middle part, and red silty clay in the lower part.

The Gasconade soils are shallow, strongly sloping to steep, and somewhat excessively drained. These soils have a surface layer of very dark brown flaggy silty clay loam and a subsoil of dark brown very flaggy silty clay. They are underlain by dolomite at a depth of 13 inches.

Of minor extent in this association are deep, very cherty Goss soils and moderately well drained Hildebrecht soils on uplands. Well drained Haymond soils and moderately well drained Wilbur soils are on flood plains. Poorly drained Auxvasse soils are on terraces and benches. Sandy, somewhat excessively drained Psamments are in tailing ponds.

About 50 percent of this association is cleared. Most of the cleared areas are used for pasture. Corn, soybeans, and grain sorghum are grown on narrow bottoms and some ridges. Mixed hardwood forest and small prairies or glades, many of which are partly invaded by eastern redcedar, are in the steep uncleared areas. Several towns are within this mapped area.

The soils in this association, except those on the narrow bottoms and gentle upland ridges, generally are not suited to cultivated crops. These soils have only limited potential for orchards and specialty crops. Much of the acreage is suited to raising livestock. Slope and the hazard of erosion and the shallowness and droughtiness of the soil are the main problems in pasture and cropland management. Sites for livestock ponds are plentiful. However, suitable fill material for the dam commonly is outside the pond site, and on some sites chemical or other treatment is required to seal the pond.

The soils in this association are suited to trees. The woodland is dominantly eastern redcedar, chinkapin oak, black oak, and hickory. Production is commonly low. Shallowness to bedrock is a major limitation on side slopes. The steep slopes limit the use of logging equipment. Erosion is a hazard along logging roads and skid trails.

The soils in this association, except the Crider soils, are generally unsuitable for sanitary and building site development. Slope and depth to bedrock are the main limitations.

The soils are suited to use as habitat for openland and woodland wildlife. Increasing urban and residential development, however, is taking up land suitable for wildlife habitat, especially for woodland wildlife. Providing food for the wildlife is a major management concern.

2. Crider-Fourche-Nicholson association

Deep, gently sloping to strongly sloping, well drained and moderately well drained soils that formed in loess and clayey material

This association is part of the Farmington Plain (fig. 5). It is a broad rolling plain that separates the drainage areas of the north flowing Big River and the south flowing St. Francis River. The north part of the association is a karst area that borders the Ste. Genevieve fault. The slope range is 2 to about 14 percent.

Higher hills are along the north and south edges of the association and isolated hills are scattered throughout. Most of the area is drained by small streams, but a small acreage, mostly in the north part, is drained by sinks into the dolomite.

This association makes up 20 percent of the county. It is about 34 percent Crider soils, 23 percent Fourche soils, 14 percent Nicholson soils, and 29 percent soils of minor extent.

The Crider soils are gently to strongly sloping and well drained. These soils are on ridgetops and side slopes. They have a surface layer of dark brown silt loam. The subsoil is brown silty clay loam in the upper part, reddish brown silty clay loam in the middle part, and red silty clay in the lower part.

The Fourche soils are moderately sloping and strongly sloping. They are moderately well drained. These soils have a surface layer of brown silt loam. The subsoil is yellowish brown silt loam in the upper part, multicolored, mottled silty clay loam in the middle part, and yellowish red, mottled silty clay in the lower part.

The gently sloping and moderately well drained Nicholson soils are on ridges. These soils have a surface layer of dark brown silt loam. The subsoil is dark brown silty clay loam and yellowish brown, mottled silty clay loam that is underlain by a yellowish brown silt loam fragipan.

Of minor extent in this association are moderately deep Caneyville soils on the uplands. Well drained Haymond soils and poorly drained Auxvasse soils are on the bottom lands.

About 85 percent of this association is cleared. The cleared acreage is used for general farming. Pasture, hay, row crops, and small grains are grown. Wheat is the major small grain. The common crops—corn, grain sorghum, and soybeans—are grown throughout the association, but production of these crops is heaviest in the southern part. Alfalfa is grown for hay. Grasses and grass-legume pastures and hayfields are common. The

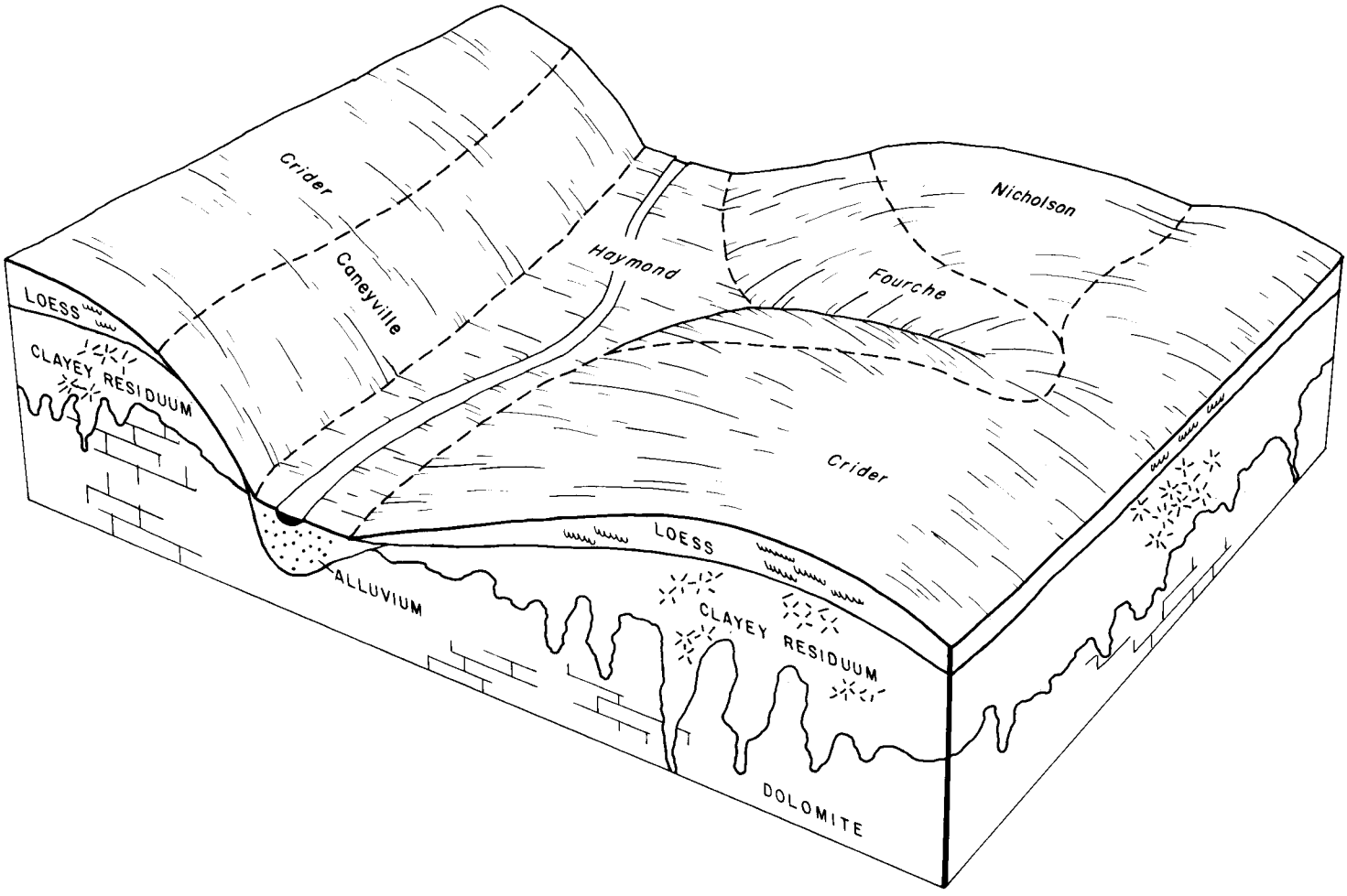

Figure 5.—Typical pattern of soils and parent material in the Crider-Fourche-Nicholson association.

uncleared acreage is scattered throughout the association in small woodlots. These generally are poorly managed and consist chiefly of mature trees. Near Farmington, the soils of this association are in urban use.

These soils are suitable for row crops. Slope and the hazard of erosion are the main limitations to growing row crops. These soils are suitable for fruits, berries, and truck crops, which are grown mainly for local use. The soils in this association are suited to livestock production. Beef cattle are raised here. A major source of water for livestock is ponds. However, the deep red clays are freely permeable, and chemical or other treatment is required to seal the ponds.

The soils in this association are suitable for trees. The woodland that remains is dominantly maple, northern red oak, white oak, bur oak, and ash. Productivity is medium.

The Crider soils in this association are generally suitable for sanitary facilities and building sites. Urban uses of Fourche and Nicholson soils are limited by slope, permeability, and wetness.

The soils generally are suitable for recreation uses. Slope and wetness are slight or moderate limitations.

The soils in this association are suitable for wildlife habitat, but providing enough food and cover for the wildlife is a management concern. Native warm season grasses, food plots, brushy areas, and fence rows help to divide the area into essential habitat.

3. Goss-Hildebrecht association

Deep, gently sloping to steep, well drained and moderately well drained soils that formed in cherty clayey material or in loess and cherty clayey material

Areas of this association are scattered throughout the county. The soils are on hilly, dissected uplands that have steep side slopes and moderately to gently sloping ridgetops (fig. 6). Most of this association is drained by small streams. The slope range is 2 to about 35 percent.

This association makes up about 24 percent of the county. It is about 50 percent Goss soils, 36 percent Hildebrecht soils, and 14 percent soils of minor extent.

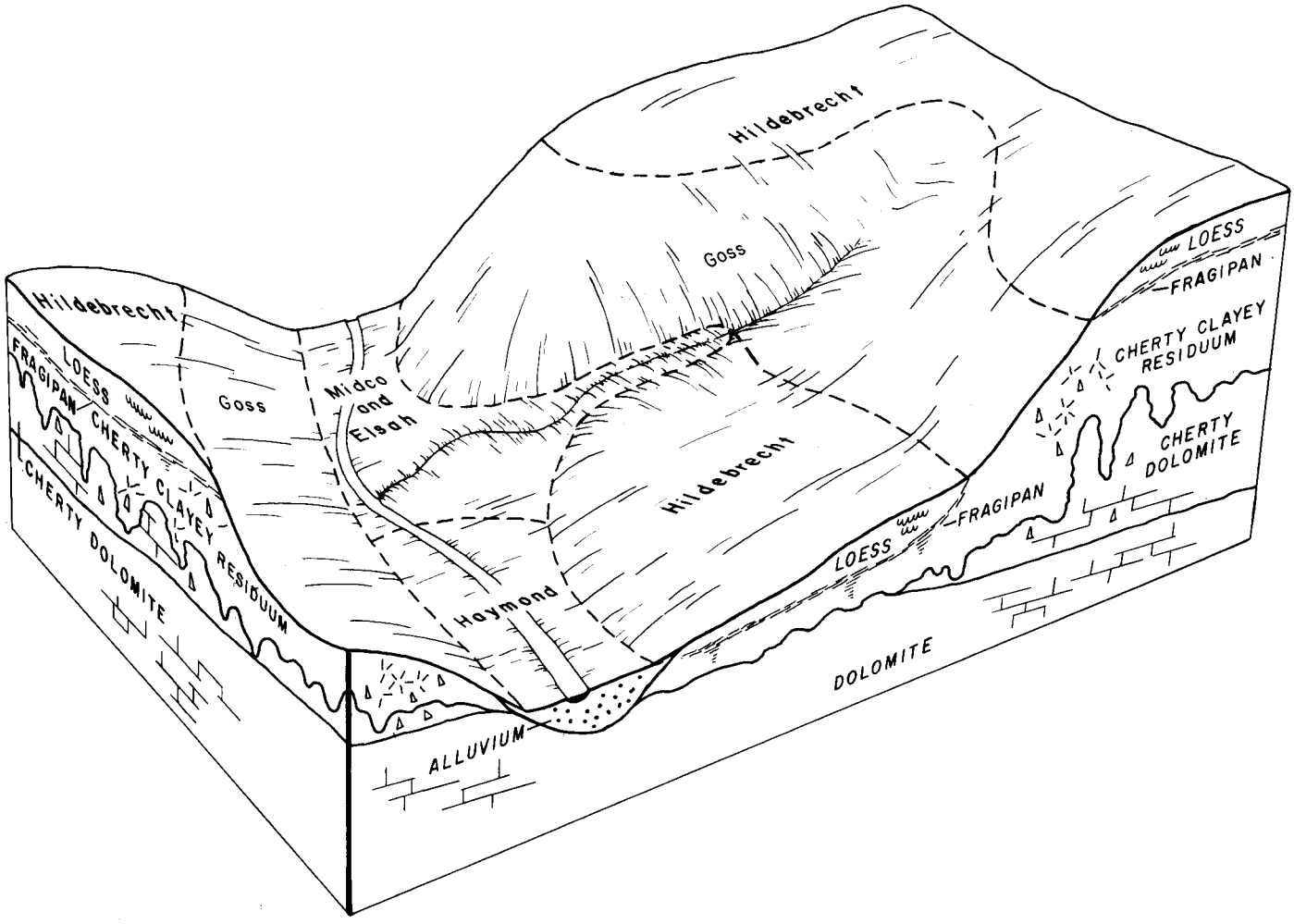

Figure 6.—Typical pattern of soils and parent material in the Goss-Hildebrecht association.

The steep Goss soils are on side slopes. They are well drained. They have a surface layer of very dark grayish brown very cherty silt loam, a subsurface layer of brown very cherty silt loam, and a subsoil of red and dark red cherty clay.

The gently sloping to strongly sloping Hildebrecht soils are on upland rdigetops and foot slopes. They are moderately well drained. They have a surface layer of very dark grayish brown silt loam, a subsurface layer of yellowish brown silt loam, a subsoil of brown silt loam and silty clay loam, and a fragipan of yellowish brown very cherty silt loam.

Of minor extent in this association are moderately well drained Wilderness soils and well drained Caneyville soils on the uplands. Somewhat excessively drained Midco soils and well drained Elsah and Haymond soils are on the narrow bottom lands.

The soils in this association are mainly forested, but some tracts are used for pasture. Only a small acreage is used for cultivated crops. About 25 percent of this association is cleared. Several large lake developments, two state parks, open pit barite mining, and urban development are other significant land uses.

The soils in this association generally are not suited to cultivated crops because of the steep slopes and the hazard of erosion. The soils on ridges, foot slopes, and bottom lands are suited to pasture, hay, and the raising of beef cattle. Sites for livestock ponds are plentiful. However, seepage can be excessive in the lower part of the subsoil, and chemical or other treatment is required to seal the pond.

The soils in this association are suitable for trees. Productivity for native hardwoods is medium on northern slopes and commonly is low on southern slopes. Steep slopes restrict the use of logging equipment. Erosion is a hazard along logging roads and skid trails.

All the steep soils are generally unsuitable for urban uses. The soils on ridgetops and foot slopes are suitable for building sites. The main problems are wetness, seepage, and slope. The soils are generally unsuitable for conventional septic tank absorption fields because of the slow perc rate and steepness of slope.

Areas of this association are suitable for habitat for

woodland wildlife. They provide the major range for deer and for most of the wild turkey in the county. Availability of food is the major limitation for wildlife. Annual and perennial plantings and openings in the forest help to provide essential food and browse.

4. Lebanon-Wilderness association

Deep, moderately sloping to moderately steep, moderately well drained soils that formed in loess and cherty clayey material or in cherty clayey material

This association consists of high, broad upland ridges, or divides, and the adjacent slopes (fig. 7). Toward the south, the gentle summit gradually changes to dominantly strongly sloping valley sides. The northern edge is steep and very hilly. Secondary ridges branch from the main divide and gradually descend in elevation with distance. The slope range is 3 to more than 20 percent.

This association makes up about 4 percent of St. Francois County. It is about 50 percent Lebanon soils, 41 percent Wilderness soils, and 9 percent soils of minor extent.

The major soils in this association are moderately well drained and have a well defined fragipan. Moderately sloping Lebanon soils are on broad divides. They have a surface layer of dark brown silt loam, a subsurface layer of yellowish brown silt loam, and a subsoil of strong brown and brown silty clay loam underlain by a dense, brittle, yellowish brown silty clay loam fragipan.

Moderately sloping to moderately steep Wilderness soils are on the sides of hills and valleys. They have a thin surface layer of dark grayish brown cherty silt loam and a subsoil of yellowish red very cherty silty clay loam underlain by a fragipan of brown very cherty silt loam.

Of minor extent in this association are somewhat excessively drained Midco soils and well drained Elsah soils on the bottom lands.

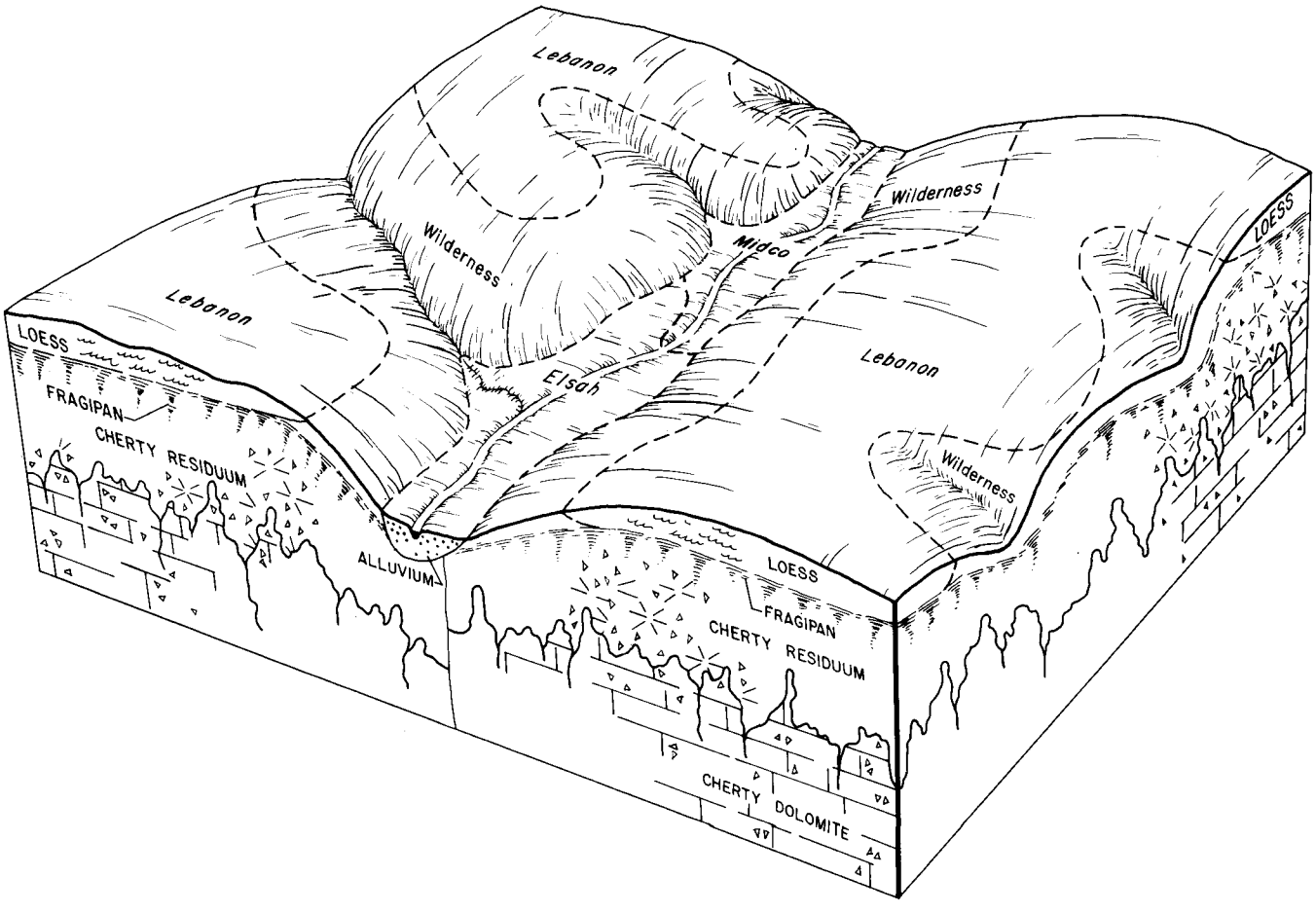

Figure 7.—Typical pattern of soils and parent material in the Lebanon-Wilderness association.

About 40 percent of the acreage of this association is cleared. Most of the cleared areas are on ridges and stream bottoms. Pasture and hay are the major uses. Corn, soybeans, and garden crops are grown in small fields on the stream bottoms and foot slopes. A small acreage of grain sorghum is grown on the broad divide. The uncleared area, much of which is in the Mark Twain National Forest, has mixed hardwoods and pine.

In some areas of this association the soils are suited to cultivated crops. Slope and the hazard of erosion are the main limitations. Limited rooting depth causes the soils to be droughty. The soils throughout the entire mapped area are suited to pasture and hay, but production is highest on the wide ridges and stream bottoms.

These soils are suitable for trees but productivity is only medium to low. The fragipan limits rooting depth and windthrow is a hazard. Erosion is a hazard along logging roads and skid trails.

Soils in this association are generally suited to most urban uses. Slope is a limitation for building sites and sanitary facilities. Other limitations, caused by the fragipan, are wetness, slow permeability, and difficulty of excavation.

The extensive plant cover makes this association best suited to woodland wildlife. Providing food for the wildlife is the major need. Planting food plots and leaving areas in native grasses and weeds are practices that help to meet this need.

5. Delassus-Syenite association

Deep and moderately deep, gently sloping to steep, moderately well drained and well drained soils that formed in loess and granite residuum

This association is in the St. Francois Mountains but slope and relief are less than in the Irondale-Delassus association (fig. 8). The area was formed by a major intrusion of molten rock that contributed to the uplift of the Ozark Dome. The slope range is 2 to 25 percent.

This association makes up about 12 percent of the county. It is about 50 percent Delassus soils, 40 percent Syenite soils, and 10 percent soils of minor extent.

The Delassus soils are mainly at higher elevations than the Syenite soils. Delassus soils have a surface

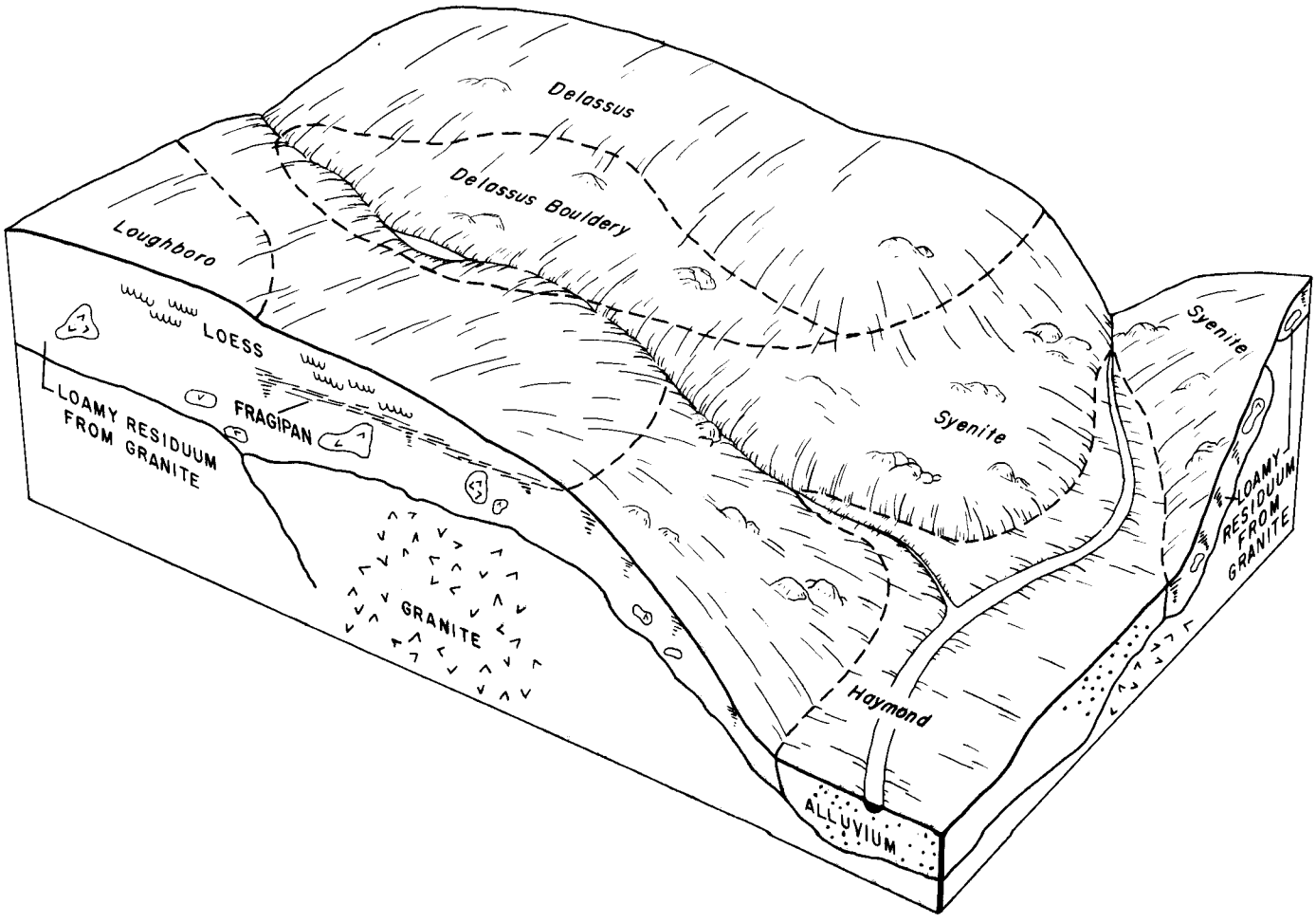

Figure 8.—Typical pattern of soils and parent material in the Delassus-Syenite association.

layer of dark brown silt loam and a subsurface layer of yellowish brown silt loam. The subsoil is brown silt loam and silty clay loam underlain by a dense, brittle, light brownish gray loam fragipan. Delassus soils are deep and moderately well drained.

Strongly sloping to steep Syenite soils are on bouldery side slopes. They have a very dark grayish brown extremely bouldery silt loam surface layer and a yellowish brown silt loam subsurface layer. The subsoil is brown silt loam and dark brown clay loam and is underlain by hard red granite at 30 inches. Syenite soils are moderately deep to hard rock and are well drained.

Of minor extent in this association are poorly drained Loughboro soils on the nearly level uplands and well drained Haymond soils on the small creek bottoms.

The soils in this association are used mainly for forest and pasture. Only a small acreage is used for cultivated crops. About 40 percent of the acreage is cleared. Boulders and the hazard of erosion are the main problems associated with use and management of these soils. Droughtiness limits plant growth on the upland soils, and flooding is common on the bottom lands.

The soils on broad ridges, foot slopes, and bottom lands are suited to pasture, hay, and livestock production. Erosion is the main limitation to pasture production, and droughtiness hinders summer growth. The soils on side slopes generally are not suited to hay production because many boulders are on the surface.

The soils in this association are suitable for trees. The woodland is dominantly white oak, northern red oak, post oak, and scattered shortleaf pine. Productivity is only moderate to low. Steepness and numerous boulders limit the use of logging equipment on side slopes. Erosion is a hazard along logging roads and skid trails.

In some areas of this association the soils are generally suitable for sanitary facilities and for building sites. Limitations and hazards to urban use include slow permeability, wetness, slope, and depth to rock. The soils are unsuitable for use as conventional septic tank absorption fields because of moderate depth to bedrock and slow permeability.

Wildlife in these soil areas are mostly woodland species. Wild turkey is the major species but some deer, squirrel, and fur bearing animals are present. The major concern in sustaining or improving wildlife populations is availability of food.

6. Irondale-Delassus association

Moderately deep and deep, moderately sloping to very steep, well drained and moderately well drained soils that formed in loess and rhyolite, felsite, or granite residuum

This association is in the St. Francois Mountains (fig. 9). The highest elevations in the county are represented in this association by such peaks as Brown Mountain, Stono Mountain, and Buck Mountain. These peaks were formed by the early volcanism that began the major uplift of the Ozark Dome. The terrain is dominantly rugged. The slope range is about 3 to 40 percent.

This association makes up 8 percent of the county. It is about 72 percent Irondale soils, 22 percent Delassus soils, and 6 percent soils of minor extent.

The Irondale soils are on the long side slopes of the mountains. They are moderately steep to very steep, moderately deep, well drained, and stony. They have a surface layer of very dark brown extremely stony silt loam and a subsurface layer of brown very cobbly silt loam. The subsoil is brown very cobbly silt loam and reddish brown very cobbly silty clay loam. It is underlain by hard rhyolite at 36 inches.

The Delassus soils are on talus slopes at the foot of mountains. They are moderately sloping, deep, and moderately well drained. They have a surface layer of dark brown silt loam and a subsoil of brown silty clay loam over a fragipan of light brownish gray loam.

Of minor extent in this association are moderately well drained Knobtop soils on mountaintops and somewhat excessively drained gravelly Midco soils on stream bottoms. There are also sizable areas of rock outcrop and waste rock from mines.

The soils in this soil association are mainly forested, but in the valleys they commonly are cleared and used for pasture. An estimated 25 percent of the acreage is cleared. The uncleared acreage consists of rough, steep mountains that generally have a cover of mixed hardwoods. Cultivated crops are grown only in a few garden plots in the valleys.

In the valleys the soils are suited to pasture, hay, and raising livestock. Generally, they are not suited to cultivated crops. The hazard of erosion is the main limitation. On the mountain slopes the soils are droughty, erodible, stony, and steep and generally unsuitable for cultivation or hay. The foot slopes are suitable for pasture and hay.

The soils in this association are suitable for trees. Production is commonly medium in the valleys and on northern exposures and low on mountaintops and southern exposures. Oak is dominant, but some pines are scattered throughout the association. The steep slopes and stones restrict the use of logging equipment. Erosion is a hazard along logging roads and skid trails.

In most places the soils generally are not suited to use as sites for sanitary facilities and buildings. Depth to rock, slope, and very slow permeability are the main limitations. In some valley areas the soils are suited to sewage lagoons and building sites. The soils are best suited to buildings without basements.

Woodland wildlife, especially turkeys, is abundant. Providing food for wildlife is the main management concern in this association. Supplying water may help sustain wildlife in some of the dry and isolated parts of this area.

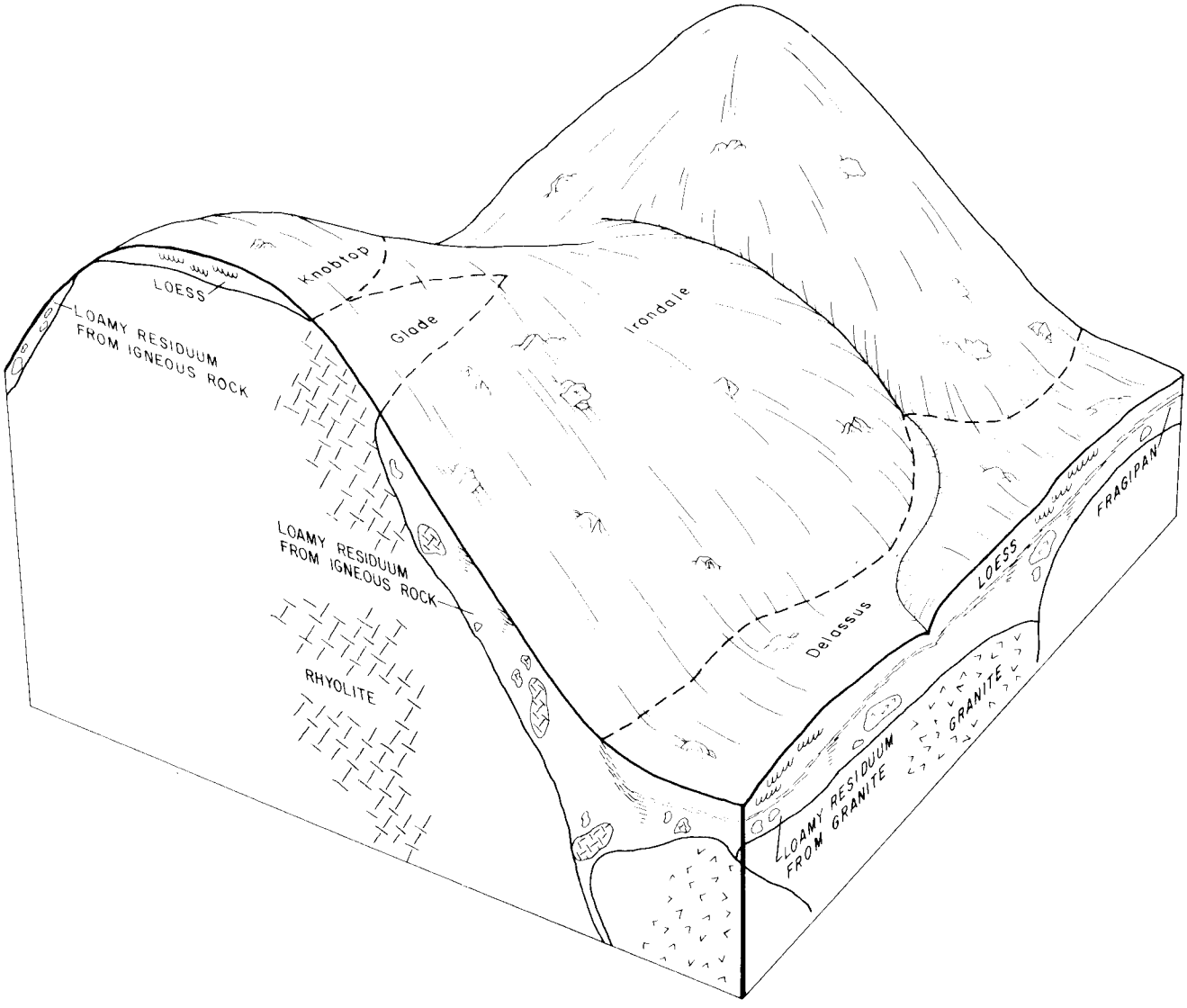

Figure 9.—Typical pattern of soils and parent material in the Irondale-Delassus association.

7. Jonca-Lamotte-Ramsey association

Deep and shallow, gently sloping to steep, moderately well drained to somewhat excessively drained soils that formed in loess and sandstone residuum

This association, part of the Farmington Plain, borders the St. Francois Mountains and occurs again on the extreme east boundary of the county. The area typically has mildly sloping ridgetops and strongly sloping to steep side slopes (fig. 10). The slope range is 2 to 35 percent.

This association makes up about 9 percent of the county. It is about 54 percent Jonca soils, 21 percent Lamotte soils, 15 percent Ramsey soils, and 10 percent soils of minor extent.

Jonca soils are on the ridgetops and divides. In most places they are higher on the landscape than Lamotte and Ramsey soils. The gently sloping and moderately sloping Jonca soils have a surface layer of dark brown silt loam and a subsoil of brown silty clay loam, clay loam, and loam underlain by a brown loam fragipan. They are moderately well drained.

The deep, moderately sloping and strongly sloping Lamotte soils are on side slopes. These soils are well drained. They have a surface layer of dark grayish brown silt loam and a subsurface layer of brown silt loam. The subsoil is brown silt loam, reddish brown clay loam, and loam. It is mottled in the lower part.

The moderately steep and steep Ramsey soils have a surface layer of very dark grayish brown very stony

sandy loam and a subsurface layer of brown sandy loam. The subsoil is strong brown cobbly sandy loam and is underlain by sandstone at 16 inches. Ramsey soils are somewhat excessively drained.

Of minor extent in this association are the moderately deep, well drained Lily soils on the uplands and the deep, well drained Haymond soils on the bottom lands.

About 65 percent of the acreage of this association is cleared. Most of the cleared areas are used for pasture and hay. Corn, grain sorghum, and wheat are grown on some ridges. Corn and soybeans are the main cultivated crops grown on the bottom lands and foot slopes. The uncleared acreage consists of short steep slopes that border streams, the adjacent side slopes, and some ridges that have a cover of mixed hardwoods.

The soils on ridges and narrow bottoms are suited to cultivated crops. Most side slopes are generally unsuitable for cultivation because of the hazard of erosion. Some fields are severely eroded. Most of the association is suited to pasture, hay, and raising livestock.

The soils in this association are suitable for trees. Oak-hickory forests are dominant but shortleaf pine are important in some woodlots. Windthrow is a hazard on the soils that have a rooting depth of less than two feet. Productivity is medium to high.

The soils are suited to sanitary facilities and building sites. The main limitations are slow permeability, shallowness to rock, and slope.

The suitability of the soils for openland wildlife habitat is fair. Providing adequate food for wildlife is a major management concern. In some parts of the area cover is not available.

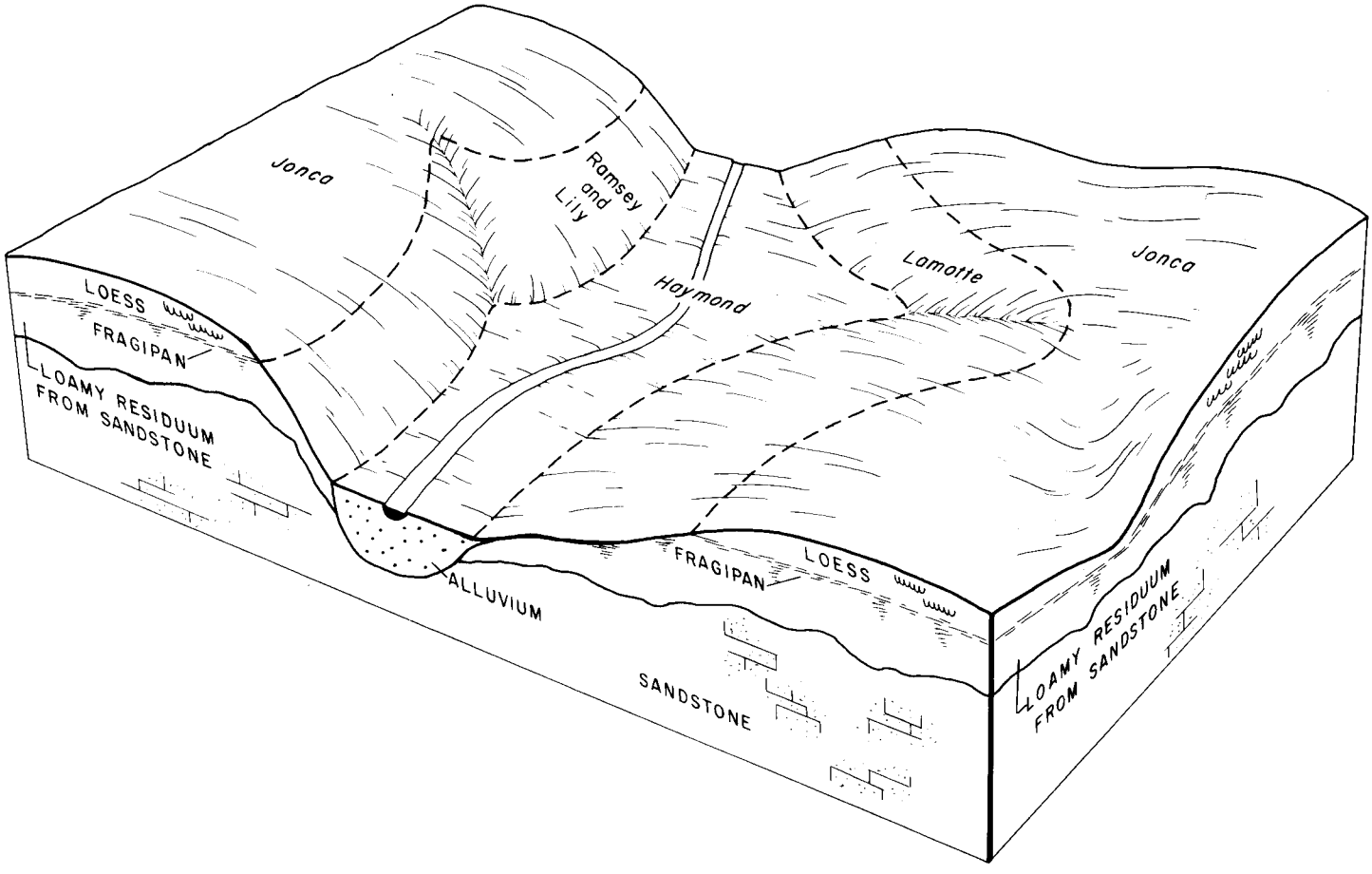

Figure 10.—Typical pattern of soils in the Jonca-Lamotte-Ramsey association.

detailed soil map units

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, boulderiness, 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, Delassus silt loam, 2 to 5 percent slopes, is one of several phases in the Delassus 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 that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Lily-Ramsey complex, 3 to 9 percent slopes, is an example.

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

This survey includes some *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Dumps, mine, is an example. Some miscellaneous areas are large enough to be delineated on the soil maps. Some that are too small to be delineated are identified by a special symbol on the soil maps.

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

soil descriptions

10A—Ashton silt loam, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on terraces that are slightly convex or very gently undulating. It is subject to flooding but only rarely. Individual areas of this map unit are irregular in shape but tend to be elongated and narrow and parallel to stream channels. They range from about 10 to 60 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 7 inches thick. The subsoil is brown silt loam about 34 inches thick. The substratum is dark yellowish brown silt loam to about 72 inches. In places the subsoil contains more sand. In places the dark surface layer is more than 10 inches thick. Also, in other places the surface layer is lighter in color.

Permeability is moderate, and surface runoff is slow. The available water capacity is high. Reaction throughout the profile ranges from neutral to medium acid. Natural fertility is high, and organic matter content is moderate. The surface layer is easily tilled, and root development is not restricted.

In most areas this soil is farmed. It is suited to corn, soybeans, small grain, and grasses and legumes. If the soil is used for cultivated crops, minimum tillage, returning crop residue to the soil, or applying other organic material to the soil on a regular basis helps to improve fertility, reduce crusting, and increase water infiltration. Some areas can be improved by the use of diversion terraces to protect them from upland runoff. Proper stocking, pasture rotation, and timely deferment of grazing reduce soil compaction and help to keep the pasture and the soil in good condition.

This soil is suited to trees. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation, by prescribed burning, or by spraying or cutting. There are no serious limitations to growing or harvesting trees.

This soil is suitable for dwellings without basements and for onsite waste disposal if structures are properly designed and installed. The use of this soil as a site for buildings is severely limited by the hazard of flooding; therefore, onsite investigation and knowledge of an area's flooding history are necessary to select building sites. Flooding is rare and of very short duration. The soil does not have sufficient strength to support vehicular traffic, but this can be overcome by adding suitable base material for local roads and streets.

This map unit is in capability class I and woodland ordination group 1o.

11A—Auxvasse silt loam, 0 to 3 percent slopes. This deep, nearly level, poorly drained soil is on second bottom, bench, and low upland positions. It is subject to rare flooding on second bottoms. Individual areas of this unit are commonly oval or oblong and range from 10 to 200 acres.

The surface layer typically is dark brown and brown silt loam about 7 inches thick. The subsurface layer is pale brown silt loam about 6 inches thick. The next layer, about 5 inches thick, is brown silty clay with pale brown silt coatings. The subsoil is grayish brown, mottled silty clay and silty clay loam about 15 inches thick. The substratum to about 70 inches is mottled gray and yellowish brown silt loam.

Permeability is very slow, and surface runoff is slow. The available water capacity is high. The surface layer is friable and easily tilled except when wet. It tends to puddle after hard rains, especially where some subsoil is mixed with the plow layer. This soil is strongly acid to extremely acid in the subsoil and varies widely in surface reaction because of local liming practices. It is low in natural fertility and very low in organic matter content. It has high shrink-swell potential in the subsoil. The upper 18 inches is saturated for extended periods during spring because of a perched water table. The clayey subsoil somewhat restricts root development.

This soil is used for cultivated crops, pasture, and some woodland. It is suited to corn, soybeans, and grain sorghum, but yields are reduced because of surface wetness and the slow movement of water and air through the soil. Artificial drainage helps remove excess water and chiseling aids in aeration of the subsoil.

Pasture plants that have taproot systems tend to die in winter on this soil because of frost heaving. Using plants with branch root systems, providing surface drainage, and controlling grazing to allow growth in late fall can help reduce winterkill.

This soil is suitable for trees, but most of the acreage is cleared. Seedling mortality and windthrow are moderate hazards. These hazards can be partly overcome by using larger planting stock than usual and by harvesting mature trees early. Harvesting operations should be scheduled for the dry part of the year. Competing vegetation can be controlled by site preparation, by prescribed burning, or by spraying or cutting.

This soil is suited to building site development and to onsite waste disposal if structures are properly designed and installed. In some areas, flooding is a severe limitation; therefore, onsite investigation and knowledge of the area's flooding history are necessary to select building sites. Foundations and footings should be designed to prevent structural damage caused by shrinking and swelling of the soil. Basements can be constructed to offset the soil's wetness and shrink-swell potential. This can be accomplished by adequate sealing and drainage and by reinforcing structures sufficiently to withstand swelling pressures.

Sewage lagoons work well on this soil, but conventional septic tank absorption fields fail because of the very slow permeability rate. The soil does not have sufficient strength to support vehicular traffic, but these limitations can be corrected by providing suitable base material for local streets and roads.

This map unit is in capability subclass IIIw and woodland ordination group 4w.

12B—Caneyville silt loam, 2 to 5 percent slopes. This moderately deep, gently sloping, well drained soil is on convex ridgetops. Where it is a major soil on the landscape, it is on irregularly shaped ridges that are several hundred acres in size. The main trunk ridges average 500 to 600 feet wide and one mile or more long. Narrow points extend from each trunk ridge. However, many areas are point ridges less than one mile long, which range from 20 to 100 acres in size.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is about 30 inches thick. The upper part of the subsoil is firm brown silty clay loam, the middle part is reddish brown firm silty clay, and the lower part is yellowish red silty clay. Gray dolomite is at a depth of about 35 inches. In some places the soil is more than 40 inches deep to bedrock.

Permeability is moderately slow, and surface runoff is slow to medium. Available water capacity is low. Reaction ranges from medium acid to mildly alkaline throughout. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled. Rooting depth is restricted by dolomite or dolomitic limestone bedrock at a depth of 20 to 40 inches (fig. 11).

This soil is suited to corn, soybeans, grain sorghum, and small grains. Grain sorghum is the preferred row crop because it withstands drought better than other row crops. Small grains, which grow in the spring, have more soil moisture available than row crops, which grow in the hotter part of the year. If this soil is used for cultivated crops, which require more tillage than small grains,

Figure 11.—The major restriction for use and management of the Caneyville soils is underlying bedrock that limits rooting depth and available water capacity. Depth is shown in feet.

erosion is a hazard. Minimum tillage, crop rotation, contouring, and returning crop residue to the soil are practices that reduce runoff and erosion. Terrace systems are applicable to some fields.

This soil is used for hay and pasture. Pastureland and hayland are effective uses in controlling erosion. Overgrazing and grazing when the soil is too wet, however, cause surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on grazing during wet periods help to keep the pasture and the soil in good condition. Common cool season grasses tend to become dormant during the dry, hot summers. Native warm season grasses are better able to reserve moisture for midsummer growth.

This soil is suited to trees, but only a few small areas remain in native hardwoods. Seedling mortality is moderate. Using special planting stock of a larger size than usual may be necessary to improve the survival in a stand. There are no other significant limitations to growing or harvesting trees.

This soil is suited to dwellings with basements, but depth to bedrock and shrink-swell potential are moderate limitations. These limitations can be overcome by constructing foundations above ground level or partly below and by reinforcing foundations. This soil does not have sufficient strength to support vehicular traffic, but this limitation can be overcome by adding suitable base material.

The soil is generally unsuitable for septic tank absorption fields because of the moderately slow permeability and the moderate depth to bedrock. The construction of sewage lagoons requires borrowing soil or ripping or blasting because of the moderate depth to bedrock. Sealant for the bottom of the lagoon may be needed to prevent excess seepage into fractures in the bedrock.

This map unit is in capability subclass IIIe and woodland ordination group 4c.

12C—Caneyville silt loam, 5 to 9 percent slopes. This moderately deep, moderately sloping, well drained soil is on upland side slopes, point ridges, and slopes above draws and drainageways. Long, irregularly shaped lobes are common. Individual areas range from 50 acres to several hundred acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil is reddish brown, firm silty clay loam and the lower part is dark reddish brown, firm silty clay and clay. Gray, hard-bedded dolomite is below the subsoil. In places most or all of the original surface layer has eroded. In a few places the soil is more than 40 inches to bedrock.

Included with this soil in mapping are a few small areas of shallow Gasconade soils. A few sinks are present near Desloge. Also included in mapping are wet gray soils that occur as seeps, wet spots, or narrow bands where thin layers of shale outcrop on slopes. These soils make up about 15 percent of the map unit.

Permeability is moderately slow, and surface runoff is medium. Available water capacity is low. Reaction ranges from medium acid to mildly alkaline. Natural fertility is medium, and the organic matter content is moderately low. Rooting depth is restricted by dolomite or dolomitic limestone bedrock.

This soil is used mainly for hay, pasture, and trees. Pastureland and hayland are effective uses in controlling erosion. Overgrazing and grazing when the soil is wet, however, cause compaction, excess runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on grazing during wet periods help to keep the pasture and the soil in good condition. Native grasses are the best suited to pasture and hay.

This Caneyville soil is suited to trees, but only a few small wooded areas remain. Trees are commonly

eastern redcedar and upland oaks. In areas having trees or sparse tree cover, soils are generally stony, flaggy, and shallow. Seedling mortality is moderate. Using special planting stock of a larger size than usual may be necessary to improve the survival rate in a stand. There are no other significant limitations to growing or harvesting trees. However, expected yields are only fair to poor.

This soil is suited to soybeans and corn, but it is better suited to grain sorghum and small grains. Grain sorghum withstands drought better than other row crops. Small grains, which grow in the cooler seasons, have more soil moisture available than do row crops, which grow in the hotter part of the year. Corn is not grown extensively on this Caneyville soil. When it is grown, it can be planted early and an early maturing variety can be used to avoid as much of the late dry summer as possible. Moisture loss and soil loss can be reduced by no-till practices. If this soil is used for cultivated crops, which require more tillage than grain sorghum and small grains, erosion is a severe hazard. Minimum tillage, terrace systems, contouring, crop rotation, and returning crop residue to the soil help reduce runoff and erosion.

This soil is suited to buildings without basements, but depth to bedrock and shrink-swell potential are moderate limitations. These limitations can be overcome by constructing dwellings above ground level or partly below and by reinforcing foundations. This soil does not have sufficient strength to support vehicular traffic, but this limitation can be corrected by adding suitable base material.

This soil is generally unsuitable for use as septic tank absorption fields because of the moderately slow permeability and the moderate depth to bedrock. The construction of sewage lagoons may require borrowing soil or difficult ripping or blasting because of the moderate depth to bedrock. Sealant for the bottom of the lagoon may be needed to prevent excess seepage into the bedrock.

This map unit is in capability subclass IVe and woodland ordination group 4c.

12D—Caneyville silt loam, 9 to 14 percent slopes. This moderately deep, strongly sloping, well drained soil is on upland side slopes bordering draws, branches, and creek bottoms. Individual areas are commonly long and narrow and range from 10 to 200 acres.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is dark reddish brown silty clay and reddish brown and dark yellowish brown clay. Bedded dolomite is below the subsoil. In a few places the soil is more than 40 inches deep to bedrock and in some spots the soil has a lighter colored surface layer. In many places the subsoil is brown.

Included with this soil in mapping are some small stony areas amounting to about 10 percent of the map unit.

Permeability is moderately slow, and surface runoff is medium. Available water capacity is low. Reaction ranges from medium acid to mildly alkaline throughout the profile. Natural fertility is medium, and organic matter content is moderately low. Root development is restricted by dolomite or dolomitic limestone bedrock.

Most areas are used for pasture, hay, and trees. Most wooded areas are grazed. This soil is generally unsuitable for cultivated crops because of droughtiness and the hazard of erosion.

Pasture and hayland provide adequate cover to control erosion if properly managed. Overgrazing and grazing when the soil is wet cause surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and the soil in good condition. Native grasses such as big bluestem, indiangrass, and switchgrass grow better and provide better cover during the summer than most common grasses.

This soil is suited to trees and nearly one-half of the acreage remains in native hardwoods. Seedling mortality is moderate. Using a special planting stock of a larger size than usual may be necessary to improve the survival rate. There are no other significant limitations to growing or harvesting trees. However, production is low except where bedrock fractures provide additional rooting depth.

This soil is generally unsuitable for most sanitary facilities, building site development, and roads because of the steepness of slope and the depth to bedrock. The moderate depth limits the soil's suitability for water impoundment. A foot or more of soil material should be left above bedrock to reduce seepage. Areas that have sinks should not be used for water impoundment.

This map unit is in capability subclass VIe and woodland ordination group 4c.

13E—Caneyville stony silt loam, 14 to 20 percent slopes. This moderately deep, moderately steep, well drained soil is on somewhat elongated upland side slopes or V-shaped draws. Individual areas range from 20 to 100 acres.

Typically, the surface layer is dark brown stony silt loam about 7 inches thick. Stones make up about .01 to 0.1 percent of the surface layer. The subsoil is reddish brown and yellowish brown silty clay and is underlain by bedded dolomite at about 31 inches. The dolomite surface is irregular, and depth to bedrock varies within short distances.

Included with this soil in mapping are areas of shallow Gasconade soils. These soils make up about 15 percent of the map unit.

Permeability is moderately slow, and surface runoff is rapid. Available water capacity is low. Reaction ranges from medium acid to mildly alkaline. Natural fertility is medium, and organic matter content is moderately low. Root development is restricted by dolomite or dolomitic limestone bedrock.

This soil is used for trees and pasture. The soil is suitable for pasture, an effective use in controlling

erosion. Removing surface stones facilitates the establishment and harvesting of hay. Prevention of overgrazing by proper stocking, pasture rotation, and timely deferment of grazing keep the pasture and the soil in good condition. Some native grasses are suitable for pasture and hay and provide a desirable alternative to fescue and orchardgrass.

This soil is suited to trees. The steepness of slope is the main concern in woodland management. Because of the slope, erosion is a hazard and the use of equipment is limited at harvest time. These limitations can be overcome by carefully selecting and managing roads and skidding trails. Seedling mortality is moderate on south- and west-facing slopes. Using special planting stock of a larger size than usual may be necessary to improve the survival rate.

This soil is generally unsuitable for sanitary facilities because of limited soil depth and excessive slope.

This map unit is in capability subclass VIe and woodland ordination group 4r.

14A—Carr fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on flood plains of rivers, creeks, and drainageways. Individual areas are long, narrow strips that border the natural meandering stream channel. This soil is subject to frequent flooding of short duration. Areas range from 10 to about 200 acres.

Typically, the surface layer is brown fine sandy loam about 6 inches thick. The substratum to 60 inches or more has stratified layers of brown loamy fine sand, brown fine sandy loam, dark grayish brown loam, and light yellowish brown sand. It is mildly alkaline and calcareous throughout. Along Doe Run Creek and some other streams the soil is noncalcareous.

Permeability is moderately rapid, and surface runoff is slow. The available water capacity is moderate, and during the growing season soil moisture is commonly not adequate for summer growing annuals. Reaction is mildly alkaline or moderately alkaline. Natural fertilility is high, and the organic matter content is low. The surface layer is friable and easily tilled. Rooting is commonly unhindered to a depth of 5 feet or more.

In places, this soil is farmed. Some areas bordering the stream channels remain forested. The soil is suitable for cultivated crops. However, production of corn, soybeans, and other summer annuals is commonly below peak levels because adequate soil moisture is not available. Local water supplies from streams or shallow wells can be used to a limited extent for irrigation. Small grains are subject to flood damage. Overflow is most common during late winter or spring, which coincides with the growing season of small grains.

Flooding is a hazard for grazing livestock. There are no other significant limitations to using this soil for pastureland or hayland. Most flooding is before the haymaking season.

This soil is suited to trees, and about 20 percent of the acreage is forested. The rate of seedling survival may be increased by selecting species that tolerate sandy, droughty conditions. Planting and harvesting should be scheduled to avoid the normal flooding season.

This soil is generally not suited to building site development or to onsite waste disposal because of flooding.

This map unit is in capability subclass IIs and woodland ordination group 3o.

15B—Crider silt loam, 2 to 5 percent slopes. This deep, gently sloping, well drained soil is on convex ridgetops and the upper end of drainageways. Individual areas of this soil are narrow to wide and smooth to irregular in shape, and 10 to 500 acres or more in size. Some broad ridgetop areas are more than one quarter mile wide.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is more than 52 inches thick. The upper part of the subsoil is dark brown and reddish brown silty clay loam, and the lower part is dark red, firm silty clay loam and silty clay. In some places the lower part of the subsoil contains a few light brownish gray or grayish brown mottles.

Included with this soil in mapping are small areas of Caneyville and Nicholson soils. The well drained Caneyville soils are on point ridges and the moderately well drained Nicholson soils are in small areas on points, saddles, and other slightly lower positions. Together they make up about 8 percent of the map unit.

Permeability is moderate, and runoff is medium. Available water capacity is high. Reaction ranges from very strongly acid to neutral in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and organic matter content is moderately low. The surface layer is friable and easily tilled through a wide range of moisture content. There are no serious restrictions to root development.

Most areas of this soil are farmed or have been cultivated. This soil is suited to corn, soybeans, grain sorghum, small grains, and grasses and legumes. If the soil is cultivated, erosion is a slight to moderate hazard. Minimum tillage, winter cover crops, contouring, and crop rotation reduce excessive soil loss. Returning crop residue to the soil or applying other organic material on a regular basis helps improve fertility, maintain tilth, and increase water infiltration.

Pastureland or hayland are effective uses in controlling erosion on this soil. Overgrazing, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help keep the pasture and the soil in good condition. This soil is suited to grasses and legumes, including alfalfa.

This soil is suited to trees and a few small areas remain in native hardwoods. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by

site preparation, by prescribed burning, or by spraying or cutting. There are no significant limitations to planting or harvesting trees.

This soil is suitable for building sites and septic tank absorption fields if proper design and installation procedures are used. In reservoir areas, exposed portions of the lower subsoil leak freely. Excessive seepage from lagoons, ponds, or lakes can be prevented by special treatment to seal the reservoir area.

This map unit is in capability subclass IIe and woodland ordination group 3o.

15C—Crider silt loam, 5 to 9 percent slopes. This deep, moderately sloping, well drained soil is on upland side slopes bordering small streams and drainageways. Individual areas are long, narrow, and parallel to streams or are leaf-shaped around the upper end of drainageways. Areas are commonly several hundred acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil to a depth of about 72 inches is brown and reddish brown silty clay loam in the upper part and red and dark red silty clay in the lower part.

Included with this soil in mapping are small areas of the moderately well drained Fourche soils and the well drained Caneyville soils. These soils make up about 10 percent of the map unit.

Permeability is moderate, and runoff is medium. Available water capacity is high. Reaction ranges from very strongly acid to neutral in the subsoil, but varies widely in the surface layer as a result of local liming practices and erosion. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled. There are no serious restrictions to root development throughout the solum.

In most places this soil is farmed or has been farmed. It is suited to corn, soybeans, grain sorghum, small grains, and grasses and legumes. If the soil is used for cultivated crops, erosion is a hazard. Minimum tillage, winter cover crops, terrace systems, contour tillage, and crop rotations reduce excessive soil loss. Returning crop residue or regularly applying other organic material helps improve fertility, maintain tilth, and increase water infiltration.

Pastureland or hayland are effective uses in controlling erosion on this soil. Overgrazing, however, causes erosion, surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and the soil in good condition.

This soil is suited to trees, and a few small areas remain in native hardwoods. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed by proper site preparation, by prescribed burning, or by spraying or cutting. There are no significant limitations to planting or harvesting trees.

This soil is suitable for building sites and for septic tank absorption fields if structures are properly designed and installed. Excess seepage from lagoons, ponds, and lakes can be prevented by special treatment to seal the reservoir area.

This map unit is in capability subclass IIIe and woodland ordination group 3o.

15D—Crider silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is on upland side slopes. Individual areas are irregularly shaped, commonly narrow and elongated, and 10 to 100 acres.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is about 63 inches thick. The upper part of the subsoil is reddish brown and yellowish red silty clay loam. The lower part is red silty clay and is underlain by dolomite or dolomitic limestone at about 68 inches. In spots, erosion has removed the surface layer, exposing the silty clay loam. In several places, erosion has created gullies. In some small areas the depth to hard rock is less than 60 inches.

Permeability is moderate, and runoff is medium. The available water capacity is high. Reaction ranges from neutral to very strongly acid in the subsoil. Natural fertility is medium, and the organic matter content is low. The surface layer is friable and easily tilled. Eroded spots can make seedbed preparation difficult.

In most areas this soil is used for pasture and hay. A few small areas are in trees. Most open fields have been used for cultivated crops. This soil is suited to corn, soybeans, and grain sorghum but is seldom used for these crops because erosion is a severe hazard and eroded spots are common.

Some areas have been severely eroded from past use. Terrace systems, crop rotation, minimum tillage, contouring, and winter cover crops reduce excessive soil loss. Returning crop residue to the soil and adding other organic material help to improve fertility, maintain tilth, and increase water infiltration. These practices are especially important for renovation of eroded areas.

Pastureland and hayland, if well established and maintained, are effective uses in controlling erosion. Overgrazing, however, can cause surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, and timely deferment of grazing help keep the pasture and the soil in good condition.

There are no severe limitations to planting and harvesting trees. Plant competition is moderate. It can be reduced by site preparation, spraying, or cutting.

This soil is suitable for use as a building site and for use as septic tank absorption fields if structures are properly designed and installed. The steepness of slope can be offset for these uses by landscaping and designing structures to fit the slope. The lower part of the subsoil is kaolinitic clay. If it is exposed in a reservoir area, seepage is a hazard. Excess seepage from lagoons, ponds, and lakes can be prevented by special treatment to seal the reservoir area.

This map unit is in capability subclass IVe and woodland ordination group 3o.

16B—Delassus silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on broad, convex upland ridgetops and plateaus. Individual areas of this unit are somewhat circular or elongated, have uneven or irregular boundaries, and range from 50 to several hundred acres. Some areas are on foot slopes below mountain peaks.

Typically, the surface layer is dark brown silt loam about 3 inches thick. It is underlain by a 4-inch yellowish brown silt loam subsurface layer. The subsoil is brown silt loam and silty clay loam about 19 inches thick. It is underlain by a buried surface layer, about 5 inches thick, of light yellowish brown silt loam. The next layer is a fragipan of multicolored, brittle loam about 30 inches thick. It is underlain by hard granite. In some places, especially where the soil is forested, there are stones and boulders, but they cover less than 0.01 percent of the surface.

Included with this soil in mapping are a few small areas of poorly drained Loughboro soils, which make up about 5 percent of the map unit.

Permeability is moderate in the upper part of the profile but very slow through the fragipan. Surface runoff is medium. The available water capacity is low. Reaction ranges from strongly acid to extremely acid in the subsoil. Natural fertility and organic matter content are low. A seasonal high water table is at a depth of 2 to 3 feet. The surface layer is friable and easily tilled but stones and boulders are a slight hindrance in some areas. Low fertility and the fragipan restrict rooting (fig. 12).

About 65 percent of the acreage of this soil is cleared and used for pasture and hay. Only about 5 percent is cultivated. The rest supports a fair growth of mixed hardwoods. Some areas are somewhat isolated, surrounded by the steep, bouldery Syenite soils. This soil is suited to corn, grain sorghum, small grains, and most grasses and legumes for pasture and hay. It has a moderate erosion hazard if used for cultivated crops and it is also droughty. Minimum tillage, crop rotation, returning crop residue to the soil, or adding other organic material are practices which help to prevent excessive soil loss, improve fertility and tilth, and increase water infiltration. Water for irrigation is commonly unavailable. Some fields are long enough and smooth enough for terrace systems and farming on the contour. A well-planned fertility program can raise soil nutrients to a level that is suitable for growing most crops. This soil is commonly too wet to cultivate in early spring and dry enough to be droughty in mid and late summer.

Pastureland or hayland are effective uses in controlling erosion. The length of the grazing period can be increased by using some native grasses. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees, and about one-third of the acreage remains in native hardwoods and a few scattered shortleaf pine. Rooting depth is limited by the fragipan and there is a slight windthrow hazard, depending on the thickness of the soil material above the fragipan. Harvesting mature trees eliminates most of the windthrow hazard. Saturation of the surface layer and upper part of the subsoil by the seasonal perched water table is an equipment limitation. The skidding, loading, and hauling of logs can be done during dry periods.

This soil is suitable for building sites, roads, and sewage lagoons if structures are properly designed and installed. Wetness and shrink-swell damage can be prevented by foundation and basement construction that assures adequate sealing, drainage, and extra reinforcement in footings and foundations. Very slow permeability and seasonal wetness make the soil generally unsuitable for conventional septic tank absorption fields. Sewage lagoons are limited by slope

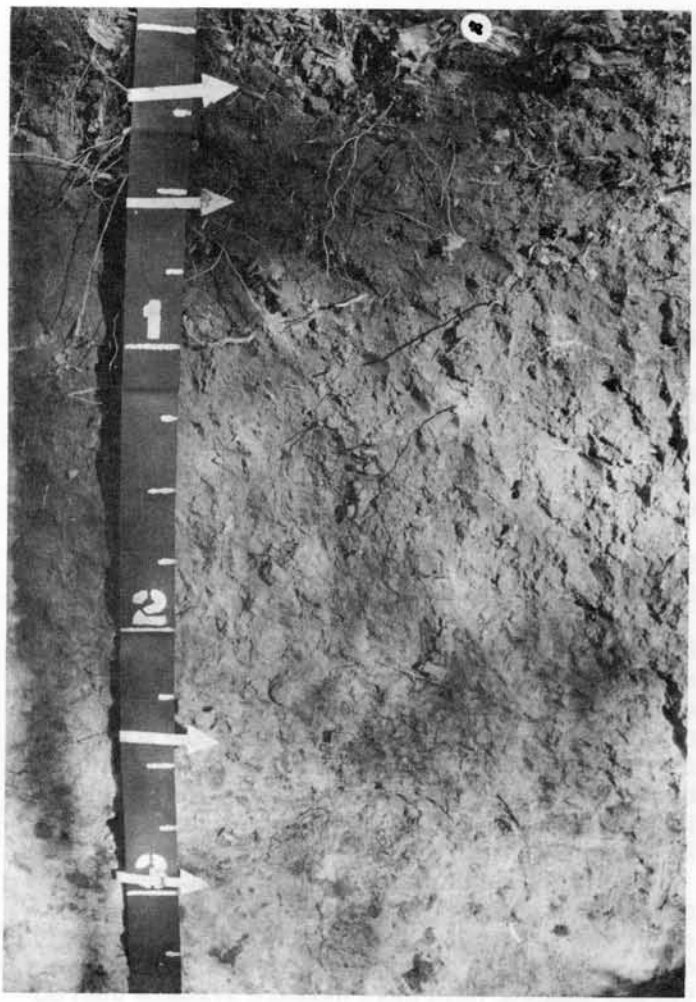

Figure 12.—Delassus soils have a strongly developed fragipan below about 30 inches that stops downward movement of roots, water, and air. Depth is shown in feet.

but can be successful if designed and constructed to fit the slope.

This map unit is in capability subclass IIe and woodland ordination group 4o.

16C—Delassus silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on upland positions bordering the broad ridgetops and plateaus, along drainageways, and on foot slopes below steep mountainous areas. Individual areas are irregularly shaped and range from 20 to 300 acres in size.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is brown silty clay loam about 20 inches thick. The next layer is a fragipan of mottled silt loam and loam. It is underlain by hard granite at about 60 inches. Stones and boulders cover less than 0.01 percent of the surface.

Included with this soil in mapping are small areas of Syenite soils and some shallow soils that make up about 5 percent of the map unit.

Permeability is very slow because of the underlying fragipan. Runoff is medium, and available water capacity is low. Reaction ranges from extremely acid to strongly acid in the subsoil. Natural fertility and organic matter content are low. A seasonal high water table is at a depth of 2 to 3 feet. Commonly, there are sufficient boulders on the surface to be noticeable but not to make tillage impractical. Rooting depth is restricted by the fragipan.

This soil is suited to summer-growing annuals such as corn and soybeans, but other crops such as grain sorghum may be grown because they are better able to resist damage from drought. Small grains, which grow in the wet seasons, have more moisture available than do row crops, which grow in the summer. Row crops should be planted early. Early maturing varieties can be used to avoid the dry season as much as possible. No-till or other minimum tillage practices help to reduce soil and moisture loss. Terrace systems, crop rotation, contour farming, returning crop residues to the soil, and adding other organic material help to reduce runoff, prevent excessive soil loss, improve fertility, and increase water infiltration.

Properly managed pastureland and hayland are effective in controlling erosion. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and the soil in good condition. Native grasses can be used for summer grazing or late summer hay.

About 70 percent of the acreage of this soil is in native timber. This soil is suited to both native hardwood trees and shortleaf pine. Rooting depth is limited by the fragipan, and there is a slight windthrow hazard depending on the thickness of the soil above the fragipan. Timely harvesting of mature trees eliminates most of the windthrow hazard. Equipment limitations occur only during periods of prolonged wetness. The skidding, loading, and hauling of logs can be done during dry periods.

This soil is suitable for building sites and sewage lagoons if structures are properly designed and installed. Depth to rock and slope are limitations for sewage lagoons, but these can be overcome by careful site selection and proper design and construction. Areas can be graded to modify the slope. Basement construction that provides adequate sealing, drainage, and reinforcement in footings and foundations can overcome the wetness and prevent damage from shrinking and swelling. Very slow permeability and seasonal wetness make the soil unsuitable for conventional septic tank absorption fields.

This map unit is in capability subclass IIIe and woodland ordination group 4o.

17C—Delassus bouldery silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on ridges, side slopes, and foot slopes. Individual areas of this map unit are irregular in shape but are commonly long and narrow or oblong. Areas range from 10 to 500 acres.

Typically, the surface layer is brown bouldery silt loam about 7 inches thick. The subsoil is brown silty clay loam and dark yellowish brown clay loam about 17 inches thick. It is underlain by a fragipan of yellowish brown loam which extends to 50 inches. The substratum to about 68 inches is light brownish gray clay loam. Boulders about 3 feet in diameter and 100 feet apart are on about 0.1 percent of the surface.

Included with this soil in mapping are small areas of Syenite soils and rock land that make up about 5 percent of the map unit.

Permeability is very slow because of the fragipan. Runoff is medium, and available water capacity is low. Reaction ranges from extremely acid to strongly acid in the subsoil and is very strongly acid or extremely acid in the fragipan. Natural fertility and the organic matter content are low. A seasonal high water table is at a depth of 2 to 3 feet. Boulders are numerous enough to interfere with tillage or other operations requiring equipment. Low fertility and the fragipan restrict rooting depth.

Most of the acreage of this soil is in native timber. About 15 percent has been cleared and is used mainly for pasture. Essentially none is used for cultivated crops and only a very small amount is used for hay. This soil is suited to pasture, but boulders and stones are a continual nuisance during mowing or tillage and can damage equipment. This soil is also subject to severe erosion and droughtiness. Pastureland and hayland commonly have no erosion problems. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and soil in good condition. Some native grasses are suitable for hay and pasture, especially for summer grazing or late summer hay.

This soil is suited to both native hardwood trees and shortleaf pine. Rooting depth is limited by the fragipan, and there is a slight windthrow hazard depending on the thickness of the soil above the fragipan. Harvesting mature trees eliminates those most susceptible to windthrow. Surface stoniness is a moderate limitation to the use of tree planting equipment. In some areas it may be necessary to plant seedlings by hand or use direct seeding.

This soil is suitable for building site development and onsite waste disposal if structures are properly designed and installed. Dry basements can be maintained if excess water is drained and the basement walls are adequately sealed. Low strength and poor stability for vehicular traffic can be corrected by strengthening or replacing the base material. This soil is generally unsuitable for septic tank absorption fields because of very slow permeability and seasonal wetness. Slope is a limitation for sewage lagoons but can be overcome by careful site selection and proper design and construction. Sites can be graded to modify the slope.

This map unit is in capability subclass VIe and woodland ordination group 4x.

18—Dumps, mines. This miscellaneous area consists of chat dumps of dolomitic material that was crushed to gravelly coarse sand during lead mining. The dumps are very steep (slopes ranging from about 20 to 50 percent), white, dome-shaped hills that are 50 to 250 feet high and 30 to more than 100 acres (fig. 13).

This excessively drained dolomitic material does not show any significant alteration by weathering. It is gray, grayish brown, or light brownish gray coarse sand or fine

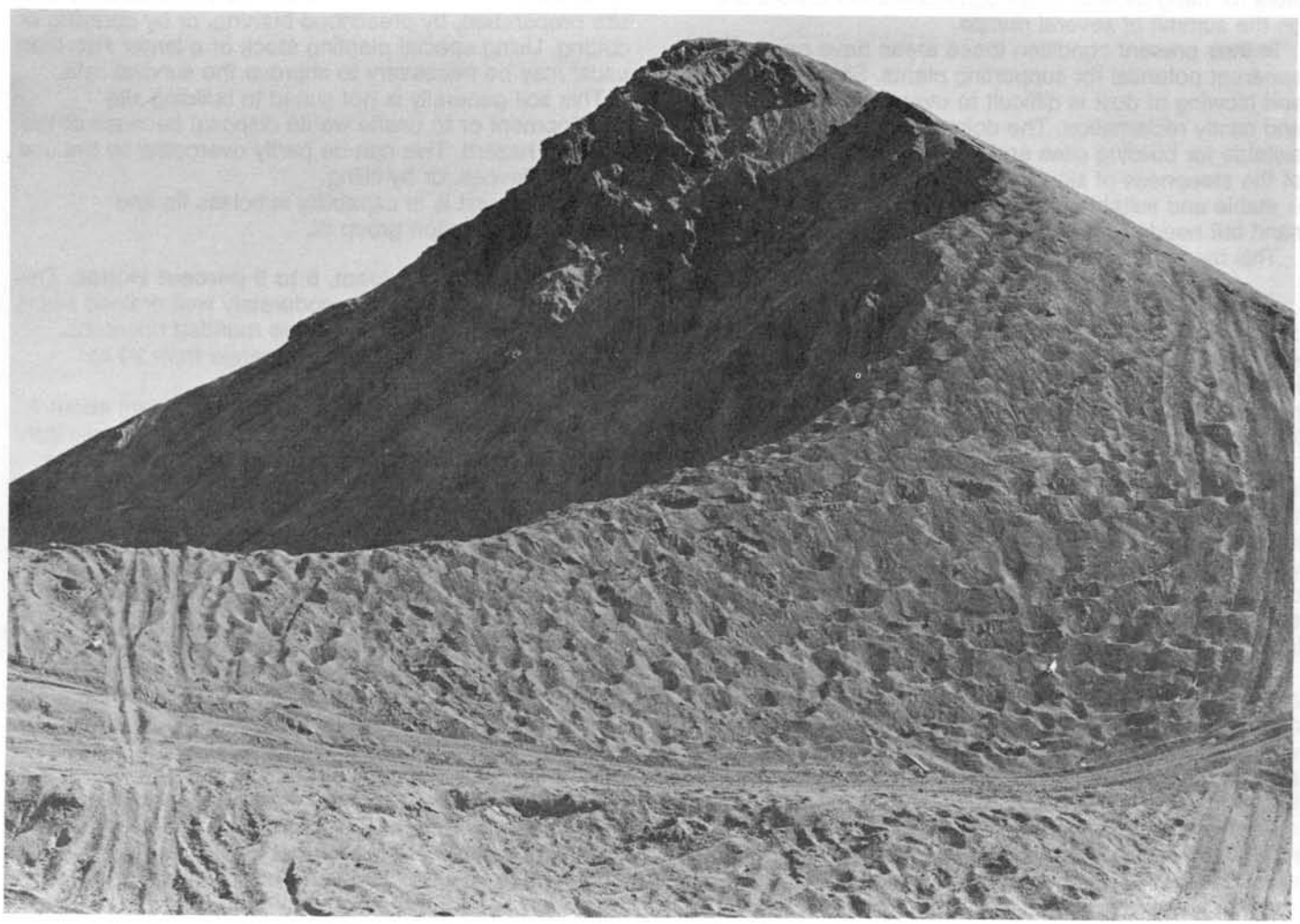

Figure 13.—The chat dumps are unique manmade landforms, reminders of early lead mining in the county.

gravel (2 to 10 millimeters in diameter). It is similar to Psamments, 0 to 9 percent slopes; however, it is much steeper and more droughty and does not support vegetation.

Permeability is very rapid, and even though the dolomitic material is very steep most precipitation is absorbed into the surface. Available water capacity is very low. The material is mildly or moderately alkaline throughout and effervesces when treated with dilute hydrochloric acid. It does not have a sufficient balance of nutrients to support plants. Organic matter content is very low or essentially nonexistent.

This material is used as a source of agricultural lime (fine portion), road material (coarse portion), asphalt mix, and fill material. It has long been a distinctive landmark of the old "Lead Belt Area," which has gained some measure of esthetic value. It captures the attention of travelers both on the ground and in the air. In recent years, some dumps have been used as recreation areas for off-the-road vehicles and hikers and as launching sites for hang gliders. Small communication towers are on the summit of several dumps.

In their present condition these areas have no apparent potential for supporting plants. Slight drifting and blowing of dust is difficult to overcome without major and costly reclamation. The dolomitic material is not suitable for building sites and sanitary facilities because of the steepness of slopes. The material, when leveled, is stable and suitable for building sites. It is a source of sand but needs screening to separate excess fines.

This map unit is not assigned to interpretive groupings.

19A—Elsah silt loam, 0 to 3 percent slopes. This deep, nearly level, well drained soil is on narrow branch and creek bottoms. It is subject to frequent flooding. Individual areas of this map unit are commonly long, narrow strips that range in size from 20 to more than 200 acres.

Typically, the surface layer is very dark grayish brown silt loam about 6 inches thick. A transition layer below that is brown silt loam about 12 inches thick. The substratum to a depth of 60 inches or more is brown and yellowish brown very cherty loam. In some places the dark surface layer is more than 10 inches thick. Also, in some areas the depth to cherty alluvium is more than 24 inches. Some areas contain more sand.

Included in mapping and making up about 15 percent of the map unit are areas of the somewhat excessively drained cherty Midco soils and a few small areas of the well drained Ashton soils. Midco soils are adjacent to the stream channel and Ashton soils are on high bottoms or foot slopes.

Permeability is moderate in the upper 18 inches and moderately rapid in the lower part of the profile. Surface runoff is slow. Frequent, very brief periods of flooding occur in winter and spring. Available water capacity is moderate. Reaction ranges from neutral to medium acid. Natural fertility is medium, and organic matter content is moderately low. The surface is friable and easily tilled. Root development is restricted slightly by the cherty substratum.

Most areas of this soil are cleared and used for pasture. Only a small acreage is cultivated. This soil is suited to corn, soybeans, small grain, grasses, and legumes but is subject to flooding and droughtiness. The hazard of flooding is most severe in early spring. Clearing the stream channel of obstructions and using dikes, levees, and diversions help prevent excess flooding and scouring. Returning crop residues to the soil or adding other organic material on a regular basis help to improve fertility, reduce crusting, and increase water infiltration. Pasture can be kept in good condition by proper stocking, pasture rotation, and timely deferment of grazing.

This soil is suited to trees, and a few areas remain in native hardwoods. Plant competition and seedling mortality are moderate. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation, by prescribed burning, or by spraying or cutting. Using special planting stock of a larger size than usual may be necessary to improve the survival rate.

This soil generally is not suited to building site development or to onsite waste disposal because of the flooding hazard. This can be partly overcome by the use of dikes, levees, or by filling.

This map unit is in capability subclass IIs and woodland ordination group 3f.

20C—Fourche silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on side slopes, points, and some rounded ridgetops. Areas are irregular in shape and range from 20 to several hundred acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil to about 60 inches is yellowish brown silt loam and brown silty clay loam in the upper part, yellowish red silty clay loam in the middle part, and yellowish red and strong brown, mottled silty clay in the lower part. In places, the surface layer is silty clay loam because severe erosion has removed most or all of the original topsoil. In some places the depth to bedrock is less than 60 inches.

Included with the soil in mapping are small areas of the moderately deep Caneyville soils, which make up about 10 percent of the unit.

Permeability is moderately slow, and runoff is medium. Available water capacity is high. Reaction in the upper part of the subsoil is very strongly acid to medium acid, but in the lower part it ranges from very strongly acid to mildly alkaline. Reaction in the surface layer varies widely as a result of erosion and local liming practices. The surface layer is friable and easily tilled, but tillage and other farming practices may be delayed from several days to two weeks by numerous seepy spots and by a seasonal high water table which is at a depth of 1.5 to 3

feet. Natural fertility is medium, and the organic matter content is moderately low.

This soil is used for hay, pasture, and some cultivated crops. It is suited to corn, soybeans, and grain sorghum. However, erosion is a severe hazard in cultivated areas of this soil. Using minimum tillage, winter cover crops, and crop rotation help to prevent excessive soil loss. Some slopes are long enough and smooth enough to be terraced and farmed on the contour. Returning crop residue to the soil or adding other organic material on a regular basis help to reduce soil loss, improve fertility, prevent excess crusting, and increase water infiltration.

This soil is suited to grasses and legumes for hay and pasture, which are effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, cause surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricting use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees, but only a few small areas remain in native hardwoods. Tree seeds, cuttings, and seedlings survive and grow well. There are no significant limitations to planting, growing, or harvesting trees.

This soil is suited to building site development and onsite waste disposal, but good design and construction procedures are needed to overcome the limitations of wetness, shrink-swell, and slope. Wetness on building sites can be overcome by draining excess water and by sealing basement walls. Extra reinforcement, sand and gravel cushions, or backfilling with other suitable material can be used to prevent damage from shrink-swell. Moderately slow permeability and wetness restrict the use of this soil for conventional septic tank absorption fields. Slope and wetness are severe limitations for sewage lagoons. The slope can be modified by grading. Sealing the bottom of sewage lagoons helps to prevent the contamination of ground water. Low strength for vehicular traffic can be corrected by adding suitable base material.

This map unit is in capability subclass IIIe and woodland ordination group 3o.

20D—Fourche silt loam, 9 to 14 percent slopes. This deep, strongly sloping, moderately well drained soil is commonly on side slopes bordering the larger creeks. Areas are small, ranging from about 20 to 50 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is yellowish brown silty clay loam in the upper part and yellowish red silty clay with grayish brown mottles in the lower part. Dolomite bedrock is at 63 inches. In places the surface layer is yellowish brown silty clay loam. Also, in a few areas bedrock is at a depth of less than 60 inches.

Permeability is moderately slow, and runoff is medium. Available water capacity commonly is moderate, but it ranges to high. Reaction in the upper part of the subsoil is very strongly acid to medium acid, but reaction in the lower part ranges from very strongly acid to mildly alkaline. Some spots are seepy and wet during part of the year and the soil is erodible. Natural fertility is medium, and organic matter content is moderately low. The water table is at a depth of 1.5 to 3 feet for short periods in winter and spring.

In most areas this soil is used for pasture or remains forested. This soil generally is not suitable for continuous cultivation of crops under conventional tillage methods. No-till or other minimum tillage practices help to prevent excessive soil loss if corn, soybeans, or grain sorghum are grown.

Grasses and legumes for pastureland or hayland are effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees and a few small areas remain in native hardwoods. There are no significant limitations to planting, growing, or harvesting trees.

This soil is suited to building site development and onsite waste disposal if structures are properly designed and installed. The wetness and moderately slow permeability rate make the soil generally unsuitable for conventional septic tank absorption fields. The slope and wetness are severe limitations for sewage lagoons, but these limitations can be overcome by special design and site preparation. Artificial drainage or diversions can reduce wetness at sites for dwellings. Wetness, shrink-swell, and slope are moderate limitations for dwellings without basements. These limitations can be corrected by proper site preparation, reinforcement of structures to prevent damage from shrinking and swelling, and installation of tile drainage to prevent excessive wetness.

This map unit is in capability subclass IVe and woodland ordination group 3o.

21E—Gasconade flaggy silty clay loam, 9 to 35 percent slopes. This shallow, strongly sloping to steep, somewhat excessively drained soil is on uneven side slopes. The slopes are dissected by, or border, shallow drainageways. Individual areas are irregular in shape but are most commonly long and narrow, oblong, or somewhat oval. They range from about 5 to 100 acres or more.

Typically, the surface layer is a very dark brown flaggy silty clay loam about 8 inches thick. The subsoil is dark brown very flaggy silty clay about 5 inches thick and is underlain by hard-bedded dolomite. The surface is about 5 percent flagstones and rock outcrop.

Included in mapping are well drained, moderately deep Caneyville soils in small pockets and along the edge of mapped areas. These soils make up 15 percent of the map unit.

Permeability is moderately slow, and surface runoff is rapid. Rooting depth is commonly limited by the shallowness to hard bedrock, but the roots of some

perennial shrubs and trees extend into crevices or fractures in the dolomite. Organic matter content is moderate, and the natural fertility is high. The available water capacity is very low. Reaction is slightly acid to mildly alkaline.

This soil is presently in timber or wooded pasture of native grasses. It is generally suitable for growing trees but production is low and generally does not warrant intensive timber management. Eastern redcedar is the major tree growing on this soil. It is a good source of high quality fence posts. Some oaks grow on this soil, also.

This soil is suited to native grasses. Big bluestem, little bluestem, indiangrass, switchgrass, and sideoats grama are some native warm-season grasses that grow on this soil. Very great restriction on grazing is necessary to protect the soil from erosion and overgrazing.

This map unit is in capability subclass VIIs and woodland ordination group 5d.

22E—Goss very cherty silt loam, 14 to 35 percent slopes. This deep, moderately steep and steep, well drained soil is on side slopes and point ridges and in V-shaped draws and hollows. Individual areas are in a somewhat narrow and irregular pattern that commonly extends a mile or more in length and ranges from 50 to 1,000 acres in size.

Typically, the surface layer is very dark grayish brown very cherty silt loam about 4 inches thick. The subsurface layer is brown very cherty silt loam about 11 inches thick. The subsoil to 85 inches is red very cherty clay in the upper part and dark red cherty clay in the lower part. In some places the subsoil is essentially chert-free below about 36 inches.

Included with this soil in mapping are areas that have bedrock at a depth of less than 40 inches. These areas make up about 8 percent of the map unit. Also included are small areas of the chert-free Crider soils, the shallow Gasconade soils, and the moderately well drained Wilderness soils. Together the included soils make up about 15 percent of the unit.

Permeability is moderate, and surface runoff is rapid. The available water capacity is low. Reaction ranges from medium acid to very strongly acid in the subsoil and tends to be somewhat less acid in the surface layer. Natural fertility is low, and organic matter content is moderately low. The surface layer is friable, but seedbed preparation is difficult because of steep slopes and chert. Root development is essentially unrestricted.

Most areas of this soil are in native timber. The steepness of slope, the droughtiness, and the content of coarse fragments make this soil generally unsuitable for cultivated crops. The use of this soil for pasture is rare because better suited soils are nearby. If a stand of pasture is planted on this soil, minimizing disturbance of the seedbed by tilling with a field cultivator, for example, helps reduce erosion while the stand is becoming established. Special equipment may be needed to prepare the seedbed and to plant. The steeper slopes may be seeded and fertilized by aerial application without seedbed preparation. A well-established grass stand adequately controls erosion if protected from overgrazing. Proper stocking, pasture rotation, and timely deferment of grazing help to prevent excess soil loss by keeping the pasture and the soil in good condition. This deep soil is suited to native grasses. Effective brush control may be a continuing problem because slope limits the use of equipment. Haying also is difficult because of the steepness of slope.

This soil is suited to trees, and most of the acreage remains in native hardwoods. Equipment limitations can be partly overcome by carefully selecting and managing roads and skidding trails. It may be necessary to plant seedlings by hand or to use direct seeding. North and east slopes are preferable for plantings. Seeding mortality on south and west slopes can be partly overcome by selecting tree species tolerant of dry, warm sites. Special planting stock of a larger size than usual may be necessary to improve the survival rate.

This soil generally is not suitable for sanitary facilities and building sites. Slopes are too steep for the soil to be effective as a septic tank absorption field. Excessive seepage from sewage lagoons or other reservoir areas can be prevented by sealing the bottom and sides of the reservoir.

This map unit is in capability subclass VIIs and woodland ordination group 4f.

23A—Haymond silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on bottom lands of creeks and rivers. Flooding is frequent and of short duration. Individual areas of this unit are relatively narrow, commonly meander for many miles, and total several hundred acres in size. There are a few isolated smaller areas.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The substratum to about 76 inches is brown silt loam and brown loam stratified with lenses of pale brown fine sandy loam. Some areas next to the stream channel have loam or sandy loam throughout.

Included with this soil in mapping are small areas of moderately well drained Wilbur soils. These are areas usually recognized as wet spots. In small bottoms, some Elsah soils are included. These inclusions make up about 10 percent of the unit.

Permeability is moderate, runoff is slow, and the available water capacity is high. Organic matter content is moderate, and natural fertility is high. Conditions are favorable for deep root development. The surface layer is friable and easily tilled through a wide range of moisture content.

Some areas are used for row crops, but a large part of the acreage of this soil is used for pasture and hay because fields are small and narrow. This soil is suited to corn, soybeans, grain sorghum, small grains, grasses,

and legumes. Flooding usually occurs in the spring, is of short duration, and is not especially hazardous to crops. If the soil is used for cultivated crops, minimum tillage and returning crop residue to the soil help to improve fertility, maintain tilth, and increase water infiltration. Installing diversions to protect against runoff from nearby uplands may be beneficial in some fields.

This soil is suited to most grasses and some legumes for pasture. Overgrazing or grazing when the soil is wet can cause surface compaction or deterioration of the stand, but these conditions can easily be prevented by proper stocking, pasture rotation, and timely deferment of grazing. Flooding is a hazard to livestock.

The soil is suited to trees, and a thin canopy usually borders each side of the stream. Plant competition is the major limitation to planting seedlings. This limitation can be overcome by proper site preparation, by prescribed burning, or by spraying or cutting. The hazard of flooding is the only other limitation to growing trees on this soil. Planting and harvesting should be scheduled to avoid the normal flooding season.

This soil is generally unsuitable for building sites or for onsite waste disposal because of the hazard of flooding.

This map unit is in capability subclass IIw and woodland ordination group 1o.

24B—Hildebrecht silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on convex, rather wide, stable ridgetops and foot slopes. Individual areas are elongated, irregular in shape, and have points extending from the main trunk in various directions. Areas are commonly several hundred acres.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is brown silt loam, and the lower part is brown silty clay loam. At a depth of 28 inches is a dense fragipan about 25 inches thick. The upper part of the fragipan is yellowish brown very cherty silt loam and the lower part is reddish brown very cherty clay loam. Below the fragipan is dark red very cherty clay to about 80 inches. In some places the upper part of the subsoil and the surface layer have been mixed by plowing.

Permeability is moderate in the upper part of the profile and slow in the fragipan. Available water capacity is low. Effective rooting depth is about 31 inches. Runoff is medium. Subsoil reaction ranges from strongly acid to extremely acid. Natural fertility and organic matter content are low. A perched water table fluctuates above the fragipan for several weeks in winter and early spring.

The present use of this soil is mainly pasture and woodland. It is suited to corn, grain sorghum, small grain, and grasses and legumes for hay and pasture. It is somewhat droughty due to low available water capacity. Grain sorghum is favored over other summer-growing annuals because it is better able to withstand drought. If the soil is used for cultivated crops, erosion is a hazard. Minimum tillage, crop rotation, contouring, and returning crop residue to the soil reduce runoff and erosion. Management practices that maintain adequate cover and keep the soil open and porous help to reduce runoff and improve the soil's water supplying capacity.

Pastureland or hayland use is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, and an estimated 25 percent of the acreage remains in native hardwoods. There are no major problems with planting, growing, and harvesting trees. The seasonal perched water table, which saturates the surface layer and upper part of the subsoil, limits the use of equipment. The skidding, loading, and hauling of logs can be done during dry periods.

This soil is suitable for building site development and for onsite waste disposal if structures are properly designed and installed. Wetness and shrink-swell potential are moderate limitations for dwellings without basements. These limitations can be overcome by reinforcing foundations to prevent damage from shrinking and swelling of the soil and by installing tile drains around footings to prevent excessive wetness. This soil does not have sufficient strength to support vehicular traffic, but this limitation can be corrected by adding suitable base material. Slow permeability in the fragipan limits the soil for use as a conventional septic tank absorption field. This soil can be used for sewage lagoons if the site is graded.

This map unit is in capability subclass IIe and woodland ordination group 4o.

24C—Hildebrecht silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on convex ridges, sloping point ridges, foot slopes, and a few short, uneven side slopes. Individual areas are commonly elongated and irregular in shape and range in size from 15 to several hundred acres.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is strong brown silt loam and the lower part is brown and dark yellowish brown silty clay loam. At 33 inches is a yellowish brown silt loam and cherty silt loam fragipan about 20 inches thick. Below this is a dark red very cherty silty clay. In some places plowing has mixed the upper part of the subsoil and the surface layer.

Included with this soil in mapping are small areas of the Wilderness soils. They are on knolls and point ridges and make up about 5 percent of the unit.

Permeability is moderate in the upper part of the soil and slow in the fragipan. Available water capacity is low,

as the rooting depth is restricted by the fragipan. Runoff is medium. Reaction in the subsoil ranges from medium acid in the upper part to extremely acid in the lower part. The fragipan is very strongly acid or extremely acid. Natural fertility and organic matter content are low. In most years, a perched water table is above the fragipan during late winter and early spring.

Most areas are used for timber, pasture, or hay. This soil is suited to corn, grain sorghum, small grains, grasses, and legumes. Using drought resistant plant varieties and moisture conservation practices help to overcome the somewhat droughty condition for summer-growing annuals. If the soil is used for cultivated crops, erosion is a hazard. Minimum tillage, crop rotation, contouring, and returning crop residues to the soil reduce runoff and erosion. Some slopes are suitable for terrace systems.

This soil is suitable for most grasses and legumes, which are effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help keep the pasture and the soil in good condition. This soil generally is not suited to alfalfa because of the limited rooting depth and perched water table. Other legumes may be substituted.

This soil is suited to trees and about one-half of the acreage remains in native hardwoods. There are no significant limitations to planting, growing, and harvesting trees. During wet periods, the perched water table saturates the surface and upper part of the subsoil, thereby limiting the use of equipment. Skidding, loading, and hauling logs can be done during dry periods.

This soil is suitable for building site development and for onsite waste disposal if structures are properly designed and installed. Wetness and shrink-swell potential are moderate limitations for dwellings without basements. Good design, reinforcement to prevent shrink-swell damage, and tile drains to remove excess water are needed. The soil does not have sufficient strength to support vehicular traffic but this limitation can be corrected by adding suitable base material. The slow permeability rate in the fragipan essentially precludes the use of the soil as a conventional septic tank absorption field. This soil can be used for sewage lagoons if the site is graded.

This map unit is in capability subclass IIIe and woodland ordination group 4o.

24D—Hildebrecht silt loam, 9 to 14 percent slopes. This deep, strongly sloping, moderately well drained soil is on upland side slopes and on some low slopes or foot slopes. Individual areas are irregularly shaped and range from about 30 acres to 100 acres or more.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 20 inches of brown silty clay loam. At 28 to 37 inches is a yellowish brown very cherty silt loam fragipan underlain by dark red very cherty clay. In some areas the fragipan is open and porous enough to allow more than the usual penetration by roots. Also, in places the surface layer contains as much as 25 percent chert.

Included with this soil in mapping are small areas of cherty Wilderness soils that make up about 10 percent of the unit.

Permeability is moderate in the upper part of the profile and slow in the fragipan. Available water capacity is low, and runoff is rapid. The effective rooting depth varies from about 24 inches to 36 inches. Reaction in the subsoil ranges from medium acid in the upper part to extremely acid in the lower part. Natural fertility and organic matter content are low. In winter and early in spring, a perched water table is above the fragipan for short periods. The extra chert content above the pan in places is probably due to the increase of windthrow where the overburden is thinner than normal.

Most of the acreage of this soil is used for timber. A small amount is in pasture. The soil is generally unsuitable for row crops because of the limited rooting depth, droughtiness, and severe erosion hazard. It is suited to most grasses and legumes for pasture and hay. Pastureland or hayland, if established and protected from overgrazing, will effectively control erosion. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and the soil in good condition. This soil is generally unsuitable for alfalfa because of the limited rooting depth and the perched water table.

This soil is suited to trees, and 75 percent of the acreage remains in native hardwoods. There is an equipment limitation during wet periods. The skidding, loading, and hauling of logs can be done when the soil is dry and firm.

This soil is suitable for building site development and for onsite waste disposal if structures are properly designed and installed. Wetness, slope, and shrink-swell potential are moderate limitations for dwellings without basements. These limitations can be corrected by designing the dwelling to fit the slope, by reinforcing the foundation to prevent damage from shrinking and swelling, and by installing drain tile around footings to prevent damage from excessive wetness. Low strength for vehicular traffic can be corrected by adding suitable base material. Slow permeability of the fragipan limits the use of the soil as a conventional septic tank absorption field. This soil can be used for sewage lagoons if the site is graded.

This map unit is in capability subclass IVe and woodland ordination group 4o.

25F—Irondale extremely stony silt loam, 15 to 40 percent slopes. This moderately deep, moderately steep to very steep, well drained soil is on stony side slopes of mountains and peaks. Areas have rugged

surface features and range from about 40 acres to 1,000 acres or more. Stones cover 1 to 50 percent of the surface and are throughout the solum.

Typically, the surface layer is very dark brown extremely stony silt loam about 4 inches thick. The subsurface layer is very cobbly silt loam about 4 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is brown very cobbly silt loam, and the middle part is reddish brown very cobbly silty clay loam. The lower part is strong brown very cobbly loam and is underlain by hard rhyolite. In some places the soil is less than 20 inches thick.

Included with this soil in mapping is a rather narrow band of deep stony soils along the lower part of the steeper slopes. These soils make up about 10 percent of the map unit, and rock land makes up another 5 percent.

Permeability is moderate, and surface runoff is very rapid. Available water capacity is low. Reaction is commonly extremely acid or very strongly acid in the subsoil. It commonly becomes more acid with depth. Natural fertility and organic matter content are low. This soil is commonly too stony to till. Root development is partly restricted by stones and cobbles but is more severely restricted by the extremely low fertility of the lower part of the solum and the underlying hard rock.

This soil is suited to native grasses for pasture. Overgrazing can permanently damage the grasses; therefore, special measures such as pasture rotation, timely deferment of grazing, and restriction on grazing during dry periods are needed.

This soil is suited to trees, and most areas are in timber. Cool north-facing slopes and sites on low slopes where this soil is deeper are the most productive. Steepness of slope causes an erosion hazard and also limits the use of equipment. Droughtiness is a limitation that cannot easily be overcome, therefore north and east slopes are preferable for planting seedlings. Using special planting stock of a larger size than usual may be necessary to improve the survival rate. Slope and stoniness cause an erosion hazard, and equipment limitations caused by slope and stones can be partly overcome by careful selection and management of roads and skidding trails. It may be necessary to plant seedlings by hand or use direct seeding.

This soil is generally unsuitable for sanitary facilities and building sites because of the steepness of slopes and the shallowness to bedrock.

This map unit is in capability subclass VIIs and woodland ordination group 5x.

26B—Jonca silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on convex ridgetops and point slopes and around the upper part of some drainageways. Individual areas are narrow and irregular in shape and range from 20 to several hundred acres in size.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsurface layer of yellowish brown silt loam is about 3 inches thick. The subsoil to a depth of about 32 inches is brown silty clay loam. A brown sandy loam fragipan extends from 32 to 62 inches and is underlain by yellowish brown sandy clay loam. In some places the fragipan is underlain by hard sandstone.

Included with this soil in mapping are small areas of a deep, moderately well drained soil that does not have a fragipan. It makes up about 10 percent of the area.

Permeability is moderate in the upper part of the profile and slow through the fragipan. The available water capacity is low. Rooting depth is restricted by the fragipan. Runoff is medium. Reaction ranges from medium acid to very strongly acid in the upper part of the subsoil. The fragipan ranges from extremely acid to strongly acid, and the lower part of the subsoil ranges from very strongly acid to slightly acid. Natural fertility and organic matter content are low. The water table is above the fragipan in winter and spring.

This soil is used primarily for pasture and hay although in some areas it is cultivated occasionally. It is suited to corn and soybeans. Irrigation may be necessary for summer annuals. Grain sorghum is a little more drought resistant. Shallowness of the root zone limits alfalfa production. If the soil is used for cultivated crops, erosion is a hazard. Excessive soil loss can be prevented by minimum tillage, winter cover crops, crop rotation, and return of crop residue to the soil. In a few areas, slopes are long enough and smooth enough to be terraced and farmed on the contour.

Using this soil for pasture or hay effectively controls erosion. If the soil is used for pasture, overgrazing must be avoided. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture stands in good condition, prevent compaction and excessive runoff, and maintain good tilth.

This soil is suited to trees, but growth is limited by the fragipan, which restricts rooting depth, and by low available water capacity. Windthrow is prevalent in old established stands. Timely harvesting of mature trees helps prevent excessive windthrow.

This soil is suited to building sites and sanitary facilities. These uses are somewhat limited because of wetness from the seasonal water table and shrink-swell potential. Shrink-swell damage can be prevented by properly designing and reinforcing footings and foundations, and damage from excessive wetness can be prevented by installing tile drains around footings. Slow permeability is a limitation for septic tank absorption fields. This soil can be used for sewage lagoons if the site is graded to modify the slope. The bottom of the lagoon may have to be sealed to prevent seepage.

This map unit is in capability subclass IIe and woodland ordination group 4o.

26C—Jonca silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is

on convex ridgetops, point slopes, and side slopes. Individual areas of this unit are narrow, elongated, irregular, or wavy in shape and range from 50 to several hundred acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The upper subsoil is about 23 inches of brown silty clay loam and clay loam. The next layer is a fragipan of brown mottled loam about 18 inches thick. The lower subsoil is reddish brown sandy loam and is underlain by sandstone rock at about 68 inches. In some small areas the soil is gullied or has a surface layer of silty clay loam because the original surface has been eroded. In some places the fragipan is underlain by hard sandstone.

Included with this soil in mapping are small areas of the moderately deep, well drained Lily soils and the deep, well drained Lamotte soils. These areas make up about 12 percent of the unit.

Permeability is moderate in the upper part of the profile and slow in the fragipan. Runoff is medium, and available water capacity is low. Reaction ranges from medium acid to very strongly acid in the upper subsoil, extremely acid to strongly acid in the fragipan, and very strongly acid to slightly acid below. Natural fertility and organic matter content are low. A seasonal perched water table is present above the fragipan during winter and spring.

Most areas of this soil are used for pasture and hay but some areas are farmed. This soil generally is not suited to corn and soybeans because of low moisture during the growing season and a hazard of erosion. Where cultivated crops are grown, minimum tillage, winter cover crops, crop rotation, and terrace systems reduce excessive soil loss. Most slopes are suitable for terracing. Loss of fertility by erosion can be partly offset by adding commercial fertilizer, by returning crop residue to the soil, or by adding manure or other organic material to the soil on a regular basis. However, the loss of water holding capacity caused by erosion is difficult to regain.

This soil is well suited to certain pasture and hay grasses and legumes, but limited rooting depth and susceptibility to frost heaving makes it unsuited to deep rooted crops such as alfalfa.

On pasture and on hayland, erosion can be controlled and the soil and plants can be maintained in good condition by proper stocking, pasture rotation, deferred grazing, and restriction on use during wet periods. A proper fertility program helps sustain yields.

This soil is suited to trees, and some native hardwoods remain. There are no particular problems in establishing tree plantations, except where the soil is severely eroded. Windthrow is prevalent in old established stands. Timely harvesting of mature trees helps prevent excessive windthrow. Careful selection and maintenance of logging roads and skidding trails helps prevent erosion.

This soil is suited to building site development and onsite waste disposal systems. Shrink-swell potential and wetness are moderate limitations for dwellings without basements. These limitations can be overcome by reinforcing footings and foundations to prevent damage from shrinking and swelling and by installing tile drains around footings to prevent damage from excessive wetness. Slow permeability of the fragipan prevents the soil from serving as an adequate absorption field for conventional septic tanks. This soil can be used for sewage lagoons, but the slope has to be modified by grading and the bottom of the lagoon may have to be sealed.

This map unit is in capability subclass IIIe and woodland ordination group 4o.

27C—Knobtop silt loam, 3 to 9 percent slopes. This moderately deep, moderately sloping, moderately well drained soil is on mountainous ridgetops and peaks. Some areas are in saddles between peaks. Individual areas are oval or elongated and range from 10 to about 200 acres.

Typically, this soil has a surface layer of dark grayish brown silt loam about 2 inches thick and a subsurface layer of brown silt loam about 3 inches thick. The subsoil is about 29 inches thick. The upper part of the subsoil is brown silt loam and silty clay loam. The middle part is light brownish gray silty clay loam, and the lower part is yellowish brown, mottled cobbly silt loam. Below the subsoil, at 34 inches, is hard fine-textured igneous rock. A few stones or boulders cover about 0.01 percent of the surface.

Included with this soil in mapping are a few spots of Irondale soils that make up about 5 percent of the unit.

Permeability is moderately slow, and surface runoff is medium. Available water capacity is low. Reaction is strongly to very strongly acid in the upper part of the subsoil and is extremely acid or very strongly acid in the lower part. Natural fertility and organic matter content are low. Rooting depth is limited by the underlying rock. For periods during winter and spring, a perched water table is above the rock.

Most areas of this soil are in timber and are somewhat inaccessible. A few small areas are partly cleared for lookout towers and the accompanying small parks. About 10 percent of the acreage has been cleared and is used mostly for pasture and hay. This soil generally is not suited to most cultivated crops because of limited rooting depth, low fertility, an extremely acid subsoil, and droughtiness. It is slightly better suited to grain sorghum than to corn or soybeans. It is suited to wheat, which grows during winter and spring, when moisture conditions are best. Erosion is a hazard if cultivated crops are grown. Minimum tillage, terracing, contouring, crop rotation, and returning crop residue to the soil help reduce runoff and erosion.

Pastureland and hayland are effective uses in controlling erosion. Overgrazing and grazing when the soil is wet, however, cause compaction, excess runoff, and poor tilth. Proper stocking, pasture rotation, timely

deferment of grazing, and restriction on use during wet periods help keep the pasture and the soil in good condition. Native grasses are best suited for summer pasture and hay.

This soil is suited to trees, but the low available water capacity and limited rooting depth cannot easily be corrected. There are no significant limitations to planting, growing, or harvesting trees.

This soil generally is not suited to buildings with basements because of moderate depth to hard rock. This limitation can be overcome by constructing foundations above ground level or only partly below the ground. Wetness and shrink-swell potential are moderate limitations for dwellings without basements. Shrink-swell damage can be prevented by reinforcing footings and foundations, and excessive wetness can be avoided by installing drain tile around footings. Low strength for vehicular traffic can be corrected by adding suitable base material. The moderately slow permeability and moderate depth to bedrock are severe limitations for septic tank absorption fields. Depth to bedrock is a severe limitation for sewage lagoons, but this can usually be corrected by borrowing soil to construct the lagoon. Ripping or blasting may also be needed. Sealant for the bottom of the lagoon may be needed to prevent excess seepage into cracks or crevices if the lagoon is built in less than 4 feet of slowly permeable material.

This map unit is in capability subclass IIIe and woodland ordination group 5o.

28C—Lamotte silt loam, 5 to 9 percent slopes. This deep, moderately sloping, well drained soil is on upland slopes, around the upper end of drainageways, and on point ridges. Individual areas are irregularly shaped and range from 10 to 200 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 48 inches thick and consists of reddish brown silty clay loam over firm, red and dark red clay loam. The substratum to 60 inches or more is stratified yellowish red loam and weathered sandstone. In some places, soft weathered sandstone is at a depth of 3 to 4 feet.

Included with this soil in mapping are a few spots that have rock outcrops. These areas make up less than 3 percent of the area.

Permeability is moderate, and runoff is medium. Available water capacity is high. Reaction ranges from medium acid to extremely acid in the subsoil and from very strongly acid to medium acid in the substratum. Natural fertility is low, and organic matter content is moderately low.

This soil is used mainly for pasture. It is suited to corn, soybeans, and grain sorghum but is subject to severe erosion if cultivated. Minimum tillage, planting winter cover crops, terrace systems, contour tillage, and crop rotations reduce soil loss. Returning crop residue to the soil or adding other organic material on a regular basis help improve fertility, maintain tilth, and increase water infiltration.

This soil is suited to grasses and legumes, which are effective in controlling erosion if properly managed. Overgrazing causes compaction, excessive runoff, and poor tilth. Proper stocking and pasture rotation help keep the pasture in good condition and protect the soil from eroding.

This soil is suited to trees, and about one-fourth of the acreage remains in native hardwoods. Seeds, cuttings, and seedlings grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation, by prescribed burning, or by spraying or cutting. There are no significant limitations to planting or harvesting trees.

This soil is suitable for building sites and for onsite waste disposal if structures are designed to offset the slope. Moderate permeability is a limitation for septic tank absorption fields but this can usually be overcome by increasing the size of the absorption area. This soil can be used for sewage lagoons if the site is graded to modify the slope. Damage from excessive shrinking and swelling of the soil can be prevented by properly designing and reinforcing footings and basements.

This map unit is in capability subclass IIIe and woodland ordination group 3o.

28D—Lamotte silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is on upland side slopes. Areas of this map unit are in narrow, irregularly-shaped bands or leaf-shaped draws and hollows. They range from 40 to about 200 acres. Many areas are dissected by shallow drainageways.

Typically, the surface soil is dark grayish brown silt loam about 6 inches thick, and the subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 49 inches thick. The upper part of the subsoil is brown silt loam, the middle part is reddish brown clay loam and loam, and the lower part is dark reddish brown loam. Soft, strong brown weathered sandstone underlies the subsoil. Some fields have eroded spots and gullies.

Included in mapping are a few small areas of Lily and Ramsey soils that make up about 5 percent of the unit.

Permeability is moderate, and runoff is rapid. Available water capacity is high. Reaction ranges from medium acid to extremely acid in the subsoil. Natural fertility and organic matter content are low. There are no serious limitations to root development.

Most of the acreage of this soil is used for pasture. About 30 percent remains in native hardwoods. This soil is suited to grasses and legumes for pasture and hay. Common pasture and hay grasses and legumes including alfalfa grow well and protect the soil from erosion. The soil is also suited to native warm-season grasses. Cultivated crops can be grown occasionally if the soil is adequately protected against erosion. If row crops are grown, minimum tillage, winter cover crops, contour tillage, and crop rotation reduce soil loss. Most slopes are too irregular and steep for terrace systems. Proper stocking, uniform grazing distribution, and

deferment of grazing keep the pasture and the soil in good condition.

This soil is suited to trees (fig. 14). Some stands of white oak remain. Some pine plantations that show good growth are on this soil. Plant competition and seedling mortality can be reduced by site preparation, by prescribed burning, or by spraying or cutting. There are no significant limitations to planting or harvesting trees.

This soil is suitable for building sites and for most onsite waste disposal systems. Excess slope can be overcome by landscaping, proper installation, designing structures to fit the slope, or a combination of these practices. Low strength for vehicular traffic can be corrected by adding suitable base material. Slope is a severe limitation for lagoons but can be corrected by grading the site and by selecting the least sloping sites.

Figure 14.—Lamotte soils have excellent rooting depth and are among the most productive for trees in the county. Depth is shown in feet.

This map unit is in capability subclass IVe and woodland ordination group 3o.

29C—Lebanon silt loam, 3 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on upland ridges, divides, and some foot slopes. Individual areas are commonly irregular in shape and several hundred acres in size.

Typically, the surface layer is brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The upper subsoil is strong brown and brown silty clay loam about 17 inches thick. It is underlain by a fragipan of yellowish brown silty clay loam about 38 inches thick. Below the fragipan is strong brown silty clay loam. In some places, chert makes up 50 percent or more of the fragipan.

Included with this soil in mapping are small areas of the cherty Wilderness soils. They are on sharp breaks in slopes along draws or adjacent to drainageways and make up about 10 percent of the unit.

Permeability is moderate in the upper part of the profile and slow through the fragipan. Runoff is medium. Available water capacity is low or moderate. Reaction ranges from very strongly acid to medium acid in the subsoil and very strongly acid or extremely acid in the fragipan and below. Natural fertility and organic matter content are low. The surface layer is easily tilled but tends to crust and puddle after hard rains. A perched water table is above the fragipan in winter and spring. Root development is restricted by the dense fragipan.

In most areas this soil is cleared and used for cultivated crops, hay, and pasture. It is suited to grain sorghum, small grain, grasses, and some legumes. If the soil is used for cultivated crops, erosion is a hazard. Minimum tillage, winter cover crops, and crop rotations reduce soil loss. A few areas have slopes that are long enough and smooth enough to be terraced. However, the fragipan is close enough to the surface to hinder both terrace construction and the revegetation of the terrace channel. Farming on the contour, returning crop residue to the soil, or applying other organic material on a regular basis help to improve fertility, reduce crusting, and increase water infiltration.

Pastureland and hayland are also effective uses in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and the soil in good condition. This soil is not suited to alfalfa.

This soil is suited to trees, but growth is hindered by the fragipan, which restricts rooting depth. The perched seasonal water table is a temporary limitation to the use of equipment. The skidding, loading, and hauling of logs can be done during dry periods. Windthrow hazard and seedling mortality are moderate because of the limited rooting depth and droughtiness. Timely harvesting of mature trees helps prevent windthrow. Using special

planting stock of a larger size than usual may be necessary to improve the survival rate.

This soil is suitable for most types of building site development and some onsite waste disposal systems. Wetness is a moderate limitation for dwellings without basements and a severe limitation for dwellings with basements. This limitation can be corrected by the use of tile drains around footings. Low strength for vehicular traffic can be corrected by adding suitable base material for roads and streets. Sewage lagoons can function if properly designed and installed, but septic tank filter fields do not work well because of the slowly permeable fragipan.

This map unit is in capability subclass IIIe and woodland ordination group 4d.

30C—Lily-Ramsey complex, 3 to 9 percent slopes. This map unit consists of moderately deep and well drained Lily soils and shallow and somewhat excessively drained Ramsey soils on upland side slopes and points. Most areas are dissected by draws or hollows. Individual areas of this unit range from 40 to 200 acres and are about 60 percent Lily soils and 30 percent Ramsey soils. Lily soils are on the mid and upper parts of the side slopes and on the points. Ramsey soils are on the foot slopes and in the draws and hollows. The areas of Lily soils and areas of Ramsey soils are so intricately mixed or so small that to separate them in mapping was not practical.

The typical Lily soil has a surface layer of very dark brown loam about 4 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is dark yellowish brown loam, the middle part is brown clay loam, and the lower part is strong brown sandy clay loam. Acid sandstone is at a depth of 35 inches.

The typical Ramsey soil has a surface layer of very dark grayish brown very stony sandy loam about 2 inches thick. The subsurface layer is brown sandy loam about 3 inches thick. The subsoil is strong brown cobbly sandy loam underlain by hard sandstone at 15 inches.

Included with these soils in mapping, and making up about 10 percent of the unit, are small areas of Jonca and Lamotte soils and sandstone outcrop. Jonca soils are on the gentler slopes, and Lamotte soils are on foot slopes and along drainageways. The Jonca and Lamotte soils are deeper to bedrock than are the Lily and Ramsey soils. Sandstone outcrops are on some steep points, on breaks in slope, and on side slopes.

Permeability is moderately rapid through the Lily soils and rapid through the Ramsey soils. The available water capacity of the Lily soils is low and of the Ramsey soils is very low. Runoff is medium. The subsoil is strongly acid to extremely acid. The root zone extends to bedrock. Organic matter content and natural fertility are low.

In most areas the soils remain in native hardwoods. The most shallow soils are partly covered by shrubs and grasses. The soils in this unit are suited to forest, wildlife habitat, and recreation. The depth to rock and the low available water capacity are major limitations to the use of these soils. The moisture supplying capacity can be improved by practices that reduce runoff, such as protecting the land from overgrazing, preventing forest fires, and maintaining an adequate stand of trees.

The soils are generally unsuitable for cultivation because of the low available water capacity. This, along with a severe erosion hazard and the shallowness of some soils, greatly limits the farming potential. Small fields that are suitable for farming may be protected from excessive erosion by minimum tillage, contouring, crop rotation, and diversions. Returning crop residue to the soil or regularly applying other organic material help to improve fertility, reduce crusting, and increase water infiltration.

These soils are suitable for use as pastureland or hayland but are moderately limited for these uses because of the low available water capacity. Prevention of overgrazing, proper stocking, pasture rotation, timely deferment of grazing, and restriction on grazing during wet periods help prevent erosion and keep the pasture and the soil in good condition. Native grasses utilize soil moisture best for midsummer growth.

The Lily soils are suited to trees, but plant competition is moderate. This limitation can be overcome by proper site preparation, by prescribed burning, or by spraying or cutting. The Ramsey soils are very stony and generally not suited to intensive timber management.

The soils in this complex are generally unsuitable for building sites and sanitary facilities. The shallowness to bedrock is a severe limitation.

This complex is in capability subclass VIIs. Lily soils are in woodland ordination group 4o and Ramsey soils are in group 4x.

31A—Loughboro silt loam, 0 to 3 percent slopes. This deep, nearly level, poorly drained soil is on upland piedmont positions. Its surface ranges from smooth to concave. Individual areas are irregularly shaped and range from about 20 to 200 acres in size.

The surface layer is brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 13 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil consists of grayish brown silty clay loam and fingers of subsurface material. The middle part is grayish brown, mottled silty clay, and the lower part is grayish brown, mottled, very firm silty clay loam. The substratum to a depth of about 67 inches is light brownish gray silt loam. In some places a few stones or boulders are on the surface.

Permeability is slow, and surface runoff is slow. This soil commonly receives significant amounts of runoff water from adjacent upland peaks. Some areas were originally ponded. Available water capacity is high. Natural fertility is low, and organic matter content is very low. The surface layer is somewhat friable but tends to

crust easily or puddle after hard rains. Natural wetness and saturation during spring and early summer hinder tillage operations. The seasonal high water table is at a depth of 1 to 2 feet. Root development is restricted by the wetness and the low fertility of lower horizons.

Most areas are cleared, and a few areas are cultivated. Some acreage remains in native timber. This soil is suited to corn, grain sorghum, small grains, grasses, and some legumes. However, wetness and low fertility limit production. Diversion ditches to control upland runoff may alleviate some surface wetness. Practices such as returning crop residue to the soil, adding other organic material on a regular basis, and chiseling help increase water infiltration, improve fertility, and reduce crusting.

Perennial grasses and legumes used for hay and pasture should have a fairly high tolerance for wetness. Grazing should be restricted during wet periods to help keep the pasture and soil in good condition.

Some acreage of this soil remains in native timber. Tree establishment may be hindered by moderate seedling mortality and severe plant competition. These limitations can be overcome by diverting upland runoff, artificial drainage, and controlling competing vegetation. Windthrow hazard is moderate and can be reduced by timely harvesting of mature trees. The wetness also limits the use of equipment during the winter and spring. The skidding, loading, and hauling of logs can be done during dry periods.

The soil is suited to building sites and some sanitary facilities, but wetness and the high shrink-swell potential are severe limitations. Structural damage caused by shrinking and swelling of the soil can be prevented if building foundations and footings are specially designed and reinforced. Tile drains can be installed to prevent damage from excessive wetness. Basements can be protected from the wetness by adequate sealing and drainage. The soil is suited to sewage lagoons if the lagoons are properly designed and constructed. Septic tank filter fields do not work because of the very slow permeability. Low strength for vehicular traffic on local streets and roads can be corrected by using suitable base material.

This map unit is in capability subclass IIIw and woodland ordination group 4w.

32A—Midco cherty silt loam, 0 to 3 percent slopes. This deep, nearly level, somewhat excessively drained soil is on narrow stream bottoms and drainageways. This soil is subject to frequent flooding. Individual areas of this unit are long, narrow strips that range from about 10 to more than 100 acres.

Typically, the surface layer is dark brown cherty silt loam about 5 inches thick. Underlying the surface layer is dark yellowish brown cherty silt loam about 6 inches thick. Below this, to a depth of 60 inches or more, is dark yellowish brown very cherty sandy loam. In some places the surface layer is less than 15 percent chert. Also in some areas the dark surface layer is more than 10 inches thick.

Included with this soil in mapping are small areas of moderately well drained Hildebrecht soils. They are on narrow, gently sloping strips on foot slopes bordering the uplands and make up about 10 percent of the unit.

Permeability is moderately rapid, and surface runoff is slow. The available water capacity is low. Natural fertility is medium, and organic matter content is moderately low. The very cherty substratum is a slight hindrance to root development.

About 70 percent of the acreage of this unit remains in native hardwoods. This soil is suited to cultivated crops, grasses, and legumes, but droughtiness is a severe limitation. In some years the low available water capacity causes this soil to be too droughty for summer annuals. Flooding is also a severe hazard during the early part of the growing season. If this soil is used for pasture, proper stocking, pasture rotation, and deferment of grazing to avoid the flooding and droughty seasons help keep the pasture and the soil in good condition.

This soil is suited to trees and in most places is covered by sycamore, maple, black walnut, ash, and some oak species. Seedling mortality is moderate. Using special planting stock of a larger size than usual may be necessary to improve the survival rate. Flooding hinders timber harvesting for a brief period in the year, but this hazard can easily be avoided by planning the cutting, skidding, and hauling activities for summer or fall.

This soil generally is not suited to building site development or to onsite waste disposal because of the flooding hazard. Dwellings, barns, feedlots, and sanitary facilities should be located in areas above the flood plain.

This map unit is in capability subclass IIIs and woodland ordination group 4f.

33A—Midco very gravelly sandy loam, 0 to 4 percent slopes. This deep, gently sloping, somewhat excessively drained soil is on narrow stream bottoms in the St. Francois Mountains. It is subject to frequent flooding. Individual areas of this unit are long and narrow and range from about 20 to more than 100 acres.

Typically, the surface layer is dark brown very gravelly sandy loam about 3 inches thick. Below this is 17 inches of brown very gravelly sandy loam underlain by several feet of stratified dark brown and brown very gravelly loamy sand. In some places the surface is dominated by cobbles.

Permeability is moderately rapid, and surface runoff is slow. Reaction ranges from strongly acid to slightly acid unless the soil is limed. Natural fertility is medium, and organic matter content is low. The available water capacity is very low. The surface contains enough gravel to hinder cultivation.

In most areas this soil is in native timber. It generally is not suited to cultivated crops because of droughtiness and flooding. In addition, the surface layer contains

enough gravel and cobblestones to make tillage, seedbed preparation, and harvesting difficult. The soil floods in spring and early summer.

This soil is suited to pasture, trees, or other perennial vegetation. If it is used for pasture, proper stocking, pasture rotation, and deferment of grazing are helpful in utilizing forage well, avoiding the flooding period, and regulating use during the droughty seasons. Native grasses are best suited to summer grazing.

If this soil is used for trees, seedling mortality is moderate. It can be partly overcome by using special planting stock of a larger size than usual. There are no significant limitations to growing and harvesting trees.

This soil generally is not suited to building sites, sanitary facilities, and local streets and roads because of the frequent flooding.

This map unit is in capability subclass IIIs and woodland ordination group 4f.

34B—Nicholson silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on upland ridgetops, saddles, points, and side slopes around the head of upland drainageways. Individual areas of this unit are irregular in shape and range from 20 to 200 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil to a depth of about 25 inches is brown silt loam in the upper part, dark brown silty clay loam in the middle part, and yellowish brown, mottled silty clay loam in the lower part. Below that, to a depth of 39 inches, is a fragipan of yellowish brown, firm, brittle silt loam. The lower part of the subsoil is yellowish brown, mottled silty clay that contains strata of weathered dolomite at a depth of 53 inches and is underlain by hard dolomite bedrock at 64 inches.

Permeability is slow, and runoff is medium. Available water capacity is low. Reaction in the upper subsoil ranges from very strongly acid to neutral. The reaction in the surface layer varies widely as a result of local liming practices. Natural fertility is low, and organic matter content is moderately low. A seasonal high water table is at a depth of 1.5 to 2.5 feet. The surface layer is friable and easily tilled. Root development is restricted by the dense fragipan.

This soil is used for hay, pasture, and some row crops. It is suited to corn, grain sorghum, soybeans, small grains, and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a hazard. Minimum tillage, contouring, crop rotation, and returning crop residue to the soil reduce runoff and help control erosion.

Pastureland and hayland are effective uses in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. A few small areas remain in native hardwoods. The fragipan causes a slight windthrow hazard depending on the depth of the soil above the fragipan. The use of equipment is moderately limited by seasonal saturation of the surface layer and upper part of the subsoil by the perched water table. Timely harvesting of mature trees can reduce windthrow. The skidding, loading, and hauling of logs can be done during dry periods.

This soil is suitable for building site development and for onsite waste disposal if structures are properly designed and installed. Wetness is a severe limitation for dwellings with basements. Damage from excessive wetness can be prevented by installing tile drains around footings. This soil does not have sufficient strength to support vehicular traffic, but this limitation can be corrected by adding suitable base material. The slow permeability rate makes this soil generally unsuitable for use as septic tank absorption fields. Slope is a moderate limitation for sewage lagoons, but the slope can be modified by grading the site.

This map unit is in capability subclass IIe and woodland ordination group 3o.

35—Pits-Orthents complex. This map unit consists of open excavations and of piles of the soil and debris that have been removed in mining. In some places the soil material has been removed to build dams, roads, or similar structures. In other places, dolomite rock, barite "tiff", and iron ore aggregate rock are being mined. At mining sites the overburden or waste material is piled into thick dumps of unsegregated soil and rock. The pits range from about 3 to 100 feet in depth. The terrain is rough and uneven. Most areas are gently sloping to strongly sloping. Areas range from 10 to about 380 acres and are 60 to 80 percent Pits and 20 to 40 percent Orthents.

The Pits part of the complex consists of open excavation areas from which soil material or rock or both have been removed. Shallow soil material is at the bottoms of the pits. Deep red cherty clay commonly remains in the barite pits and essentially no soil is in the pits where rock is quarried.

Orthents are deep deposits. They are dominantly clayey or loamy soil material that contains varying amounts of gravel, cobblestones, stones, and boulders.

Orthents vary widely in permeability, but most are estimated to be moderate or moderately slow. Available water capacity is moderate. Acidity, drainage, natural fertility, and runoff are too variable to estimate. Organic matter content is commonly low.

The Pits generally are not suited to plant growth, except in barite mining areas, where the deep red cherty soils are suited to trees. The Pits are generally unsuitable for building sites and common recreation uses. Some areas have wetland wildlife potential. Each site should be carefully evaluated for the intended use.

The Orthents make up mostly idle areas that have been left to revert to natural vegetation. Some areas are

being restored and planted to trees or grasses. Stony, uneven areas generally are unsuitable for most farming purposes. In most areas, Orthents have a fair potential for trees and wildlife habitat. Limitations for building site development are severe and can be overcome only by major landscaping and reclamation of the site.

This map unit is not assigned to an interpretive grouping.

36C—Psamments, sloping. This map unit consists of deep, nearly level to gently rolling, somewhat excessively drained, newly formed soil on low slopes and in tailing ponds. Individual areas are commonly somewhat oval or irregular in shape and are large. Most of the acreage is in only a few areas ranging from about 400 to more than 1,000 acres. A few small areas are scattered in the vicinity of the large areas. These soils are formed in crushed dolomitic material from lead mining.

Typically, the surface layer is brown loamy fine sand about 1 inch thick. Below this is a thin transitional layer of pale brown loamy fine sand about 1 inch thick. The underlying material is light gray loamy fine sand, stratified by thin lenses of light brownish gray silt loam or very fine sandy loam amounting to about 10 percent of the mass. It extends to 60 inches or more and is mildly alkaline throughout.

Permeability is rapid, and surface runoff is slow to medium although most precipitation is absorbed into the surface. The available water capacity is low. Reaction is mildly or moderately alkaline throughout. The natural fertility is very unbalanced, and careful fertilization is required to make the soil more suitable for plant growth. The organic matter content is very low. Some areas of the tailing ponds are subject to frequent flooding.

Most areas of these soils have essentially been abandoned since mining ceased. Some areas have been seeded to grasses and legumes but results are poor. These soils are generally unsuitable to growing grasses, shrubs, and trees unless intensively managed. The most important need in managing the soil is to establish a vegetative cover. This may be done by assuring adequate available moisture, carefully selecting plants, balancing fertility, and protecting the soil from blowing. Moisture conservation practices or sprinkler irrigation are also helpful. Plants that require or tolerate soil that is alkaline and contains lime should be chosen. Fertilizer needs include nitrogen, phosphates, potash, and possibly some trace elements. Temporary operations such as rough tillage or mulching may be adequate to protect young plants from abrasion by blowing soil.

Because it is very difficult to establish any kind of vegetative cover, there is a lack of essential wildlife habitat elements such as food, water, and cover. Once cover is established, wildlife potential can improve.

Most of the acreage is not suited to recreation uses because of flooding. In areas not subject to flooding the sandy textures and blowing are limitations. Vegetative cover is essential for areas used for camping, picnicking, and playgrounds. Spreading a thin layer of topsoil may be necessary to assure vegetation of critical areas.

These soils are generally unsuitable for building site development and onsite waste disposal because of the hazard of flooding. Areas free of the flooding hazard are suitable for building sites. Rapid permeability may allow effluent from sanitary facilities to contaminate ground water. Detailed onsite investigation is needed in any area considered for building sites.

This map unit is not assigned to interpretive groupings.

37E—Ramsey very stony sandy loam, 14 to 35 percent slopes. This shallow, moderately steep and steep, somewhat excessively drained soil is on side slopes. Individual areas of this map unit are irregular in shape and range from 20 to several hundred acres in size.

Typically, the surface layer is very dark grayish brown very stony sandy loam about 2 inches thick. A brown sandy loam subsurface layer is about 3 inches thick. The subsoil is strong brown cobbly sandy loam and is underlain by hard sandstone at 16 inches. Some areas are not stony.

Included with this soil in mapping, and making up about 10 percent of the map unit, are moderately deep, well drained Lily soils which are on foot slopes, benches, and lesser slopes.

Permeability and runoff are rapid, and available water capacity is very low. Organic matter content and natural fertility are both low. Reaction in the subsoil is very strongly acid or strongly acid. Rooting depth is 7 to 20 inches and is limited by sandstone except for occasional fractures in the bedrock.

Most areas of this soil are in timber. A few areas are cleared and used for pasture. This soil is suited to trees, but production is low. Intensive timber management is not common because erosion hazard, equipment limitations, and windthrow hazard are severe. Droughtiness and low fertility are also limitations that cannot easily be overcome. Planting seedlings on north and east slopes helps overcome the drying effect of aspect. The erosion hazard and equipment limitations can be partly overcome by careful selection, preparation, and maintenance of roads and skidding trails. Timely harvesting of mature trees limits windthrow.

Some of the less stony and less steep areas are used for pasture. This Ramsey soil is suited to some grasses and legumes. It is droughty because of low available water capacity and water loss by runoff. Maintaining an adequate vegetative cover helps to prevent excessive soil loss and reduce runoff. Overstocking and overgrazing reduce the protective cover and increase runoff and erosion. Native grasses are desirable for summer grazing. Proper stocking, uniform grazing distribution, timely deferment of grazing, and a planned grazing system help to keep the pasture and the soil in good condition. Some areas are suitable for pond reservoir sites but there may be no soil material suitable for a dam.

This soil is generally unsuitable for sanitary facilities and building sites because of the shallowness to bedrock and steepness of slope. Sealant is needed for the reservoirs if a layer of white sand derived from bedrock is above the bedrock or if deep fractures occur in the rock.

This map unit is in capability subclass VIIs and woodland ordination group 4x.

38E—Syenite extremely bouldery silt loam, 10 to 25 percent slopes. This moderately deep, strongly sloping to steep, well drained soil is on side slopes and in draws in mountainous areas. Individual areas are large, ranging from a few hundred acres to one thousand acres or more in size.

Typically, the surface layer is very dark grayish brown extremely bouldery silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 22 inches thick. The upper part of the subsoil is brown silt loam, the middle part is dark brown clay loam, and the lower part is brown loam. Hard, red granite underlies the subsoil.

Included with this soil in mapping are small areas of soils that are underlain by granite at a depth of less than 20 inches, granite rock outcrop (fig. 15), and Delassus soil. These inclusions make up about 15 percent of the unit.

Permeability is moderately slow, and surface runoff is rapid. Reaction ranges from strongly acid to slightly acid in the surface layer and from extremely acid to strongly acid in the subsoil. Natural fertility is low, and organic matter content is moderately low. Available water capacity is low. This soil is not tillable in most places. Root development is restricted by the extremely low fertility in the lower part of the solum and by the underlying hard rock.

Most areas are in timber. This soil is essentially limited to use as woodland, wildlife habitat, and, in a few places, pasture. It is suited to pasture grasses but yields are low to moderate. It can be used for grazing but stocking should be limited. Native grasses are best for summer grazing. Overgrazing can permanently damage the grass stand; therefore, rotation of pastures, timely deferment of grazing, and restriction on use during dry periods are needed.

This soil is suited to trees, but production is low because of droughtiness and low fertility. The equipment limitation, because of steep slopes and boulders, is severe and the erosion hazard is moderate. Droughtiness and low fertility are basic limitations that cannot economically be overcome. Planting seedlings on north and east slopes helps overcome the drying effect of aspect. The erosion hazard and equipment limitations can be partly overcome by carefully selecting and managing roads and skidding trails. It may be necessary to plant seedlings by hand or by direct seeding. Timber growth is fair on cool north-facing slopes and on low lying slopes where the soil is deeper.

This soil generally is not suitable for sanitary facilities and building sites. It is too steep and too shallow to work effectively as septic tank absorption fields or as sites for buildings or sewage lagoons.

This soil is in capability subclass VIIe and woodland ordination group 5x.

39A—Wilbur silt loam, 0 to 2 percent slopes. This deep, nearly level, moderately well drained soil is on flood plains of rivers, creeks, and some smaller drainageways. This soil is subject to frequent flooding. Individual areas are commonly long and narrow. They range from about 15 acres to more than 200 acres.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The underlying layers to a depth of 70 inches are brown, mottled silt loam and dark grayish brown silt loam. In some places the mottles are not present.

Included with this soil in mapping is a poorly drained soil that has gray colors throughout. This soil is in shallow depressions near the edge of uplands and amounts to about 10 percent of the unit.

Permeability is moderate, and surface runoff is slow. Reaction ranges from neutral to medium acid throughout. Natural fertility is high, but organic matter content is low. The surface layer is friable and easily tilled but has a tendency to crust or puddle, especially if tilled when wet. Root development is restricted below a depth of about 3 feet by a fluctuating water table. The available water capacity is high.

In most areas this soil is cleared and used for cultivated crops. It is suited to corn, soybeans, grain sorghum, grasses, and most legumes. Flooding is commonly of short duration before the planting and growing season. It is not especially hazardous to summer-growing annuals but can damage small grains. If the soil is used for cultivated crops, minimum tillage and returning crop residues to the soil help to improve fertility, maintain tilth, and increase water infiltration. Surface drainage and land smoothing may be needed for some depressional areas. Diversions can be used to protect these areas from excessive upland runoff. Underground tile drainage is also effective.

This soil is suited to use as pastureland or hayland. Overgrazing or grazing when the soil is wet can cause compaction or deterioration of grasses and legumes. Those problems can be prevented by proper stocking, pasture rotation, and deferment of grazing. Flooding is a hazard to livestock. Grazing should be avoided during the flooding season. The haying season commonly follows the normal flooding season. The water table and associated wetness can damage some deep rooting plants such as alfalfa.

This soil is suited to trees, and a few small areas remain in native hardwoods. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation, by prescribed burning, or by spraying or

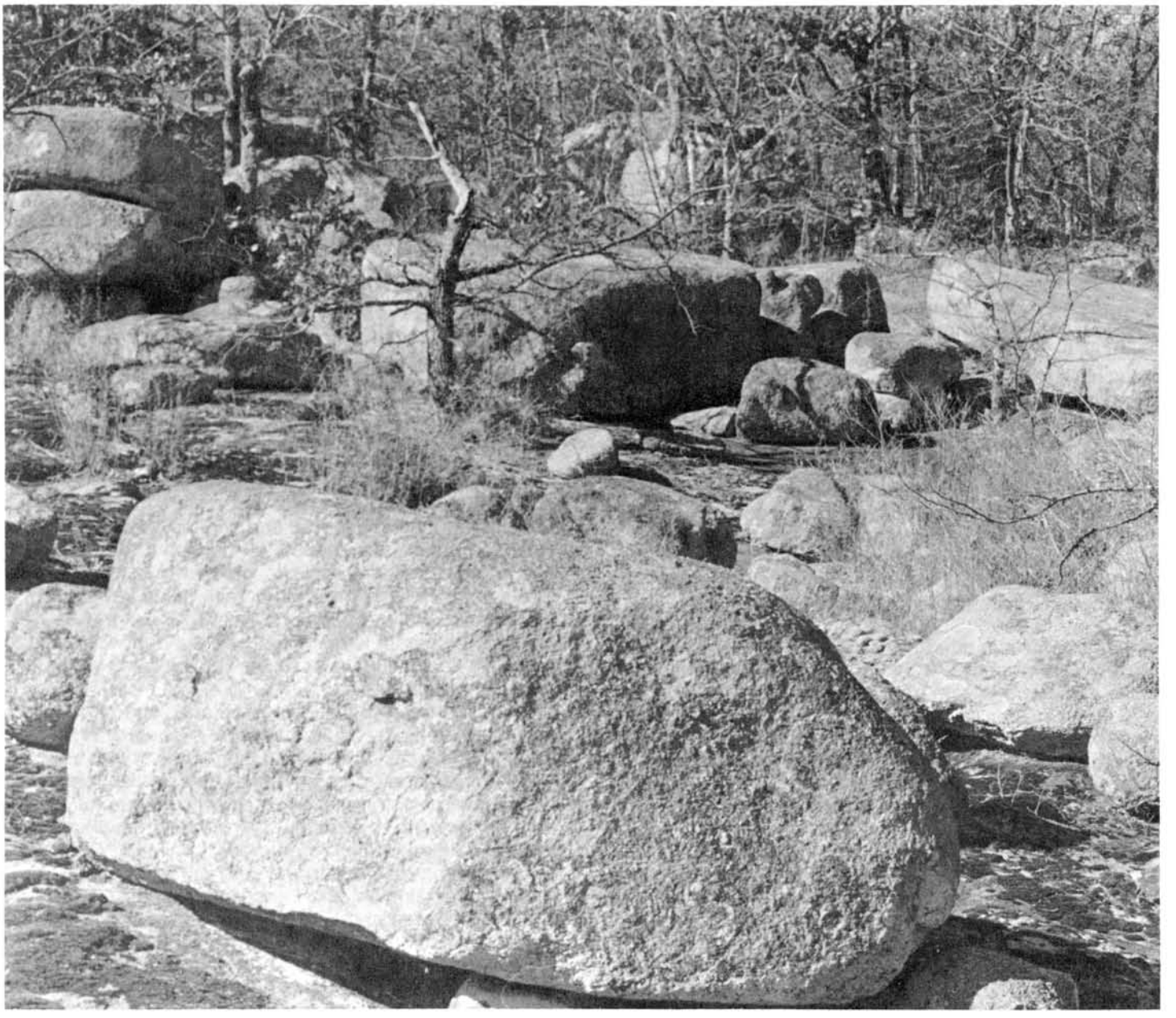

Figure 15.—The mapping of Syenite extremely bouldery silt loam, 10 to 25 percent slopes, includes some "granite glades," which are partly covered by boulders and stones and have little or no soil to support vegetation.

cutting. Logging when the soil is wet causes miring and rutting of the soil. The skidding, loading, and hauling of logs can be done during dry periods.

This soil generally is unsuitable for building site development or for onsite waste disposal because of frequent flooding. Some protection from overflow may be gained from the use of dikes, levees, or fill.

This map unit is in capability subclass IIw and woodland ordination group 1o.

40C—Wilderness cherty silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on convex point ridges. Individual areas are rather narrow and elongated and range from about 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown cherty silt loam about 4 inches thick. Some forest litter is on the surface. The subsoil to a depth of 22 inches is brown cherty silt loam in the upper part and yellowish

red very cherty silty clay loam in the lower part. Below that, to a depth of 37 inches, is a fragipan. The upper part of the fragipan is brown very cherty silt loam and the lower part is strong brown very cherty silty clay loam. Below the fragipan is red cherty clay that extends to a depth of about 60 inches. In some places the fragipan is less developed and more root penetration is evident.

Included with this soil in mapping are small areas of Lebanon and Hildebrecht soils. They do not have chert in the surface layer and upper part of the subsoil. These included soils are in saddles and on the wider, more stable parts of the ridgetops. They make up about 5 percent of the unit.

Permeability is moderate in the upper part of the profile and slow through the fragipan. Runoff is medium. The available water capacity is low. Reaction ranges from medium acid to very strongly acid in all horizons below the surface layer except for the fragipan. In the fragipan it ranges from strongly acid to extremely acid. Natural fertility is low, and organic matter content is moderately low. A seasonal high water table is at a depth of 1 to 2 feet. Root development, as well as downward movement of air and water, is severely limited below a depth of 22 inches by the fragipan.

In most areas this soil is in timber. It generally is not suited to corn, soybeans, and small grains. It is suited to grasses and legumes for hay and pasture. The shallowness of the root zone and low available water capacity cause this soil to be droughty. Adapted native grasses use available water best for summer growth. Grazing should be prevented when the soil is too wet.

This soil is suited to trees. Restricted root growth, because of the fragipan, causes this soil to be droughty and subject to windthrow. Seedling mortality due to drying is common. This can be partly overcome by surface preparation and mulching that aid infiltration and retard evaporation. Timely harvesting of mature trees helps reduce windthrow.

This soil is suited to building site development and onsite waste disposal, but wetness is a severe limitation. Properly designing buildings and installing tile drains around footings help prevent damage from wetness. This soil is not suited to use as conventional septic tank absorption fields because of slow permeability. It is suited to use as a site for sewage lagoons, but slope and wetness are severe limitations. These limitations can be overcome by properly designing the lagoon, grading the site to modify the slope, and sealing the bottom to prevent the contamination of ground water.

This map unit is in capability subclass IVs and woodland ordination group 4d.

40D—Wilderness cherty silt loam, 9 to 20 percent slopes. This deep, strongly sloping and moderately steep, moderately well drained soil is on side slopes of main valleys. Individual areas are irregularly shaped but tend to be narrow and elongated following the general contour of the topography. Areas are commonly large, ranging from 100 to 1,000 acres or more.

Typically, the surface layer is dark grayish brown cherty silt loam about 4 inches thick. Forest litter is on the surface. A 10-inch subsurface layer is brown cherty silt loam. The subsoil to a depth of 29 inches is reddish brown very cherty silty clay loam. It is underlain by a fragipan of strong brown and yellowish red very cherty silty clay loam that is 27 inches thick. Below the fragipan, to a depth of 79 inches, is reddish yellow silty clay loam. In some areas the soil is well drained, has a very cherty surface layer, and has slope greater than 20 percent.

Permeability is moderate in the upper part of the profile but slow through the fragipan. Runoff is rapid. Reaction ranges from medium acid to very strongly acid except in the fragipan, where it ranges from strongly acid to extremely acid. Natural fertility and organic matter content are low. The available water capacity is low. Root development is restricted primarily to the upper 20 inches because of the fragipan.

Most areas of this soil are forested. Most of the acreage is within the boundaries of the Mark Twain National Forest. Low available water capacity, slope, erosion hazard, and coarse fragments make this soil generally unsuitable for cultivation. This soil is suited to pasture. Native grasses are the best adapted. Proper stocking, pasture rotation, timely deferment of grazing, and restriction on use during wet periods and droughty periods help to keep the pasture and the soil in good condition.

This soil is suited to trees but restricted rooting depth causes it to be droughty and subject to windthrow. Timely harvesting of mature trees helps reduce windthrow. Seedling mortality is moderate due to the drying effect of aspect. This may be partly overcome by surface preparation and mulching that aid infiltration and retard evaporation.

This soil is suited to building site development and onsite waste disposal, but wetness and slope are severe limitations. These limitations can be partly overcome by proper sealing of basements, adequate drainage around foundations and footings, and landscaping and design to fit the slope. Some sites are too steep to be suitable for building. Generally, this soil is not suitable for sewage lagoons and conventional septic tank filter fields. However, in some places sewage lagoons can be located on lesser slopes and in areas that are suitable for land shaping to modify the slope. Sealing the bottom of sewage lagoons helps to prevent contamination of ground water.

This map unit is in capability subclass VIs and woodland ordination group 4d.

prime farmland

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce sustained high crop yields if acceptable farming methods are used. Prime farmland produces the highest yields with minimal inputs of energy and money, and for farming it results in the least damage to the environment. Prime farmland is of major importance in satisfying the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited and should be used with wisdom and foresight.

Prime farmland is either currently used for producing food or fiber or is available for this use. Urban or built-up land or water areas are not included.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It has favorable temperature and growing season and acceptable reaction. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods or frequently flooded during the growing season. Slope ranges mainly from 0 to 6 percent.

About 68,000 acres or nearly 23 percent of St. Francois County meets the soil requirements for prime farmland. Areas are scattered throughout the county but most are on the Farmington Plain in soil associations 1, 2, and 7 of the general soil map. Nearly all the row crops and small grain are grown on prime farmland. This land is used for pasture and hay as well.

Some prime farmland has been lost to urban and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate, and usually less productive.

Soil map units that make up prime farmland in St. Francois County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The use and management of the soils is described in the section "Detailed soil map units."

Some areas of Elsah, Haymond, and Wilbur soils may require protection from flooding to qualify as prime farmland. Also, some areas of Auxvasse and Loughboro soils may require drainage. In the following list, soils that are frequently flooded or are naturally wet are noted. Onsite evaluation is necessary to determine if these limitations have been overcome by corrective measures or if some areas of the unit flood less often than once in 2 years during the growing season. In St. Francois County the naturally wet soils generally have been adequately drained because of the application of drainage measures or because of the incidental drainage that results from farming, roadbuilding, or other kinds of land development.

The soils that meet the requirements for prime farmland are:

10A—Ashton silt loam, 0 to 3 percent slopes
11A—Auxvasse silt loam, 0 to 3 percent slopes [1]
12B—Caneyville silt loam, 2 to 5 percent slopes
15B—Crider silt loam, 2 to 5 percent slopes
16B—Delassus silt loam, 2 to 5 percent slopes
19A—Elsah silt loam, 0 to 3 percent slopes [2]
23A—Haymond silt loam, 0 to 2 percent slopes [2]
24B—Hildebrecht silt loam, 2 to 5 percent slopes
26B—Jonca silt loam, 2 to 5 percent slopes
31A—Loughboro silt loam, 0 to 3 percent slopes [1]
34B—Nicholson silt loam, 2 to 5 percent slopes
39A—Wilbur silt loam, 0 to 2 percent slopes [2]

[1] This soil is prime farmland only in areas where it is adequately drained.

[2] This soil is prime farmland only where it is protected from flooding or where it is flooded during the growing season less often than once in 2 years.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

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

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

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

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

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

crops and pasture

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 one-half of St. Francois County is cleared, and about 50,000 acres is used as cropland. Row crops and small grains are regularly grown on only about 7 percent of the soils. Corn and wheat are the major crops. Soybeans, grain sorghum, oats, and barley are grown on only a few hundred acres. Hay takes in nearly 30,000 acres and open pasture takes in about 68,000 acres.

The potential of the soils in St. Francois County for increased food production is good. About 68,000 acres of cropland on nearly level to gentle slopes qualifies as prime farmland. An additional 80,000 acres of moderately sloping soils is favorable for crop production if adequately protected from erosion. Food production may also be increased considerably by extending the latest crop production technology to all cropland in the county. This survey can greatly facilitate the use of such technology.

Acreages for urban and built-up land have increased by about one-third in the county over the last decade but this growth has not been on good agricultural soils. Most of the acreage has been lake development property in areas generally poorly suited to farming. The use of this soil survey to help make land use decisions that influence farming and urban uses is discussed in the section "General soil map units."

Soil erosion is the major management concern on about 85 percent of the cropland and pasture in St. Francois County. It is a hazard on soils that have slope exceeding 2 percent. Most erosion has occurred in areas of Crider, Fourche, Jonca, and Lamotte soils. In those areas, eroded spots of one to five acres are in draws and on side slopes. Sheet and rill erosion are dominant but some old gullies persist. Loss of the surface layer reduces fertility, available water capacity, and tilth. Loss of the surface layer is especially damaging to Caneyville, Delassus, Hildebrecht, Jonca, Knobtop, Lebanon, Lily, Nicholson, and Wilderness soils, which are limited in available water capacity and rooting depth by bedrock or a fragipan. The eroded material enters lakes, ponds, and streams. Control of erosion is needed to minimize stream pollution by sediment and improve the water quality for domestic, municipal, recreation, and wildlife uses. Crop rotation, permanent vegetative cover, conservation

tillage, contouring, terrace systems, diversions, and grade stabilization structures can be used to control erosion.

Crop rotation reduces the time that erosive cultivated crops are grown by alternating them with close-grown protective crops. A permanent vegetative cover such as grasses and legumes grown for hay or pasture can reduce soil loss to a negligible amount. Conservation tillage, which minimizes plowing and cultivation and leaves crop residues on or near the surface, helps to increase infiltration and reduce runoff and erosion. Minimum tillage helps to maintain good tilth, increase infiltration, and reduce erosion. A yield of corn leaves substantially more residue than a comparative yield of soybeans or grain sorghum. Plowing in spring rather than in fall allows residue to remain on the surface throughout the winter and thereby helps to reduce erosion. Tillage that leaves residue on the surface during the growing season is even more effective. Special techniques, such as the use of chisel plows and the direct planting of conventionally plowed fields, reduce the amount of actual tillage. Currently, no-till planters are gaining acceptance. Contouring and contour stripcropping are erosion control practices applicable to the survey area. They are best adapted to soils that have smooth, uniform slopes, for example, Auxvasse, Caneyville, Crider, Jonca, Loughboro, and Nicholson soils. Terraces and diversions reduce the length of slope and minimize runoff and erosion. They are most practical on deep, well drained or moderately well drained soils that have uniform slopes. Crider, Fourche, and some areas of Lamotte soils are suitable for terraces.

Soil fertility is a basic management requirement on all soils for maintaining high yields. Natural fertility is commonly high for Ashton, Carr, Haymond, and Wilbur soils. These soils require balanced and moderate additions of nitrogen, phosphate, and potash. Lime is commonly adequate on the Big River bottoms but light to moderate amounts may be needed on the St. Francis River bottoms. Caneyville, Crider, Elsah, Fourche, and Midco soils are medium in natural fertility and commonly require heavy applications of phosphate and moderate amounts of lime, nitrogen, and potash. Soils such as Auxvasse, Delassus, Hildebrecht, Jonca, Knobtop, Lamotte, Lebanon, Lily, Loughboro, and Nicholson soils commonly are low in fertility and require heavy applications of most of the elements essential for plant growth.

Soil tilth is an important factor in seedbed preparation, the germination of seeds, and the infiltration of water into the soil. Granular, porous soils have good tilth. Organic matter content is important to good tilth. Most soils used for crops in St. Francois County have a surface layer of silt loam that is low or moderately low in organic matter content. Generally, the soil structure of frequently cultivated fields is weak and intense rainfall causes the soil particles which form the surface to run together and crust. The crust hardens when dry, reducing infiltration and increasing runoff. Returning crop residue to the soil helps maintain the organic matter content. It also reduces crusting and keeps the soil porous, thereby increasing the infiltration rate and the available water capacity.

Soil drainage is the major concern of management on about 18,000 acres in the county. The soils making up that acreage are naturally wet because of their position on the landscape, slow permeability, or both. In most years, Haymond and Wilbur soils, which are on flood plains, flood for short periods. Flooding commonly occurs early in spring and in most years does not damage growing crops. Constructing dikes and levees generally is not an adequate solution. Auxvasse and Loughboro soils are naturally wet because they have a clayey subsoil that is slowly or very slowly permeable. They do not flood but have slow runoff. Surface drainage and diversion of upland runoff can benefit some areas of Auxvasse and Loughboro soils.

Soil blowing is a hazard in areas of the sandy Psamments soils and the steep chat dumps. Maintenance of vegetative cover is possible on the Psamments but not practical on the Dumps. Establishing windbreaks on the edge of these areas helps to reduce soil blowing and drifting.

Field crops that are suited to local soil and climate include many crops that are not now commonly grown. Corn is by far the major row crop, and wheat continues to be the dominant small grain. Oats, barley, rye, alfalfa, red clover, timothy, orchardgrass, bromegrass, and many other crops can also be grown.

Small grains grow well on most tillable soils of the county where fertility is adequate. They grow during the cool months, when moisture commonly is adequate. Deep, well drained soils with high lime content, such as Ashton and Crider soils are the best for alfalfa. The alluvial soils—Haymond and Elsah soils—and the Fourche soils are also suited to alfalfa. Soils that have a fragipan, limited depth to bedrock, or wetness are better suited to clover. If adequately fertilized and drained most of the soils suited to pasture and hay can support red clover, ladino, and other clover. Fescue, orchardgrass, bromegrass, and other cool season grasses grow well on most of the soils in the county (fig. 16). These grasses grow best in spring, early summer, and fall. Warm season grasses can be used where there is a need for additional midsummer pasture or hay.

Native, warm season grasses grow well in the survey area. Big bluestem, switchgrass, and indiangrass are tall grasses that once grew on small, isolated prairies throughout the county. Deep, well drained and moderately well drained soils such as Ashton, Crider, Elsah, Fourche, Goss, Haymond, and Lamotte soils are suited to all these grasses. Auxvasse and Loughboro, deep soils that have a firm clayey subsoil, are probably best suited to big bluestem. Soils that have restricted rooting depth or other properties that limit the available water capacity, such as Caneyville, Carr, Delassus, Hildebrecht, Jonca, Knobtop, Lebanon, Lily, Midco,

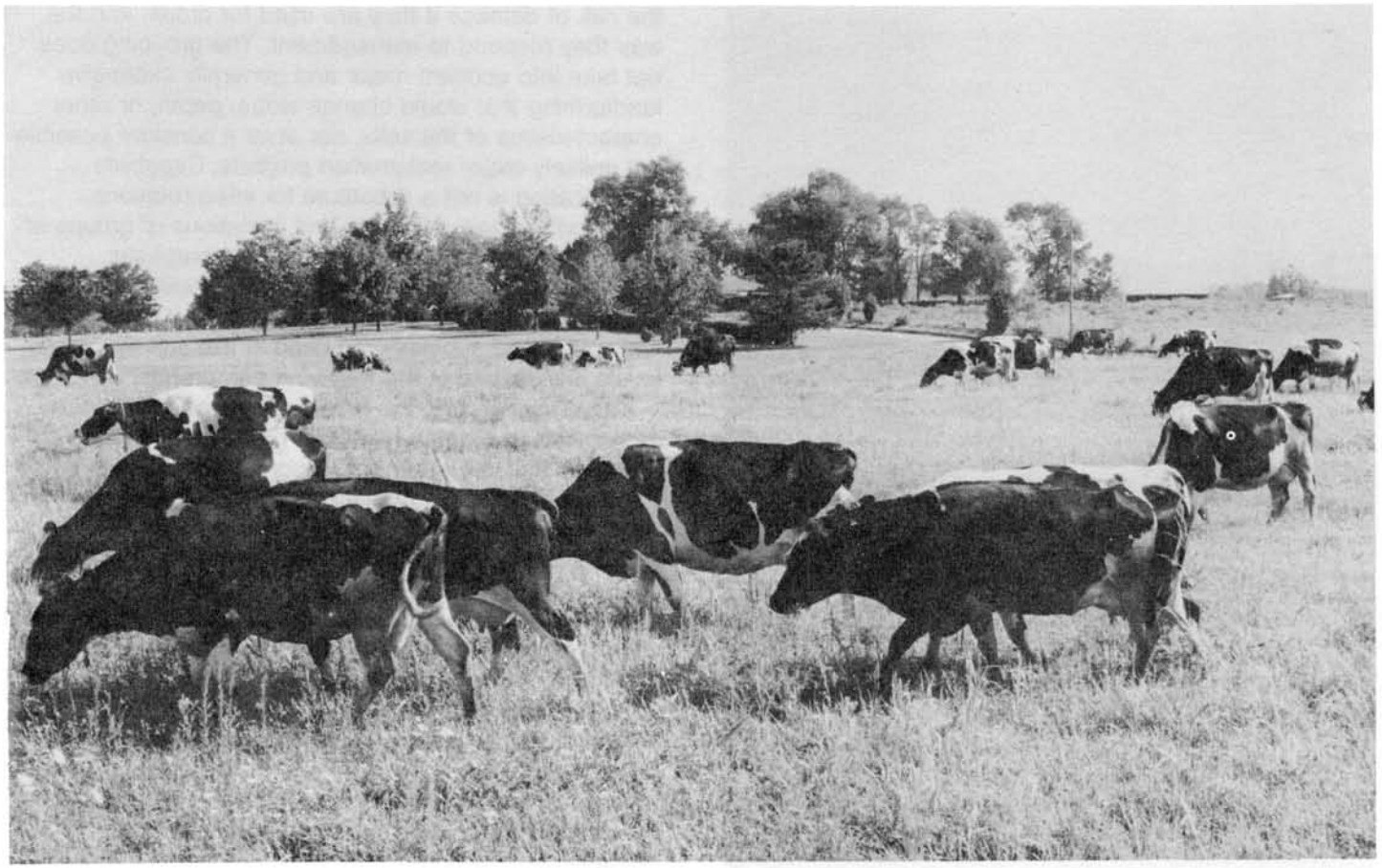

Figure 16.—Holsteins grazing fescue that is growing on Nicholson silt loam, 2 to 5 percent slopes. Fescue is the primary grass grown for pasture and hay.

Nicholson, and Wilderness soils, are best suited to switchgrass and indiangrass.

Special crops grown commercially in the county are strawberries (fig. 17), apples, peaches, and potatoes. The acreage devoted to these crops could be increased and more grapes, blueberries, other fruits, vegetables, nuts, and nursery plants could also be grown.

Many vegetables, small fruits, and tree fruits grow best on deep soils that have good natural drainage and that warm up early in the spring. In St. Francois County the best suited soils are the Ashton and Crider soils, which have slope of about 5 percent and total about 13,000 acres. Tree fruits can be grown on soils that have slope of 5 to 9 percent, for example, Crider and Lamotte soils, which take in about 17,000 acres. Caneyville soils having slope of less than 5 percent, which take in 300 acres, are well suited to vegetables and fruits if they are irrigated. Crops can generally be planted and harvested on these well drained soils earlier than on the other soils in the survey area.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

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

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium,

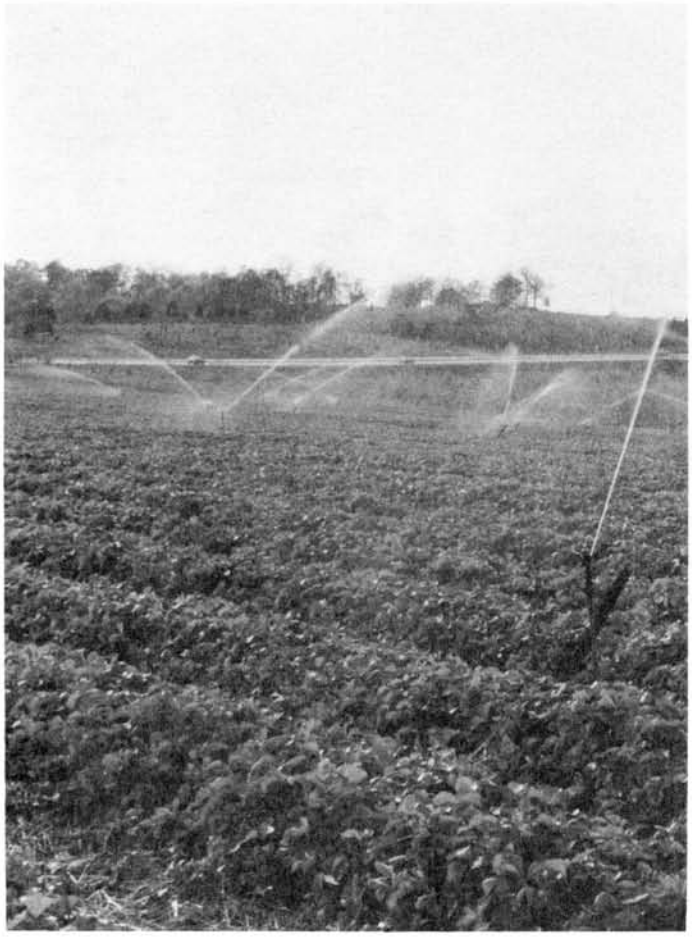

Figure 17.—Irrigation water is pumped from a pond, which is in turn filled from a deep well, to produce strawberries on Crider silt loam, 2 to 5 percent slopes.

and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

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

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

land capability classification

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

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*24*). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

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

Class I soils have slight limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use. There are no class V soils in St. Francois County.

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

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

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production. There are no class VIII soils in St. Francois County.

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

In class I there are no subclasses because the soils of this class have few limitations. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

James L. Robinson, forester, Soil Conservation Service, assisted in the preparation of this section.

Most of St. Francois County was forested at the time of early settlement. Small areas of shallow soils supported native grasses. Early loggers removed much of the virgin pine and oak in the county. Subsequent practices of repeated burning and heavy grazing resulted in degradation of the soil and an increase of less desirable species such as blackjack oak and post oak in the forest stand. As a consequence, the quality of timber stands in the county is generally low. Tree planting, seeding, and improved timber management are essential to upgrade the timber quality and to assure a continuing supply of marketable trees.

The most recent survey of St. Francois County's forest resource was conducted by the Forest Service, U.S. Department of Agriculture, in 1972 (*13*). According to this survey, St. Francois County has 141,100 acres of forest land. This figure represents a decrease of approximately 7 percent since 1959, when a previous Forest Service survey had been made.

The major forest cover type in St. Francois County is the Oak-Hickory type. It is found primarily on the Goss-Hildebrecht, Lebanon-Wilderness, Delassus-Syenite, Irondale-Delassus, and Jonca-Lamotte-Ramsey associations on the general soil map. Northern red oak, white oak, and hickories dominate this type. Actual stand composition depends on the soil's productivity. Black oak, scarlet oak, post oak, and blackjack oak are the common associates along with many other hardwood species that occur in the Oak-Hickory forest. Northern red oak and white oak generally are more abundant on the moist deep soils on ridgetops and north-facing slopes. As the sites become less productive, black oak, post oak, blackjack oak, and hickories replace the northern red oak and white oak. Typically, these less productive sites are on dry ridgetops, in areas of soils that are shallow to bedrock, or on slopes facing south and west.

The Shortleaf Pine-Oak forest cover type is found on the same associations as the Oak-Hickory type but is less extensive. The forest composition is similar to that of the Oak-Hickory forest, with the inclusion of shortleaf pine which often dominates. This forest cover type is most obvious on the Lebanon-Wilderness and the Jonca-Lamotte-Ramsey soil associations.

The Sugar Maple-Northern Red Oak forest cover type dominated the Caneyville-Crider-Gasconade and Crider-Fourche-Nicholson associations prior to settlement. Sugar maple and northern red oak were probably dominant, and white oak, black oak, river birch, white ash, American basswood, eastern redcedar, and American beech were their main associates. The soils in these associations generally were also suited to more intensive agricultural uses and consequently were cleared. Small remnants of the forest can still be found along the steeper slopes in these associations.

The Eastern Redcedar-Hardwood forest cover type grows in small isolated areas primarily in the Caneyville-Crider-Gasconade, Crider-Fourche-Nicholson, and Goss-Hildebrecht associations. Species such as eastern redcedar, chinkapin oak, white ash, winged elm, American hornbeam, post oak, and blackjack oak, and a variety of native grasses and shrubs characterize this forest type. These woodland areas locally called "cedar glades," are typically found on soils that are shallow to bedrock such as the Gasconade soil.

The American Elm-Green Ash forest cover type can be found in all associations along the small rivers and creeks throughout the county. Eastern cottonwood, American sycamore, pecan, willows, silver maple, white ash, and other bottom land hardwoods are found along with the American elm and green ash. The forest composition varies depending upon the successional development of the forest and the soils.

Table 6 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

In table 6, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly

planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

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

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

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

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

windbreaks and environmental plantings

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

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold 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 insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 7 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 7 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 nursery.

recreation

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

Outdoor recreational opportunities are increasing in St. Francois County. Projected population growth and the county's close proximity to the St. Louis metropolitan area affect recreation planning and development. The recently acquired St. Joe State Park (9,235 acres) is already drawing visitors from the Chicago area who wish to test their off-the-road vehicles. In 1970, the Statewide Comprehensive Outdoor Recreation Plan (SCORP) listed 9,935 acres of existing recreation developments within the county (*19*). The amount of land devoted to recreation uses today has doubled from that early inventory figure. The facilities listed in 1970 include 30 miles of horse trails, 128 acres of playfields, 512 acres of fishing waters, 358 acres of water suitable for all types of boats, 102 acres of water suitable for sailboats or canoes, 272,460 square feet of swimming area, 2,072 acres of hunting area, 1,150 acres of campgrounds, 45 miles of hiking trails, and 136 acres of picnicking areas.

The 1970 report also projects the minimum additional acreage that will be needed for some uses by 1990: bike paths, 165 miles; playfields, 406 acres; fishing waters, 1,937 acres; and hunting areas, 6,269 acres. This would meet the needs of 42,400 people, the projected population for that date (*16*). Tracts of state owned lands, over 100 acres, that are open to the public include the Buck Mountain Hunting Area (194 acres), the St. Francois State Park (2,403), and the St. Joe State Park (9,235 acres). A portion of the Mark Twain National Forest (893 acres) is in the extreme southeastern tip of the county. The French Village Tower Site, owned by the State, offers limited hunting opportunities on its 20-acre tract of land. Approximately 75 miles of permanent streams add to the county's recreation resource base.

The 1974 NACD Nationwide Outdoor Recreation Inventory lists eighteen private and semi-private recreation enterprises operating within the county (*10*). Of these, fifteen are commercial enterprises, including fishing lakes, a racetrack, golf courses, a mine tour, a rodeo, and gun clubs. In the 1974 inventory, the county's most pressing recreation needs were for the construction of additional campgrounds and the establishment of natural areas.

Several subdivisions built around lakes combine residential and vacation homes and water based

recreation facilities. The recreation areas are available only to the homeowners and their guests.

Soils best suited for playfields occur in small areas throughout the county but are most plentiful in the soil associations 1 and 2, described in the section "General soil map units." Soils that are best suited to extensive recreation uses such as hunting and nature study are in associations 3, 4, 5, and 6.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, 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 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

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

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

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

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

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

wildlife habitat

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

St. Francois County is one of thirteen counties that makes up the North and East Ozark Border Zoogeographic Region in Missouri. Though the entire county was originally wooded, now less than half remains in farm woodland and forest cover (*17*). Urbanization, agriculture, timbering, and mining have changed the original plant cover. Today, about 48 percent of the land area is classified as woodland. Of the remainder, 43 percent is grassland, 7 percent is cultivated, and 2 percent is in other land uses. Game species found here are primarily those which favor a woodland habitat, including deer, turkey, and squirrel. Quail and rabbit occur wherever woodland and open areas intermingle to provide the required habitat. Small fur animals such as fox, opossum, and skunk are fairly abundant (*16*). Many songbirds can be found throughout the county. Waterfowl habitat is rare in this county.

The Goss-Hildebrecht, Caneyville-Crider-Gasconade, Irondale-Delassus, Syenite-Delassus, and Lebanon-Wilderness soil associations provide the primary habitat for woodland wildlife species. Wooded acreage in the other two associations add to this 140,000-acre timbered base. The population of turkey is rated as good, and the deer and squirrel populations are rated as fair. Furbearing species rate about fair in these associations.

During the 1977 season, 141 deer were harvested, giving St. Francois a rank of 78th of 114 counties in Missouri. Its eastern neighbor, Ste. Genevieve County, ranked 3rd in the state on deer, with a harvest of 1,042 animals. Changes from woodland to agricultural land

uses are expected to be minimal in the foreseeable future. However, the continued urban growth and subsequent loss of woody habitat to residential development is an increasing problem for wildlife in the county. Management practices that provide additional food supplies to woodland wildlife are needed. Such practices include establishment of food plots and creation of woodland openings to encourage herbaceous vegetation and browse plants. Preserving den trees and snags during timber harvest enhances the quality of the habitat for cave-dwelling wildlife.

The majority of openland habitat, approximately 133,000 acres, is in the Crider-Fourche-Nicholson and Jonca-Lamotte-Ramsey associations. Almost half of this openland is classified as grassland. Most of the cropland in the county is in the Crider-Fourche-Nicholson association.

Quail and rabbit populations are rated as only fair in the county. Resident populations of dove are rated as very poor. Fall migrations, however, provide some hunting in areas of cropland. To sustain wildlife in these areas, management practices are needed which assure the continued supply of adequate food and cover. Generally, areas of cover do not extend into areas of food supply. Examples of this type of cover are fencerows, brushy or wooded draws, windbreaks, hedgerows, and some areas within or around fields (fig. 18). Habitat quality can be improved by planting food plots in grassland areas and legumes in unmixed stands of fescue pasture. Using warm season grasses in a pasture management program can improve habitat quality by diversifying vegetative cover.

Wetland habitat is almost nonexistent in St. Francois County. Waterfowl populations are rated as poor at best. Wood ducks use certain streams to a limited extent, but human disturbance and lack of suitable cover have kept their numbers low. The county's lakes and ponds provide resting areas during spring and fall migrations.

St. Francois County has at least 75 miles of permanent streams within its borders (*16*). The best fishing waters, and the most heavily used, are the Big, St. Francis, Flat, Little St. Francis, and Whitewater rivers and Terre Bleue, Mill, and Wolf Creeks and Doe Run. Common fish are largemouth bass, smallmouth bass, spotted bass, goggle-eye, channel catfish, carp, and

Figure 18.—The grassed waterway, field border, and fencerow in this area of Crider silt loam, 5 to 9 percent slopes, provide habitat for openland wildlife such as rabbit and quail.

various suckers, bullheads, and sunfish. Big River provides year-round float fishing opportunities.

The county's lakes and ponds are usually stocked with largemouth bass, channel catfish, and bluegill. More than a dozen sizable lakes are in St. Francois County, but access is controlled by membership, permit, or similar restrictions. Approximately 600 private ponds provide fishing opportunities to landowners and their guests. No commerical fishing ponds are in operation in the county at the present time.

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

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

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

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

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

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

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

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

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

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

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

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

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and

associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

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

engineering

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

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

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

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

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

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

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

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

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

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

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and

construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

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

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

sanitary facilities

Table 11 shows the degree and the 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 11 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 effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoon areas 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 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 11 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 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

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

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

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

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

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

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

water management

Table 13 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 embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

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

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

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

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

soil properties

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

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

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

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

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, 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 (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

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, SP-SC.

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

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

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

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

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

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

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

The four hydrologic soil groups are:

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

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

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

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

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

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. Only saturated zones within a depth of about 6 feet are indicated. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to

the seasonal high water table; the kind of water table—that is, perched, artesian, 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 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

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

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

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

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

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*25*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

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

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; 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 Fragiudalfs (*Fragi*, meaning fragipan, plus *udalf*, the suborder of the Alfisols that have an 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 Fragiudalfs.

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

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

soil series and their morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*23*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*25*). 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."

Ashton series

The Ashton series consists of deep, well drained, moderately permeable soils on stream terraces, alluvial fans, and foot slopes. These soils formed in silty alluvium derived from dolomite and limestone rocks and loess. Slopes range from 0 to 3 percent.

Ashton soils are similar to Haymond and Crider soils. Haymond soils are on first bottom positions subject to frequent flooding and do not have an argillic horizon. Crider soils are on upland positions and are red and clayey in the lower part of the subsoil.

Typical pedon of Ashton silt loam, 0 to 3 percent slopes, about 3 miles north of Bonne Terre; 660 feet

north and 300 feet east of the center of sec. 32, T. 37 N., R. 4 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; many very fine grass roots; neutral; clear smooth boundary.
A12—7 to 14 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common very fine roots; neutral; clear smooth boundary.
B1—14 to 24 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; common very fine roots; neutral; gradual smooth boundary.
B21t—24 to 33 inches; brown (10YR 4/3) silt loam; weak medium prismatic structure parting to moderate very fine subangular blocky; friable; few very fine roots; neutral; clear smooth boundary.
B22t—33 to 48 inches; brown (7.5YR 4/4) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few thin dark brown (7.5YR 3/2) patchy clay films; few very fine roots; neutral; gradual smooth boundary.
C—48 to 72 inches; dark yellowish brown (10YR 4/4) silt loam; massive; friable; few very fine roots; neutral.

The thickness of the solum ranges from about 40 inches to 60 inches. Depth to bedrock is greater than 60 inches. Reaction ranges from neutral to medium acid throughout.

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

The B1 horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 3 or 4. The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam, silty clay loam, and loam and averages between 18 and 30 percent clay.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam, loam, and rarely sandy loam.

Auxvasse series

The Auxvasse series consists of deep, poorly drained, very slowly permeable soils on terraces, benches, and low upland positions. These soils formed in loess and old alluvium. Slopes range from 0 to 3 percent.

Auxvasse soils commonly are near Caneyville, Crider, Fourche, and Nicholson soils of the uplands and Haymond soils of the flood plains. Caneyville, Crider, and Haymond soils are well drained and have dominant brown and red colors throughout. Fourche soils are moderately well drained and are not clayey in the upper part of the subsoil. Nicholson soils are moderately well drained and have a fragipan.

Typical pedon of Auxvasse silt loam, 0 to 3 percent slopes, 950 feet west of Perrine Road and 55 feet north of Overall Road in the southeast part of survey 2969, T. 35 N., R. 5 E.

Apl—0 to 3 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine roots; neutral; clear smooth boundary.
Ap2—3 to 7 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
A2—7 to 13 inches; pale brown (10YR 6/3) silt loam; common medium faint light brownish gray (10YR 6/2) mottles; weak fine granular structure; friable; many fine roots; strongly acid; clear wavy boundary.
B&A—13 to 18 inches; brown (10YR 4/3) silty clay (Bt) with common medium distinct light brown (7.5YR 6/4) mottles; strong fine and medium subangular blocky structure; friable; pale brown (10YR 6/3) silt coatings 1 to 4 mm thick (A2), white (10YR 8/2) dry, on faces of peds and as fillings in occasional vertical cracks; very strongly acid; many fine roots; clear smooth boundary.
B21t—18 to 28 inches; grayish brown (2.5Y 5/2) silty clay; many medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; firm; many fine shiny pressure faces; few fine roots; very strongly acid; clear smooth boundary.
B22t—28 to 33 inches; grayish brown (10YR 5/2) silty clay loam; many coarse faint light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; firm; discontinuous clay films on surfaces of peds; few fine roots; very strongly acid; gradual smooth boundary.
IIC—33 to 70 inches; mottled gray (10YR 6/1) and yellowish brown (10YR 5/4) silt loam; massive; friable; few (less than 5 percent) fine pebbles; neutral; gradual smooth boundary.

The thickness of the solum is typically about 30 inches and ranges from 24 to 38 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Reaction is slightly acid or neutral. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3.

Peds of the B & A horizon are 60 percent or more covered by a silt coating 1 to 6 mm thick that has hue of 10YR or 2.5Y, value of 6 or 5 (7 or 8 dry), and chroma of 2 or 3. Ped interiors have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture is silty clay or clay.

The B2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2. Texture is silty clay or clay. This horizon is very strongly acid or strongly acid.

The C horizon is mottled silt loam, silty clay loam, or clay loam, but stratified subhorizons may range from loamy sand to clay.

Caneyville series

The Caneyville series consists of moderately deep, well drained soils which formed in thin loess and clayey material over dolomite or dolomitic limestone. Permeability is moderately slow. These soils are on upland ridgetops and side slopes. Slopes range from 2 to about 20 percent.

The Caneyville soils commonly are adjacent to Crider, Fourche, Nicholson, and Gasconade soils. Crider, Fourche, and Nicholson soils are more than 40 inches deep to bedrock. Fourche and Nicholson soils are moderately well drained. Also, Nicholson soils have a fragipan. Gasconade soils are 4 to 20 inches deep to bedrock.

Typical pedon of Caneyville silt loam, 5 to 9 percent slopes, about 2 miles east of Esther; 780 feet east of Hillsboro Road and 50 feet north of Highway O in survey 3063, T. 36 N., R. 5 E.

Ap—0 to 7 inches; dark brown (7.5YR 4/4) silt loam, light brown (7.5YR 6/4) dry; moderate fine granular structure; friable; many fine roots; mildly alkaline; abrupt smooth boundary.

B21t—7 to 18 inches; reddish brown (5YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; neutral; gradual boundary.

B22t—18 to 27 inches; dark reddish brown (2.5YR 3/4) silty clay; strong fine and very fine subangular blocky structure; firm; patchy clay films; common black stains on surfaces of peds; common fine roots; neutral; clear smooth boundary.

B23t—27 to 31 inches; dark reddish brown (2.5YR 3/4) clay; weak fine subangular blocky structure; firm; many black stains; reddish yellow (7.5YR 6/6) soft limestone in lower inch; many very fine roots; slight effervescence; mildly alkaline; abrupt irregular boundary.

R—31 inches; hard dolomite.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. Bedrock in most places has an irregular surface. The maximum and minimum depths from pinnacles to troughs commonly can be found within a single pedon. Outcropping of pinnacle rock or "floating" stones is recognized in stony phases. Stones occur throughout the solum in some pedons.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. Where the moist value is 3, the dry value is 6 or more. The A horizon commonly is silt loam but in places is stony silt loam. Reaction is neutral or mildly alkaline.

The B2 horizon has hue of 5YR, 2.5YR, and less commonly 7.5YR; value of 3 to 5; and chroma of 4 to 6. In some pedons it has gray or grayish brown mottles in the lower part. It is silty clay loam, silty clay, and clay. The clay content increases with depth, averaging between 35 and 50 percent. This horizon is medium acid to mildly alkaline. Some pedons have minor amounts, less than 15 percent, of cobblestones and gravel in the lower part of the subsoil.

Carr series

The Carr series consists of deep, well drained soils on flood plains of rivers and creeks. Permeability is moderately rapid. These soils formed in stratified loamy and sandy alluvium. Slopes range from 0 to about 2 percent.

Carr soils are commonly adjacent to the Haymond and Wilbur soils on bottom lands. Haymond and Wilbur soils are silt loam to a depth of about 40 inches or more. In addition, the Wilbur soils have grayish brown mottles within 20 inches of the surface.

Typical pedon of Carr fine sandy loam, 0 to 2 percent slopes, 1,700 feet west and 300 feet south of the NE corner of sec. 36, T. 38 N., R. 4 E., about 3 miles north of Bonne Terre:

A1—0 to 6 inches; brown (10YR 4/3) fine sandy loam; weak fine and very fine granular structure; about 15 percent very dark grayish brown (10YR 3/2); many fine and very fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—6 to 18 inches; brown (10YR 5/3) loamy fine sand; weakly stratified with lenses of brown (10YR 4/3) sandy loam; single grain; very friable to loose; common fine and very fine roots; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—18 to 37 inches; brown (10YR 4/3) fine sandy loam; stratified with lenses of loamy sand; massive; very friable; common fine and very fine roots; slight effervescence; mildly alkaline; clear and slightly wavy boundary.

C3—37 to 52 inches; dark grayish brown (10YR 4/2) loam; stratified; massive; friable; few very fine roots; slight effervescence; mildly alkaline; clear and slightly wavy boundary.

C4—52 to 60 inches; light yellowish brown (10YR 6/4) sand; 10 percent lenses of brown (10YR 4/3) sandy loam; single grain; loose; about 15 percent fine gravel; few fine and very fine roots; mildly alkaline.

Reaction is dominantly mildly alkaline and rarely moderately alkaline. This soil effervesces in all parts, although slowly, because it contains free carbonates from dolomite. The sand fraction is dominated by either medium or fine sand.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 3.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It has strata of loam, sandy loam, or loamy sand and, in places, silt loam and sand.

The 10- to 40-inch control section averages more than 15 percent sand coarser than very fine and less than 18

percent clay. Except for lenses or thin layers, sand or coarse sand is only at depths greater than 40 inches.

Crider series

The Crider series consists of deep, well drained, moderately permeable soils on upland ridgetops and side slopes. These soils formed in loess and clayey material underlain below 60 inches by dolomite or dolomitic limestone. Slopes range from 2 to 14 percent.

Crider soils are adjacent to Caneyville, Fourche, and Nicholson soils on the landscape and are similar to Lamotte soils. Caneyville soils are 20 to 40 inches to bedrock. Fourche and Nicholson soils are moderately well drained and do not have red colors. In addition, Nicholson soils have a fragipan. Lamotte soils contain 15 to 40 percent sand coarser than very fine in the upper 20 inches of the argillic horizon.

Typical pedon of Crider silt loam, 5 to 9 percent slopes, about 5 miles north of Farmington; 650 feet east and 500 feet north of the SW corner of sec. 35, T. 37 N., R. 5 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1t—7 to 18 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; friable; many fine roots; neutral; clear smooth boundary.

B21t—18 to 24 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine and fine subangular blocky structure; firm; common fine roots; thin patchy dark reddish brown (5YR 3/4) clay films; neutral; clear smooth boundary.

IIB22t—24 to 40 inches; reddish brown (5YR 4/4) silty clay loam; moderate fine and very fine subangular blocky structure; firm; common fine roots; many thick patchy dark reddish brown (5YR 3/4) clay films; medium acid; gradual smooth boundary.

IIB23t—40 to 60 inches; red (2.5Y 4/6) silty clay; moderate very fine subangular blocky structure; firm; few fine roots; common thick patchy dark reddish brown (2.5Y 3/4) clay films; strongly acid; gradual boundary.

IIB24t—60 to 72 inches; dark red (2.5Y 3/6) silty clay; moderate fine and very fine subangular blocky structure; firm; few fine roots; many thick patchy dark reddish brown (2.5Y 3/4) clay films and flows; common fine black stains on surfaces of peds; a few fine dark concretions; medium acid.

The thickness of the solum and the depth to bedrock are more than 60 inches and commonly are greater than 100 inches. Content of chert ranges from 0 to 15 percent in the upper IIB horizon. Chert occurs as a stone line.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. It is silt loam but silty clay loam where eroded. The horizon ranges from neutral to medium acid.

The B1 horizon commonly has hue of 7.5YR but in a few pedons has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is most commonly silty clay loam but is silt loam in some pedons. It ranges from neutral to medium acid. The B2t horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam. Reaction ranges from neutral to very strongly acid. The IIB2t horizon has hue of 2.5YR or 5YR, value of 3 or 4, and chroma of 4 to 6. It is commonly silty clay or clay, but in some pedons individual horizons in the upper part are silty clay loam. This horizon ranges from medium acid to very strongly acid.

Delassus series

The Delassus series consists of deep, moderately well drained, very slowly permeable soils that have a fragipan. These soils are on broad convex upland ridgetops, side slopes, and foot slopes. They formed in loess and loamy residuum of granite or other igneous rocks. Slopes range from 2 to 9 percent.

Delassus soils are similar to the Jonca soils and are commonly adjacent to the Syenite and Loughboro soils. Jonca soils have a base saturation of more than 35 percent at 30 inches below the top of the fragipan. Syenite soils are very bouldery or extremely bouldery and are underlain by hard granite at 20 to 40 inches. The poorly drained Loughboro soils are on nearly level to gently sloping uplands at the base of the mountain peaks or knobs.

Typical pedon of Delassus silt loam, 2 to 5 percent slopes, 1,980 feet south and 2,210 feet west of the NE corner of sec. 2, T. 34 N., R. 5 E.

A1—0 to 3 inches; dark brown (10YR 4/3) silt loam; pale brown (10YR 6/3) dry; moderate fine and very fine granular structure; friable; many very fine and few fine roots; neutral; abrupt smooth boundary.

A2—3 to 7 inches; yellowish brown (10YR 5/4) silt loam; about 10 percent dark brown (10YR 4/3) spots; weak fine granular structure; friable; common very fine and few fine roots; medium acid; clear wavy boundary.

B1t—7 to 13 inches; brown (7.5YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; common fine and few very fine roots; strongly acid; clear wavy boundary.

B2t—13 to 26 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; few thin patchy reddish brown (5YR 4/4) clay films; common fine and few medium and very fine roots; very strongly acid; clear smooth boundary.

A'2—26 to 31 inches; light yellowish brown (10YR 6/4) silt loam; many coarse distinct dark yellowish brown

(10YR 4/6) mottles; weak fine and medium platy structure; firm; common fine and very fine roots along horizontal plates; extremely acid; abrupt smooth boundary.

IIBx1—31 to 45 inches; light brownish gray (10YR 6/2) loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; moderate very coarse (16 to 30 cm wide) prismatic structure, ped interiors massive; very firm; brittle, very hard when dry; few very fine roots along surfaces of peds; dark brown (7.5YR 4/2) clay flows on vertical surface of peds; extremely acid; gradual wavy boundary.

IIBx2—45 to 61 inches; reddish yellow (7.5YR 6/6) loam; many coarse distinct light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure, ped interiors massive; very firm, brittle, very hard when dry; brown (7.5YR 4/2 to 5/2) clay films and flows on vertical side of prisms; 2 percent coarse fragments by volume; extremely acid; abrupt wavy boundary.

IIR—61 inches; hard red granite.

Solum thickness typically is 48 to 72 inches and ranges from 40 to 100 inches. Solum thickness and depth to hard rock are commonly the same. Depth to the fragipan on uneroded sites ranges from about 24 to 36 inches. Coarse fragments make up 0 to 15 percent, by volume, of the profile. Surface boulders cover from none to about 1 percent of the surface.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is silt loam or bouldery silt loam and very rarely bouldery loam. It ranges from neutral to medium acid.

The B1 horizon is silt loam or loam. Reaction ranges from very strongly acid to slightly acid. The B2 horizon has hue of 7.5YR, 10YR, and rarely 5YR, value of 4 or 5, and chroma of 3 to 6. It is gritty silty clay loam, loam, or clay loam. The upper 20 inches of the argillic horizon averages between 24 and 34 percent clay and from about 18 to 30 percent sand larger than 0.1 mm. The B2 horizon ranges from strongly acid to extremely acid.

The A' horizon has hue of 10YR, value of 6 or 7, and chroma of 2 to 4. It is silt loam or loam.

The IIBx horizon has hue of 10YR, 2.5Y, or 7.5YR, value of 5 or 6, and chroma of 2 to 6. This horizon consists of silt loam or loam. It is very strongly acid or extremely acid.

Elsah series

The Elsah series consists of deep well drained and somewhat excessively drained soils that are moderately permeable in the upper part of the profile and moderately rapidly permeable in the lower part. These soils are on small stream bottoms. They formed in silty and loamy alluvium that increases in chert content with depth. Slopes range from 0 to 3 percent.

Elsah soils are adjacent to Haymond soils. Haymond soils are silt loam to a depth of 30 inches or more and do not have coarse fragments.

Typical pedon of Elsah silt loam, 0 to 3 percent slopes, 1,350 feet west and 1,900 feet north of the SE corner of sec. 28, T. 36 N., R. 5 E., in the St. Joe State Park.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; very friable; many very fine and fine roots; few fine pebbles (about 1 percent by volume); neutral; abrupt smooth boundary.

AC—6 to 18 inches; brown (7.5YR 5/4) silt loam; weak fine granular structure; friable; common very fine roots; 5 percent fine chert gravel; slightly acid; clear wavy boundary.

IIC1—18 to 42 inches; brown (7.5YR 4/4) very cherty loam; weak medium and fine subangular blocky structure; friable; common fine and very fine roots; 50 percent chert and a few coarse chert fragments; medium acid; gradual wavy boundary.

IIC2—42 to 60 inches; yellowish brown (10YR 5/4) very cherty loam; massive with some pockets of weak fine granular structure in the upper part; friable; few very fine roots; 40 percent chert and 10 percent coarse chert fragments; slightly acid.

Thickness of alluvium and depth to bedrock range from 4 to about 8 feet. Reaction ranges from neutral to medium acid. The cherty (IIC) horizon is at a depth of 6 inches to about 24 inches.

The A horizon has value of 3 or 4 and chroma of 2 or 3. Chert content of the surface layer ranges from 0 to about 15 percent.

The IIC horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is the cherty or very cherty analogues of silt loam or loam. Chert content ranges from 25 to about 70 percent, averaging more than 35 percent between depths of 10 and 40 inches.

Fourche series

The Fourche series consists of deep, moderately well drained, moderately slowly permeable soils that formed in loess and clayey material. These upland soils have slopes which range from 5 to 14 percent.

Fourche soils are commonly adjacent to Caneyville, Crider, and Nicholson soils. Caneyville soils are 20 to 40 inches deep to bedrock. Crider soils are well drained, do not have thick silt coatings and grayish mottles, and have reddish colors throughout the B horizon. Nicholson soils have a fragipan.

Typical pedon of Fourche silt loam, 5 to 9 percent slopes, 1 mile north of Farmington; approximately 200 feet south and 150 feet west of NE corner of sec. 25, T. 36 N., R. 5 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many very fine roots; neutral; abrupt smooth boundary.

B1t—7 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak fine and very fine subangular blocky structure; friable; common very fine roots; few patchy clay films on faces of peds; few fine soft dark brown concretions; medium acid; clear smooth boundary.

B21t—14 to 23 inches; brown (7.5YR 5/4) silty clay loam; moderate fine and very fine subangular blocky structure; friable; common fine distinct yellowish red (5YR 4/6) mottles; common very fine roots; common discontinuous clay films on faces of peds; few fine dark concretions (oxides); strongly acid; clear smooth boundary.

IIB&A—23 to 33 inches; yellowish red (5YR 4/6) silty clay loam (IIB), strong brown (7.5YR 5/6) kneaded; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; firm; light yellowish brown (10YR 6/4) silt loam (IIA) 1 to 5 mm thick covering faces of peds; very pale brown (10YR 8/3) dry; few clay films; common black stains; common very fine roots; few fine dark concretions (oxides); strongly acid; clear wavy boundary.

IIB22t—33 to 52 inches; yellowish red (5YR 4/6) silty clay; moderate fine subangular blocky structure; very firm; few medium distinct light brownish gray (2.5Y 6/2) mottles; common brown (7.5YR 4/2) clay films and flows; many dark stains and concretions (oxides); few very fine roots; slightly acid; gradual smooth boundary.

IIB23t—52 to 80 inches; strong brown (7.5YR 5/6) silty clay; moderate grading to weak with depth fine subangular blocky structure; firm; few fine prominent light gray (2.5Y 7/2) mottles; clay flows and films of brown (7.5YR 4/2); common dark concretions (oxides) and stains; neutral; gradual smooth boundary.

IIR—80 inches; bedded dolomite.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is silt loam. If eroded it is silty clay loam. Reaction ranges from medium acid to neutral.

The Bt horizon has hue of 10YR and 7.5YR, value of 4 to 6, and chroma of 3 to 6. It ranges from very strongly acid to medium acid.

In the IIB&A horizon, the IIB part has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6, and chroma of 4 to 6. Some pedons are mottled in shades of gray. Texture is silty clay loam or silty clay. The A part is discontinuous silt coatings that constitute 5 to 20 percent of the horizon and range from 1 to 2 1/2 mm in thickness on vertical ped surfaces. It has hue of 10YR, value of 5 to 7, and chroma of 1 through 4. This horizon is extremely acid to strongly acid.

The IIB horizon has hue of 10YR, 7.5YR, 5YR, and rarely of 2.5YR, value of 4 or 5, and chroma of 4 through 6. Commonly, it has mottles that have hue of 10YR, value of 5 or 6, and chroma of 1 to 3. Texture is silty clay loam, silty clay, or clay. Reaction ranges from strongly acid to mildly alkaline.

Gasconade series

The Gasconade series consists of shallow, somewhat excessively drained, moderately slowly permeable soils on upland side slopes. These soils formed in thin clayey material underlain by bedded dolomite. Slopes range from about 9 to 35 percent.

Gasconade soils commonly are adjacent to Crider and Caneyville soils and in some areas are associated with Fourche and Nicholson soils on the landscape. All these soils are deeper to bedrock, lighter colored, and less stony than the Gasconade soils. Crider, Fourche, and Nicholson soils commonly do not have any stones.

Typical pedon of Gasconade flaggy silty clay loam, 9 to 35 percent slopes, about 2 miles northeast of Desloge; 2,240 feet east and 990 feet north of SW corner of sec. 22, T. 37 N., R. 5 E.

A1—0 to 8 inches; very dark brown (10YR 2/2) flaggy silty clay loam; dark grayish brown (10YR 4/2) dry; strong very fine subangular blocky structure; friable; approximately 25 percent of the volume is fragments of dolomite, 4 to 18 inches long and 1/2 inch to 3 inches thick, and about 5 percent of the surface is covered with flagstones; abundant fine roots of native grasses and other plants; mildly alkaline; abrupt smooth boundary.

B2—8 to 13 inches; dark brown (10YR 4/3) very flaggy silty clay; moderate fine subangular blocky structure; firm; about 60 percent of the volume is dolomite flagstones, 15 to 30 inches or more long and 1 to 3 inches thick; abundant roots; mildly alkaline; abrupt smooth boundary.

R—13 inches; hard, gray, bedded dolomite; crevices coated with dark brown (10YR 4/3) clay films and containing roots of native grasses and eastern red cedar.

Thickness of the solum and depth to dolomite bedrock range from about 4 to 20 inches. Amount of coarse fragments ranges from 35 to 75 percent of the soil volume, but the A horizon commonly contains less than 35 percent. The solum ranges from slightly acid to mildly alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is flaggy silty clay loam or flaggy silty clay 4 to 10 inches thick.

The B horizon has hue of 7.5YR, 10YR, or 2.5Y and value and chroma of 2 or 4. It is flaggy silty clay loam, flaggy silty clay, or flaggy clay and ranges to about 10 inches in thickness. Some pedons do not have a B horizon except in crevices between bedrock.

Goss series

The Goss series consists of deep, well drained, moderately permeable, cherty soils on upland side slopes. These soils formed in red cherty clay more than 60 inches thick. Slopes range from about 14 to 35 percent.

Goss soils are associated with Hildebrecht and Wilderness soils. These soils have a fragipan and are less clayey.

Typical pedon of Goss very cherty silt loam, 14 to 35 percent slopes, in Lake Timberline Subdivision, 2,640 feet west and 1,840 feet north of SE corner of sec. 13, T. 38 N., R. 4 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) very cherty silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many very fine roots; 55 percent chert; neutral; abrupt wavy boundary.

A2—4 to 15 inches; brown (7.5YR 5/4) very cherty silt loam, light yellowish brown (10YR 6/4) dry; weak fine platy structure parting to weak fine granular; friable; common very fine roots; 65 percent chert (55 percent less than 3 inches and 10 percent larger than 3 inches); medium acid; clear smooth boundary.

B21t—15 to 41 inches; red (2.5YR 4/6) very cherty clay; strong fine and very fine angular and subangular blocky structure; very firm; common fine and very fine roots; 75 percent chert (50 percent less than 3 inches and 25 percent larger than 3 inches); strongly acid; clear wavy boundary.

B22t—41 to 65 inches; dark red (2.5YR 3/6) cherty clay; moderate fine and very fine angular and subangular blocky structure; very firm; few medium roots; about 35 percent chert (25 percent less than 3 inches and 10 percent larger than 3 inches); strongly acid; gradual smooth boundary.

B23t—65 to 85 inches; dark red (2.5YR 3/6) cherty clay; common medium distinct dark brown (7.5YR 4/4) and few fine prominent grayish brown (10YR 5/2) mottles; moderate fine and very fine angular and subangular blocky structure; very firm; few fine and very fine roots; about 35 percent chert (25 percent less than 3 inches and 10 percent larger than 3 inches); medium acid.

Solum thickness and depth to bedrock range from about 60 inches to more than 100 inches.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 through 4. The A2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. Content of coarse fragments (chert) ranges from 20 to 60 percent. The A horizon ranges from mildly alkaline to medium acid.

In some pedons the B21t horizon has hue of 5YR and 7.5YR, value of 3 to 5, and chroma of 4 to 6. Texture is silty clay loam. The B2 horizon is commonly dominated by hue of 2.5YR, 5YR, and in places 10R, value of 3 or 4, and chroma of 4 to 6. Its texture is very cherty or cherty silty clay or clay. Coarse fragment (chert) content averages from 35 to about 80 percent in the B2 horizon. The B horizon is medium acid or strongly acid.

Haymond series

The Haymond series consists of deep, well drained, moderately permeable soils on flood plains of rivers and creeks. These soils formed in silty alluvium washed from the loess covered uplands. Slopes range from 0 to 2 percent.

Haymond soils are similar to the Wilbur soils and are adjacent to them on flood plains. Wilbur soils are moderately well drained and have gray mottles within 20 inches of the surface.

Typical pedon of Haymond silt loam, 0 to 2 percent slopes, about 2 miles east of Farmington on Camp Creek bottom; 700 feet south and 590 feet west of the center of sec. 28, T. 36 N., R. 6 E.

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and very fine roots and pore spaces; neutral; clear smooth boundary.

C1—10 to 34 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common very fine grass roots; neutral; clear smooth boundary.

C2—34 to 41 inches; brown (10YR 4/3) silt loam; 15 percent strata of light yellowish brown (10YR 6/4); few very dark brown stains; massive, thinly stratified; friable; common very fine roots; neutral; abrupt smooth boundary.

C3—41 to 76 inches; brown (10YR 4/3) loam; 10 percent thin strata of pale brown (10YR 6/3) fine sandy loam; massive; very friable; few very fine roots; neutral.

Thickness of the soil to bedrock is more than 60 inches and commonly more than 100 inches. Reaction is slightly acid or neutral.

The A horizon has color value of 3 or 4 (dry value of 6 or more) and chroma of 2 or 3.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The C3 horizon is massive, having stratification of soil texture and color, and has strata of silt loam, loam, and fine sandy loam. Individual lenses, thin strata, and mottles have value of 5 or 6 and chroma of 2 or 3 in hue of 10YR. The 10- to 40-inch control section averages between 12 and 18 percent clay and less than 15 percent fine and coarser sand.

Hildebrecht series

The Hildebrecht series consists of deep, moderately well drained, slowly permeable soils that have a fragipan.

These soils are on upland ridgetops and side slopes. They formed in loess and the underlying cherty residuum on slopes of 2 to 14 percent.

Hildebrecht soils are similar to Delassus, Jonca, Lebanon, and Nicholson soils and commonly are adjacent to Goss and Wilderness soils on the landscape. Delassus soils contain more sand and have less than 35 percent base saturation in the material at 30 inches below the top of the fragipan. Goss and Wilderness soils are cherty throughout. In addition, the Goss soils are on steep side slopes and do not have a fragipan. Jonca and Nicholson soils do not have chert within the solum. Lebanon soils are more clayey.

Typical pedon of Hildebrecht silt loam, 2 to 5 percent slopes, under mixed hardwoods, about 1 1/2 miles east of Doe Run; 1,650 feet east and 2,340 feet north of the SW corner of sec. 15, T. 35 N., R. 5 E.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and very fine granular structure; friable; many very fine roots; slightly acid; abrupt smooth boundary.

A2—3 to 8 inches; yellowish brown (10YR 5/4) silt loam, very pale brown (10YR 7/4) dry; weak coarse platy structure parting to moderate fine granular; friable; common very fine roots; medium acid; clear wavy boundary.

B1t—8 to 13 inches; brown (7.5YR 5/4) silt loam, dark brown (7.5YR 4/4) ped interiors; moderate fine subangular blocky structure; firm; few fine roots; few patchy clay films on surfaces of peds; strongly acid; clear smooth boundary.

B21t—13 to 22 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; few fine roots; few patchy clay films on surfaces of peds; very strongly acid; clear wavy boundary.

B22t—22 to 28 inches; brown (7.5YR 5/4) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate fine subangular blocky structure; firm; common very fine and medium roots; patchy dark brown (7.5YR 4/4) clay films and clay flows on vertical faces of peds, along old root channels; 12 percent coarse fragments; 6 percent fine chert (2 to 20 mm), 6 percent coarse chert; very strongly acid; abrupt wavy boundary.

IIBx1—28 to 41 inches; yellowish brown (10YR 5/4) very cherty silt loam; weak very coarse prismatic structure, massive ped interiors; very firm, brittle, very hard when dry; common patchy dark brown (7.5YR 4/4) clay films; gray (10YR 5/1) silty clay loam on vertical faces of prisms; few very fine roots in vertical cracks between prisms; common thin white silt coats; 50 percent fine chert (2 to 20 mm), 15 percent chert (1 to 3 inches), and 5 percent coarse chert; very strongly acid; gradual smooth boundary.

IIBx2—41 to 53 inches; reddish brown (5YR 5/4) very cherty clay loam; weak very coarse prismatic structure, ped interiors massive; very firm, brittle, very hard when dry; common patchy dark reddish brown (5YR 3/3) clay films; gray (10YR 5/1) silty clay loam on vertical faces of prisms; few very fine roots in vertical cracks between prisms; 65 percent chert, and 5 percent coarse chert; very strongly acid; clear smooth boundary.

IIB23t—53 to 80 inches; dark red (2.5YR 3/6) very cherty clay; strong medium and fine subangular blocky structure; firm; few fine roots; 40 percent chert, 15 percent coarse chert; weathered chert fragments strong brown (7.5YR 5/6) crushed; very strongly acid.

Solum thickness ranges from 60 to more than 100 inches. Depth to bedrock is commonly 10 feet or more. The thickness of the loess over the fragipan ranges from about 24 to 40 inches. The most common range is 26 to 36 inches.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B2 horizon has hue of 10YR, 7.5YR, or in some places 5YR, value of 4 to 6, and chroma of 4 to 6. Reaction ranges from extremely acid to strongly acid.

The fragipan is 10 to 24 inches thick and contains 25 to 80 percent chert, especially in the lower part. Reaction is extremely acid or very strongly acid.

The IIB2 horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5, and chroma of 4 to 6. It is clay or silty clay and 15 to 60 percent chert. Reaction ranges from very strongly acid to slightly acid.

Irondale series

The Irondale series consists of moderately deep, well drained, moderately permeable soils on upland side slopes. These soils formed in silty residuum of rhyolite and felsitic rocks and a thin layer of loess. Slopes range from 15 to about 40 percent.

Irondale soils are similar to the Syenite soils and are adjacent to the Knobtop soils. Syenite soils contain fewer coarse fragments and more sand, being derived from coarse-grained granite. Knobtop soils are on the moderately sloping tops of knobs, mountain peaks, and ridges and contain less than 35 percent coarse fragments in the upper 20 inches of the argillic horizon.

Typical pedon of Irondale extremely stony silt loam, 15 to 40 percent slopes, 800 feet south and 100 feet west of the NE corner of sec. 4, T. 35 N., R. 4 E.

A1—0 to 4 inches; very dark brown (10YR 3/3) extremely stony silt loam, very pale brown (10YR 7/3) dry; moderate very fine granular structure; friable; many fine and very fine roots; stones make up 20 percent of the surface and the solum; 20

percent cobblestones and 20 percent gravel; medium acid; abrupt smooth boundary.
A2—4 to 8 inches; brown (10YR 4/3) angular very cobbly silt loam; weak thin platy structure parting to weak fine subangular blocky; friable; common fine and very fine roots; 15 percent cobblestones, 25 percent gravel; strongly acid; clear smooth boundary.
B1t—8 to 13 inches; brown (7.5YR 5/4) angular very cobbly silt loam; moderate fine subangular blocky structure; friable; common medium roots; 25 percent cobblestones, 15 percent gravel; strongly acid; abrupt smooth boundary.
B2t—13 to 28 inches; reddish brown (5YR 4/4) angular very cobbly silty clay loam; moderate fine subangular blocky structure; firm; patchy dark red (2.5YR 3/6) clay films on faces of peds; common medium roots; 25 percent cobblestones, 15 percent gravel; very strongly acid, clear smooth boundary.
B3—28 to 36 inches; strong brown (7.5YR 5/6) angular very cobbly loam; many medium and coarse distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm, very hard when dry; few fine and medium roots; 25 percent cobblestones and 25 percent gravel; very strongly acid; abrupt wavy boundary.
R—36 inches; reddish brown hard rhyolite.

The thickness of the solum and the depth to hard rock range from 20 to 40 inches. Boulders and stones cover 1 to 50 percent of the surface and are throughout the solum. Content by volume of coarse fragments ranges from 15 to 55 percent in the A horizon and is 10 to 25 percent cobblestones and 5 to 30 percent gravel. Content by volume of coarse fragments in the Bt and B3 horizons ranges from 35 to 60 percent and is 20 to 35 percent cobblestones and 10 to 25 percent gravel. Approximately 65 percent of the gravel ranges from 3 inches to 1/4 inch in size.

The A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. Dry value is 5 or 6. The texture of the A1 horizon is extremely stony, very stony, or very cobbly silt loam. The A2 horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 or 4. The A horizon ranges from very strongly acid to medium acid unless the soil is limed.

The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 through 6. Reaction is extremely acid or very strongly acid. Textures of the Bt horizons are very cobbly or very gravelly analogues of silt loam, silty clay loam, or clay loam.

The B3 horizon has hue of 10YR, 7.5YR, 5YR, or rarely 2.5Y, value of 4 through 6, and chroma of 3 through 8. Hue and value of the mottles are similar to those of the matrix. Textures are the very cobbly or very gravelly analogues of silt loam, loam, or clay loam.

Jonca series

The Jonca series consists of deep, moderately well drained, slowly permeable soils that have a fragipan. These soils formed in a thin layer of loess and in the underlying residuum of sandstone. They are on uplands and have slopes ranging from 2 to 9 percent.

Jonca soils are similar to Delassus, Hildebrecht, and Nicholson soils and commonly are adjacent to Lamotte and Lily soils. Delassus soils have lower base saturation in the material 30 inches below the top of the fragipan. Hildebrecht and Nicholson soils have less sand throughout the solum. Lamotte and Lily soils do not have a fragipan, and, in addition, the Lily soils are less than 40 inches to hard sandstone.

Typical pedon of Jonca silt loam, 5 to 9 percent slopes, 2,480 feet south and 2,140 feet east of the NW corner of sec. 28, T. 36. N., R. 6 E.

A1—0 to 7 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine roots; neutral; clear wavy boundary.
B1t—7 to 11 inches; brown (7.5YR 5/4) silty clay loam and 20 percent dark brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; many fine roots; strongly acid; clear wavy boundary.
B21t—11 to 24 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few thin patchy clay films; common fine roots; very strongly acid; clear smooth boundary.
IIB22t—24 to 30 inches; brown (7.5YR 4/4) loam; many medium and coarse distinct grayish brown (10YR 5/2) mottles and silt coatings; weak fine subangular blocky structure; firm; few thin discontinuous clay films in pores and cavities; common fine roots; very strongly acid; gradual boundary.
IIBx—30 to 48 inches; brown (7.5YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; dark grayish brown (10YR 4/2) clay loam filling 10 to 15 mm cracks of weak very coarse prismatic structure with massive interiors; very firm, brittle; few fine roots along vertical cracks; dark brown (7.5YR 4/4) clay films in channels and cavities; very strongly acid; gradual boundary.
IIB3t—48 to 68 inches; reddish brown (5YR 4/4) sandy loam; weak fine subangular blocky structure; friable, moderately brittle; dark brown (7.5YR 4/4) clay flows and bridging along channels and cracks; few black concretions; very strongly acid; clear wavy boundary.
IIR—68 inches; hard sandstone.

The thickness of the solum and the depth to bedrock are commonly greater than 60 inches. Depth to the fragipan commonly ranges from 28 to 37 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Dry value is 6 or more. Some pedons have a thin yellowish brown A2 horizon. It ranges from neutral to medium acid.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or silty clay loam and averages 28 to 35 percent clay. It is very strongly or strongly acid.

The IIBx horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 through 6. Mottles have hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The horizon ranges from extremely acid to strongly acid.

The IIBt horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR, value of 3 or 4, and chroma of 4 through 6. Texture is sandy loam, sandy clay loam, or clay loam. This horizon is very strongly acid to slightly acid.

Knobtop series

The Knobtop series consists of moderately deep, moderately well drained, moderately slowly permeable soils which formed in loess and residuum of igneous rock on mountainous ridgetops. Slopes range from 3 to 9 percent.

Knobtop soils are commonly near Irondale, Delassus, Loughboro, and Syenite soils. Irondale soils commonly surround the Knobtop soils on steeper slopes and contain more coarse fragments throughout the solum. Delassus soils are deeper to hard rock and have a fragipan. Loughboro soils are grayer and are in nearly level areas at the base of mountains. Syenite soils have more sand in the solum and are very bouldery.

Typical pedon of Knobtop silt loam, 3 to 9 percent slopes, 800 feet south and 725 feet east of the NW corner of sec. 25, T. 35 N., R. 4 E.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; light brownish gray (10YR 6/2) dry; strong fine granular structure; friable; many very fine to medium roots; medium acid; abrupt smooth boundary.

A2—2 to 5 inches; brown (10YR 5/3) silt loam; very pale brown (10YR 7/3) dry; weak medium platy structure parting to moderate medium granular; friable; common fine and medium roots; strongly acid; clear smooth boundary.

B1t—5 to 7 inches; brown (7.5YR 5/4) silt loam; very pale brown (10YR 7/4) dry; moderate fine and very fine subangular blocky structure; friable; common fine and medium roots; strongly acid; clear smooth boundary.

B21t—7 to 16 inches; brown (7.5YR 4/4) silty clay loam; reddish yellow (7.5YR 7/6) dry; moderate fine subangular blocky structure; firm; common very fine and coarse roots; very strongly acid; clear wavy boundary.

B22t—16 to 23 inches; brown (7.5YR 5/4) silty clay loam; very pale brown (10YR 7/4) dry; moderate fine subangular blocky structure; firm; few thin patchy brown (7.5YR 4/4) clay films; common very fine and coarse roots; 3 percent small stones that overlap from lower horizons; very strongly acid; clear smooth boundary.

B23t—23 to 29 inches; light brownish gray (10YR 6/2) silty clay loam; white (10YR 8/2) dry; common medium and coarse distinct mottles and some ped interiors brown (7.5YR 4/4); moderate fine subangular blocky structure; firm, hard dry; patchy clay films on faces of peds; dark gray (10YR 4/1) organic stains, many very fine and fine roots, 1 to 2 mm thick mat of partially decomposed very fine and fine roots along the lower boundary; 5 percent cobbles and stones; extremely acid; clear smooth boundary.

IIB3t—29 to 34 inches; yellowish brown (10YR 5/4) cobbly silt loam; very pale brown (10YR 7/4) dry; common medium and coarse faint light brownish gray (10YR 6/2) mottles; weak coarse platy structure parting to weak fine subangular blocky; firm, very hard dry; dark gray (10YR 4/1) clayey organic stains and patchy clay films on faces of peds; 25 percent cobblestones and 5 percent stones; extremely acid; abrupt wavy boundary.

R—34 inches; hard, fine-grained granite.

The thickness of the solum commonly corresponds with the depth to bedrock and ranges from 20 to 40 inches. A few stones or boulders are commonly on the surface. Content by volume of coarse fragments larger than 3 inches ranges from 0 to 5 percent throughout the upper part of the profile. The lower 4 to 12 inches contains 9 to about 35 percent cobbles and stones. Content by volume of coarse fragments 3 inches to 2 mm in size is 0 to 5 percent for the A and Bt horizons and 0 to 15 percent for the IIB3 horizon.

The A1 horizon has a hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 6. Reaction ranges from very strongly acid to medium acid, unless the soil is limed.

The B1t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 6. Texture is silt loam or silty clay loam. The horizon is very strongly acid or strongly acid. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 through 6. Texture is silt loam, silty clay loam, or clay loam. Reaction is extremely acid or very strongly acid.

The IIB3 horizon has hue of 7.5YR, 10YR, or 2.5Y and value of 4 through 6. Its chroma is commonly 2 but ranges from 2 to 6. Mottles have hue of 5YR through 10YR, value of 4 through 6, and chroma of 2 through 8. Texture is silt loam, silty clay loam, loam, or clay loam. Reaction is extremely acid or very strongly acid.

Lamotte series

The Lamotte series consists of deep, well drained, moderately permeable soils on upland side slopes and point ridges. These soils formed in loamy residuum of sandstone on slopes ranging from 5 to 14 percent.

Lamotte soils are similar to Crider soils and are commonly adjacent to Jonca, Lily, and Ramsey soils on

the landscape. Crider soils are clayey in the lower part of the subsoil and contain less sand throughout the solum. Jonca soils have a fragipan. Lily soils are 20 to 40 inches to sandstone and Ramsey soils are less than 20 inches to sandstone.

Typical pedon of Lamotte silt loam, 9 to 14 percent slopes, 1,340 feet north and 1,880 feet west of the SE corner of sec. 11, T. 35 N., R. 6 E.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine and medium roots; neutral; clear smooth boundary.

A2—6 to 11 inches; brown (10YR 5/3) silt loam; pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine and medium roots; medium acid; clear smooth boundary.

B1—11 to 15 inches; brown (7.5YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; very strongly acid; clear smooth boundary.

B21t—15 to 28 inches; reddish brown (5YR 4/4) clay loam; moderate fine subangular blocky structure; firm; common fine roots; thick discontinuous reddish brown (2.5YR 4/4) clay films and bridging on surfaces of peds; very strongly acid; clear wavy boundary.

B22t—28 to 39 inches; reddish brown (2.5YR 4/4) loam; many medium and coarse brown (7.5YR 5/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; common thick patchy clay films; very strongly acid; gradual smooth boundary.

B3t—39 to 60 inches; dark reddish brown (2.5YR 3/4) loam; many medium and coarse prominent light brownish gray (10YR 6/2) and yellowish red (5YR 5/6) mottles; weak fine and medium subangular blocky structure; very firm; common black stains and concretions; few dark gray (10YR 4/1) organic stains coating vertical pores and cracks; few fine roots; common patchy clay films; 10 percent hard sandstone fragments of mostly gravel size; extremely acid; abrupt wavy boundary.

Cr—60 to 72 inches; dark brown extremely firm weathered sandstone that crushes to sandy loam, bedded with occasional fractures.

Thickness of the solum ranges from about 3 to 6 feet, and depth to sandstone ranges from 40 to 100 inches. Coarse fragments make up 0 to 15 percent of the subsoil.

The A1 or Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. Texture is silt loam or loam. Reaction is neutral to medium acid.

The B horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 5, and chroma of 4 to 8. Texture is gritty silty clay loam, clay loam, loam, or sandy clay loam. Reaction ranges from extremely acid to medium acid.

The Cr horizon consists of very firm or extremely firm weathered sandstone. Reaction ranges from extremely acid to medium acid.

Hard sandstone is commonly below 6 feet.

Lebanon series

The Lebanon series consists of deep, moderately well drained, slowly permeable soils that have a fragipan. These soils are on upland divides, ridgetops, and foot slopes. They formed in loess and the underlying cherty residuum. Slopes range from about 3 to 9 percent.

Lebanon soils are similar to the Delassus, Hildebrecht, Jonca, and Nicholson soils and are adjacent to the Wilderness soils. All these soils have a fragipan, but the Delassus and Jonca soils contain more sand and less clay. The Nicholson soils contain more clay in the lower part of the solum, and both the Nicholson and Hildebrecht soils have less than 35 percent clay content in the upper 20 inches of the argillic horizon. Wilderness soils have cherty coarse fragments throughout.

Typical pedon of Lebanon silt loam, 3 to 9 percent slopes, 500 feet east and 800 feet north of the SW corner of sec. 4, T. 34 N., R. 8 E.

A1—0 to 3 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium and fine granular structure; very friable; common wormcasts and krotovinas; many very fine roots; strongly acid; clear smooth boundary.

A2—3 to 6 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium platy structure parting to weak fine granular; friable; common fine and few medium roots; very strongly acid; clear smooth boundary.

B1t—6 to 10 inches; strong brown (7.5YR 5/6) silty clay loam; weak fine subangular blocky structure; friable; common fine and few medium roots; very strongly acid; gradual wavy boundary.

B2t—10 to 23 inches; brown (7.5YR 4/4) silty clay loam; weak fine subangular blocky structure; firm; common thin patchy reddish brown clay films; common fine and medium roots; very strongly acid; gradual wavy boundary.

Bx1—23 to 32 inches; yellowish brown (10YR 5/6) silty clay loam; light brownish gray (10YR 6/2) tongues in vertical cracks 0.5 to 1.0 cm wide; moderate coarse prismatic structure parting to weak very fine blocky; firm, brittle; few to common patchy brown clay films; few (less than 1 percent) fine pebbles; few fine and medium roots; very strongly acid; clear wavy boundary.

IIBx2—32 to 61 inches; dark yellowish brown (10YR 4/6) silty clay loam with light brownish gray (10YR 6/2) tongues in vertical cracks; weak very coarse prismatic structure, massive interiors; firm, brittle, very hard when dry; few thin patchy brown clay films; 5 percent chert gravel; few fine and medium

black concretions and stains; extremely acid; clear wavy boundary.

IIB2t—61 to 72 inches; strong brown (7.5YR 5/8) silty clay loam; common medium light brownish gray (10YR 6/2) mottles; common patchy red (2.5YR 4/8) clay films on surfaces of peds; weak fine subangular blocky structure; firm; 10 percent chert; very strongly acid.

Solum thickness is greater than 60 inches. Depth to hard rock is more than 72 inches. Depth to the fragipan ranges from 18 to 27 inches.

The A horizon has color value of 4 or 5 and chroma of 2 or 4.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4. Reaction is very strongly acid or strongly acid. The fragipan has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. Chert content ranges from 1 percent to about 60 percent by volume.

Lily series

The Lily series consists of moderately deep, well drained soils on upland side slopes, draws, and point ridges. Permeability is moderately rapid. These soils formed in loamy residuum of acid sandstone. Slopes range from about 3 to 9 percent.

Lily soils are commonly adjacent to Jonca, Lamotte, and Ramsey soils on the landscape. Jonca soils have a fragipan and Ramsey soils are shallow to sandstone. Lamotte soils are more than 40 inches to sandstone.

Typical pedon of Lily loam in an area of Lily-Ramsey complex, 3 to 9 percent slopes, 1,400 feet west and 10 feet north of the SE corner of sec. 31, T. 35 N., R. 6 E.

A1—0 to 4 inches; very dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many very fine roots; slightly acid; abrupt smooth boundary.

A2—4 to 7 inches; brown (10YR 5/3) loam; weak fine platy structure; very friable; common fine roots; medium acid; abrupt smooth boundary.

B1t—7 to 11 inches; dark yellowish brown (10YR 4/4) loam, yellowish brown (10YR 5/4) kneaded; weak very fine subangular blocky structure; friable; common fine roots; extremely acid; abrupt smooth boundary.

B2t—11 to 25 inches; brown (7.5YR 4/4) clay loam, dark yellowish brown (10YR 4/4) kneaded; weak medium subangular blocky structure; firm; common fine roots; few patchy dark brown (7.5YR 3/2) clay films and bridging on surfaces of peds; very strongly acid; gradual boundary.

B3t—25 to 35 inches; strong brown (7.5YR 5/6) sandy clay loam, yellowish brown (10YR 5/4) kneaded; common coarse prominent gray (10YR 5/1) mottles; weak fine subangular blocky structure; friable; common dark brown (7.5YR 4/4) clay films, bridging and organic coatings on surfaces of peds and flows along cracks and channels; common fine roots and mat of roots 1 to 2 mm thick on rock surface; very strongly acid; abrupt smooth boundary.

R—35 inches; hard acid sandstone.

The thickness of the solum and the depth to sandstone range from 20 to 40 inches. The content of coarse fragments of sandstone commonly ranges from 0 to 10 percent throughout, but in some pedons it is as much as 25 percent in the B3 horizon.

The A1 or Ap horizon has value of 3 or 4 and chroma of 2 or 3 in hue of 10YR or 7.5YR. Texture is loam, sandy loam, or silt loam.

The Bt horizon has value of 4 or 5 and chroma of 3 to 6 in hue of 7.5YR, 10YR, or 5YR. It is clay loam, loam, or sandy clay loam and averages between 28 and 35 percent in content of clay. The B horizon ranges from strongly acid to extremely acid.

Loughboro series

The Loughboro series consists of deep, poorly drained, slowly permeable soils on upland plateaus or plains adjacent to major peaks. These soils formed in loess and the underlying loamy residuum of granite. Slopes range from 0 to about 3 percent.

Loughboro soils are similar to the Auxvasse soils and are commonly adjacent to Delassus, Irondale, and Syenite soils. Auxvasse soils are on stream terraces or benches and do not have tongues of material from the albic horizon in the argillic horizon. Delassus soils are browner and have a fragipan. Irondale and Syenite soils are browner and moderately deep to hard rock.

Typical pedon of Loughboro silt loam, 0 to 3 percent slopes, approximately 1,495 feet north and 2,490 feet east of the SW corner of sec. 25, T. 35 N., R. 4 E.

A1—0 to 2 inches; brown (10YR 5/3) silt loam; weak fine granular structure; very friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

A21—2 to 10 inches; yellowish brown (10YR 5/4) silt loam; few fine faint dark brown (10YR 4/3) mottles; weak thick platy structure; very friable; many fine and medium roots; very strongly acid; clear smooth boundary.

A22—10 to 15 inches; yellowish brown (10YR 5/6) silt loam; few medium faint dark brown (10YR 4/3) mottles; weak thick platy structure parting to weak medium subangular blocky; very friable; common thin patchy light brownish gray (10YR 6/2) silt coatings on surfaces of peds and along old root channels; many fine roots; very strongly acid; clear wavy boundary.

B&A—15 to 22 inches; grayish brown (10YR 5/2) silty clay loam (B2t); moderate fine and medium subangular blocky structure; firm; common thin clay

films on surfaces of peds; light grayish brown (10YR 6/2) silt loam (A2) fingering the B2t, coating vertical faces of peds 1 mm or more thick, and filling old root channels and cracks; very friable; common fine prominent yellowish red (5YR 4/6) and common medium distinct brown (10YR 5/3) mottles; common fine roots; very strongly acid; abrupt wavy boundary.

B21t—22 to 32 inches; grayish brown (10YR 5/2) silty clay; common fine prominent yellowish red (5YR 4/6) and gray (10YR 5/1) mottles; weak coarse subangular blocky structure; very firm; common thick clay films on faces of peds; few pressure faces (slickensides); common fine roots; very strongly acid; gradual wavy boundary.

IIB22t—32 to 39 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6), yellowish red (5YR 4/6), and dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure; very firm; common thin clay films on faces of peds; few clay flows in channels and on vertical surfaces; few fine roots; 5 percent gravel (2 to 20 mm in diameter); very strongly acid; gradual irregular boundary.

IIC1—39 to 59 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct brown (10YR 5/3) and few fine faint grayish brown (10YR 5/2) mottles; weak very coarse prismatic structure; firm; few fine roots; 5 percent gravel (2 to 10 mm in diameter); very strongly acid; diffused wavy boundary.

IIC2—59 to 67 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent dark brown (7.5YR 4/4) and common fine prominent yellowish red (5YR 4/6) mottles; massive; very firm; 5 percent gravel (2 to 20 mm in diameter); strongly acid.

The thickness of the solum is commonly about 40 inches and ranges from 30 to 60 inches. Depth to hard rock is greater than 60 inches.

The A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 2 or 3. An Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 5. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 through 6. The A horizon ranges from very strongly acid to neutral.

The B&A horizon has hue of 7.5YR or 10YR. It has value of 4 through 6 and chroma of 2 through 4 for the subsoil part (B2t) and value of 5 or 6 and chroma of 2 for the silty part (A2). Texture is silty clay loam or silty clay for the B2t part and silt loam for the A2 part. Reaction is very strongly acid or strongly acid.

The B2t horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 2. It typically is silty clay and silty clay loam and rarely clay or clay loam. The upper 20 inches of the argillic horizon averages 36 to 48 percent clay. The content of coarse fragments, by volume, ranges from 0 to 10 percent. Reaction ranges from extremely acid to strongly acid.

The IIC horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 2 through 6. Texture is silt loam, loam, or silty clay loam. The content of coarse fragments, by volume, ranges from 0 to 15 percent.

Midco series

The Midco series consists of deep, somewhat excessively drained, moderately rapidly permeable soils on narrow bottoms of creeks, branches, and hollows. These soils formed in gravelly alluvium washed from uplands. Slopes range from 0 to 4 percent.

Midco soils are similar to Elsah soils. Elsah soils are more silty in the upper 18 inches and contain less sand.

Typical pedon of Midco cherty silt loam, 0 to 3 percent slopes, 800 feet east and 2,640 feet north of the SW corner of sec. 31, T. 36 N., R. 5 E.

A1—0 to 5 inches; dark brown (10YR 3/3) cherty silt loam, brown (10YR 5/3) dry; moderate very fine granular structure; very friable; many very fine roots; 15 percent chert; neutral; clear smooth boundary.

C1—5 to 11 inches; dark yellowish brown (10YR 4/4) cherty silt loam; moderate fine granular structure; very friable; many fine roots; 18 percent chert (less than 3 inches in diameter); slightly acid; clear smooth boundary.

C2—11 to 30 inches; dark yellowish brown (10YR 4/4) very cherty sandy loam; massive parting to single grain; very friable; common fine roots; 60 percent chert fragments (10 percent 3 inches to 10 inches in diameter and 50 percent less than 3 inches in diameter); neutral; abrupt smooth boundary.

C3—30 to 60 inches; dark yellowish brown (10YR 4/4) very cherty sandy loam; massive; very friable; few fine roots; 65 percent fragments (15 percent 3 inches to 10 inches in diameter, 50 percent less than 3 inches in diameter); neutral.

The content of coarse fragments in the surface horizon ranges from 15 to 50 percent but most commonly is 15 to 20 percent.

The A horizon has value of 3 or 4 and chroma of 2 to 4. Textures are cherty silt loam or very gravelly sandy loam. Gravelly phases are dominated by coarse fragments from igneous rocks.

The C1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Textures are cherty or very cherty loam, sandy loam or silt loam, or the gravelly equivalents. The C2 and C3 horizons are similar to the C1 horizon in color but in texture are cherty analogues of sandy loam, loamy sand, or loam. Reaction ranges from strongly acid to neutral throughout.

Nicholson series

The Nicholson series consists of deep, moderately well drained, slowly permeable soils that have a fragipan.

These soils formed in loess and clayey material on upland ridgetop positions. Slopes range from 2 to 5 percent.

Nicholson soils are similar to Delassus, Hildebrecht, Jonca, and Lebanon soils and are commonly associated with Crider, Caneyville, and Fourche soils. Delassus soils have a lower base saturation, and Jonca soils contain more sand and less clay below the fragipan. Hildebrecht and Lebanon soils contain more coarse fragments in and below the fragipan. Crider, Caneyville, and Fourche soils do not have a fragipan.

Typical pedon of Nicholson silt loam, 2 to 5 percent slopes, about 2 1/2 miles south of Farmington, 820 feet north and 1,490 feet east of the SW corner of sec. 13, T. 35 N., R. 5 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure parting to moderate fine granular; friable; many very fine roots; slightly acid; clear smooth boundary.

B1—8 to 11 inches; brown (7.5YR 5/4) silt loam; weak fine subangular blocky structure; friable; many fine roots; strongly acid; gradual smooth boundary.

B21t—11 to 20 inches; dark brown (7.5YR 4/4) silty clay loam; moderate fine and very fine subangular blocky structure; firm; few thin patchy clay films on surfaces of peds; common fine roots; strongly acid; gradual smooth boundary.

B22t—20 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm; common fine roots; pale brown (10YR 6/3) coatings on faces of peds; very strongly acid; abrupt smooth boundary.

Bx—25 to 39 inches; yellowish brown (10YR 5/4) silt loam; weak coarse prismatic structure, interior of prisms massive; brittle, very firm; light brownish gray (10YR 6/2) vertical cracks 5 to 10 inches apart; one or two dark grayish brown (10YR 4/2) horizontal bands 5 to 15 mm thick marking the upper boundary and few thin patchy dark brown (7.5YR 4/4) clay films and clay flows; few fine roots along vertical cracks; very strongly acid; clear wavy boundary.

IIB22t—39 to 53 inches; yellowish brown (10YR 5/4) silty clay, common fine distinct yellowish red (5YR 4/6) and common medium distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; firm; few slickensides and pressure faces; strongly acid; gradual boundary.

IIC—53 to 64 inches; yellowish brown (10YR 5/4) silty clay; a few strata (about 15 percent) of brownish yellow (10YR 6/8) weathered dolomite; common medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; medium acid; clear wavy boundary.

IIR—64 inches; hard dolomite rock.

The solum thickness and depth to bedrock are commonly greater than 60 inches. Depth to the fragipan ranges from 24 to 39 inches on uneroded sites.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Reaction ranges from slightly acid to neutral.

The Bt horizon has hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 3 to 8. It ranges from very strongly acid to medium acid. The Bx horizon has hue of 10YR and 7.5YR, value of 4 or 5, and chroma of 2 to 6. Reaction is very strongly acid or strongly acid.

The IIB horizon has hue of 10YR, 7.5YR, 5YR, or 2.5Y, value of 4 to 6, and chroma of 4 to 8. Texture ranges from silty clay loam to clay. Reaction ranges from strongly acid to neutral.

Ramsey series

The Ramsey series consists of shallow, somewhat excessively drained, rapidly permeable soils on upland side slopes. These very stony soils formed in loamy residuum of sandstone on slopes ranging from 14 to 35 percent.

Ramsey soils are commonly adjacent to the Lamotte, Lily, and Jonca soils. Lamotte, Lily, and Jonca soils are all deeper than 20 inches. In addition, Jonca soils have a fragipan.

Typical pedon of Ramsey very stony sandy loam, 14 to 35 percent slopes, 825 feet north and 300 feet west of the center of sec. 18, T. 34 N., R. 7 E.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) very stony sandy loam; moderate fine granular structure; very friable; many fine tree roots and few very fine grass roots; about 0.5 percent of the surface area is 8 percent sandstone fragments (gravel) and stones; medium acid; abrupt smooth boundary.

A2—2 to 5 inches; brown (10YR 4/3) sandy loam; weak fine granular structure; very friable; common fine roots and few coarse roots; about 12 percent sandstone fragments (gravel and cobbles); medium acid; abrupt wavy boundary.

B2—5 to 16 inches; strong brown (7.5YR 5/6) cobbly sandy loam; moderate fine subangular blocky structure; friable; common fine and medium roots; patchy matting of roots on bedrock; about 25 percent, by volume, sandstone fragments; very strongly acid; abrupt wavy boundary.

R—16 inches; acid sandstone bedrock; occasional fracture is coated with dark brown (7.5YR 4/4) clay films and fine roots.

The thickness of the solum and the depth to sandstone range from 7 to 20 inches. Content, by volume, of coarse fragments ranges from a trace to 35 percent throughout the profile. Stones are commonly present on the surface, but the range is none to about 10 percent.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Reaction is strongly acid or medium acid.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is cobbly sandy loam, sandy loam, or loam. Reaction is very strongly acid or strongly acid.

Some pedons have a loamy sand or sandy loam C horizon 3 to 6 inches thick.

Syenite series

The Syenite series consists of moderately deep, well drained, moderately slowly permeable soils on upland mountainous slopes. These soils formed in residuum of granite and possibly in a thin deposit of loess in some places. Slopes range from 10 to 25 percent.

Syenite soils are similar to the Irondale soils and are adjacent to the Delassus and Loughboro soils. Irondale soils have more coarse fragments and less sand throughout the solum. Delassus soils have a fragipan. Loughboro soils are poorly drained, have a clayey subsoil, and are in nearly level areas.

Typical pedon of Syenite extremely bouldery silt loam, 10 to 25 percent slopes, 200 feet south and 200 feet west of the NE corner of sec. 10, T. 35 N., R. 5 E.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) extremely bouldery silt loam; strong medium and fine granular structure; very friable; many fine and medium roots; approximately 40 percent of the surface area is granite boulders; slightly acid; abrupt wavy boundary.

A2—4 to 8 inches; yellowish brown (10YR 5/4) silt loam; weak medium granular structure; very friable; many fine and medium roots; medium acid; clear smooth boundary.

B1t—8 to 13 inches; brown (7.5YR 5/4) silt loam; moderate fine subangular blocky structure; friable; common medium roots; very strongly acid; clear smooth boundary.

B2t—13 to 21 inches; dark brown (7.5YR 4/4) clay loam; moderate fine subangular blocky structure; firm; few medium patchy reddish brown (5YR 4/4) clay films on surfaces of peds; common medium roots; 10 percent fine gravel; extremely acid; abrupt smooth boundary.

B3t—21 to 30 inches; brown (7.5YR 5/4) loam; many medium and coarse distinct pale brown (10YR 6/3) mottles; weak fine and very fine subangular blocky structure; firm; few dark brown (7.5YR 4/4) clay films and flows; few medium and fine roots; 15 percent fine gravel; extremely acid; abrupt wavy boundary.

R—30 inches; hard red granite.

The thickness of the solum and the depth to bedrock are commonly the same, ranging from 20 to 40 inches. Boulders, stones, and cobblestones are prevalent and cover 3 to about 50 percent of the surface. The gravel content, by volume, of the A horizon and upper Bt horizon ranges from 0 to 15 percent, and the gravel content of the lower part of the B horizon ranges from 0 to 35 percent. Approximately 60 percent of the coarse fragments smaller than 3 inches in diameter are less than 1/4 inch in size.

The A1 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Reaction ranges from slightly acid to strongly acid.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 6. Texture is silt loam, clay loam, sandy clay loam, or loam. The argillic horizon averages between 25 and 35 percent in content of clay and is 20 to 55 percent sand (larger than very fine). Reaction ranges from strongly acid to extremely acid.

Some pedons have a Cr horizon that has hue of 5YR or 7.5YR, value of 3 to 8, and chroma of 4 or 5. Texture is sandy clay loam or loam.

Wilbur series

The Wilbur series consists of deep, moderately well drained, moderately permeable soils on flood plains of the major creeks and rivers. These soils formed in silty alluvium on bottom lands. Slopes range from 0 to 2 percent.

Wilbur soils are similar and adjacent to the Haymond soils. The well drained Haymond soils do not have mottles with gray colors above a depth of 40 inches.

Typical pedon of Wilbur silt loam, 0 to 2 percent slopes, 1,500 feet west and 200 feet south of the NE corner of sec. 10, T. 35 N., R. 6 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; many very fine grass roots; neutral; abrupt smooth boundary.

C1—6 to 23 inches; brown (10YR 5/3) silt loam; common fine distinct dark reddish brown (5YR 3/3) and few fine faint grayish brown (10YR 5/2) mottles; weak fine and medium granular structure; friable; common fine soft black masses; common very fine roots; neutral; gradual smooth boundary.

C2—23 to 36 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (2.5Y 5/2) and common fine distinct very dark brown (10YR 3/3) mottles; weak medium and fine granular structure, weakly stratified; common very fine roots; neutral; clear smooth boundary.

C3—36 to 70 inches; dark grayish brown (2.5Y 4/2) silt loam; massive, thin faint stratification; nonplastic; few very fine roots in the upper part; neutral.

The reaction ranges from neutral to medium acid throughout. Texture is silt loam in the upper 3 feet and silt loam, loam, or fine sandy loam below.

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

The upper part of the C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. Common to many mottles, some having chroma of 1 or 2, are within 20 inches of the surface. Below 3 feet, colors of 1 and 2 chroma increase, and in some pedons this area is dominantly gray.

Wilderness series

The Wilderness series consists of deep, moderately well drained, slowly permeable cherty soils that have a fragipan. These soils formed in residuum of cherty dolomite. They are on narrow ridgetops and side slopes. Slopes range from 2 to 20 percent.

Wilderness soils are similar and adjacent to Lebanon and Hildebrecht soils and are adjacent to Goss soils. Lebanon and Hildebrecht soils do not have any significant chert content in the upper 30 inches. Goss soils do not have a fragipan, typically have steeper slopes, and are below the Wilderness soils on the landscape.

Typical pedon of Wilderness cherty silt loam, 5 to 9 percent slopes, about 1,710 feet north and 875 feet west of the SE corner of sec. 17, T. 36 N., R. 5 E.

O1—1 inch to 0; partially decomposed leaves, twigs, bark, acorns, and other forest litter from deciduous trees; common very fine roots.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) cherty silt loam, grayish brown (10YR 5/2) dry; strong very fine granular structure; friable; many very fine and common fine tree roots; 25 percent angular chert; neutral; clear irregular boundary.

B1t—4 to 11 inches; brown (7.5YR 5/4) cherty silt loam; moderate fine and very fine subangular blocky structure; friable; common fine and few coarse tree roots; 30 percent angular chert; strongly acid; clear smooth boundary.

B21t—11 to 22 inches; yellowish red (5YR 4/6) very cherty silty clay loam; strong fine and very fine subangular blocky structure; friable; common medium patchy clay films; common fine and few coarse tree roots; 55 percent angular chert; medium acid; clear smooth boundary.

A2x—22 to 31 inches; brown (7.5YR 5/4) very cherty silt loam; massive; firm, very firm, brittle; common fine discontinuous pores; thin patchy yellowish red (5YR 4/6) clay films; few very fine roots along vertical cracks; about 55 percent angular chert; strongly acid; abrupt smooth boundary.

Bx—31 to 37 inches; strong brown (7.5YR 5/6) very cherty silty clay loam; thin discontinuous clay films or coatings of yellowish red (5YR 4/6); weak platy breaking to moderate fine subangular blocky structure; friable; slightly brittle; 50 percent angular chert; very strongly acid; clear wavy boundary.

IIB22t—37 to 60 inches; red (2.5YR 4/6) cherty clay, thinly bedded or mixed with soft reddish yellow (7.5YR 6/6) silty siliceous material; strong fine and very fine subangular blocky structure; very firm; about 35 percent angular chert; strongly acid.

The fragipan is at a depth of 20 to about 29 inches. It is about 12 to 36 inches thick. Reaction ranges from medium acid to very strongly acid except in the fragipan, where it ranges from strongly acid to extremely acid.

The A1 horizon is very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), or brown (10YR 4/3). Chert content ranges from 15 to 30 percent. Some pedons have an A2 horizon.

The B2 horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam and 35 to 65 percent chert.

The fragipan (Ax, Bx) has hue of 10YR, 7.5YR, and in places 5YR, value of 4 to 6, and chroma of 2 to 6. Chert content is similar to that of the B2 horizon.

The IIBt horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 3 to 6, and chroma of 5 to 8. Its texture is clay, silty clay, silty clay loam, or clay loam. Chert content commonly ranges from 35 to 65 percent.

Some pedons, especially on steeper slopes, have a Cr horizon immediately below the fragipan. This saprolitic material is commonly very firm and massive.

formation of the soils

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 the forces of soil formation have acted on the soil material. These five factors are discussed in the sections that follow.

parent material

Parent material, the weathered mass from which soil forms, determines the textural, chemical, and mineralogical composition of the soil. Even soil drainage and color are influenced by the kind of parent material. Soils of St. Francois County formed in material weathered from rhyolite, granite, sandstone, dolomite, clays, loess, and alluvium.

The regolith, or layer of loose rock material that rests on the bedrock, in the St. Francois Mountains developed primarily from rhyolites and granites. Delassus, Irondale, Knobtop, Loughboro, and Syenite soils formed partially or wholly in these residual materials. The rhyolites are considered the oldest rocks in the county. Mountain peaks of rhyolite were probably exposed to weathering as islands before and during the deposition of the sedimentary rocks. Later, migration of granitic magmas up to the surface expanded the mountainous area. All the igneous rocks occur in the southwest corner of the county.

Two major sedimentary deposits of the early Cambrian System are important to soil formation in St. Francois County. During the early weathering of the mountain peaks, thick beds of sand were deposited around the base of the mountains. The sandstone (Lamotte Formation) shows cross bedding and other evidence that deposition was rapid. Jonca, Lamotte, Lily, and Ramsey soils formed partially or wholly in residuum of sandstone. The Lamotte Formation has alternating sedimentary beds of sandstone and dolomite. In contrast, the extensive dolomite deposits of the Bonneterre Formation indicate a relatively quiet period of warm shallow water conditions. The red clays above the dolomite contain a large amount of kaolinite along with illite and some expandable clay minerals (*8*). Chemically they do not appear to have weathered from dolomite. In addition, they lie unconformably on sculptured, water-worn bedrock surfaces. The clayey sediments overlying the bedrock have apparently been transported from a foreign source, although some mixing with local material is evident.

A second period of instability is shown by the clastic carbonate rocks, the submarine breccia, and the deposits of lead ore in the dolomite. This period probably began at the time of the intrusion of the major St. Francois batholith, from which emanated the lead-bearing veins. Chert and quartz druse associated with the Potosi Formation probably owe their existence to submarine volcanism. Chert is believed to be a chemical precipitate formed by the reaction of magma and sea water under considerable hydrostatic pressure (*5*). The entire Goss profile and the lower part of the Hildebrecht soils formed in the cherty red clays of the Potosi Formation. The possibility that the red nonexpandable clays originated in volcanic ash is compatible with the evidence. The lower parts of the Lebanon and Wilderness soils formed in similar materials.

Thin loess is on all the stable upland positions throughout the county. Loess 20 to 40 inches thick is on all landforms from the top of the mountains to stream terraces. The upper part of Delassus, Hildebrecht, Knobtop, Lebanon, and Loughboro soils formed in loess on the St. Francois Mountains and Salem Plateau. Stone lines associated with the fragipan in some of these soils support the distinction between materials and reveal the genetic history of the area (*18*). On the Farmington Plain, the upper layers of the Crider, Fourche, Jonca, and Nicholson soils formed in loess. Ashton and Auxvasse soils on the terraces and benches also have some loessal influence. Where no fragipan or stone line exists, the boundaries between the soil materials are rather obscure. It is clear from the distribution of loess that the major landforms were fixed prior to loess deposition. Geologic erosion has been mild since the loess was deposited. Only surface materials have been removed; no major alterations of landforms have occurred.

Alluvial deposits about 4 feet to more than 30 feet thick are on flood plains and bottom lands. Carr, Elsah, Haymond, Midco, and Wilbur soils formed in thick alluvium along Big River, Castor River, St. Francis River, and the many tributaries. The coarsest deposits—gravels—are commonly the basal deposits, and sediment size decreases upward toward the surface layer. A decrease in stream velocity and the relatively sudden accumulation of loess contributed to the gradation of materials. The greater stream velocity of the

earlier period is probably due to a larger volume of runoff that carried away the fines and left the gravel and cobblestones. The regional deposition of loess provided a source of erodible, gravel-free loess that has been the major source of sedimentation during recent centuries and is responsible for the silty nature of most alluvial soils.

living organisms

Living organisms both in and on the soil have contributed to the alteration of parent material and the properties of the soil. Plants, bacteria and fungi, burrowing animals, and man have had varying impacts on soil formation. They have influenced the organic matter and nitrogen content, reaction, color, thickness and kinds of horizons, structure, aeration, and other properties of the soil.

Plants greatly influence soil formation. Throughout time, plant communities have varied according to the soil's fertility, its available water capacity, its drainage, and its depth. In St. Francois County, trees have been the dominant vegetative cover during soil formation. About 4 percent of the county formed under native grassland. The thick, dark colored surface layer of the Gasconade soils is characteristic of the native grass influence. Small scattered areas of shallow soils supporting prairies are included in the mapping of Caneyville, Elsah, Irondale, Midco, and Ramsey soils. The annual return of grass residue affects the physical, biological, and chemical composition of the surface layer. For example, bases extracted from the soil by plants are eventually returned to the soil.

Micro-organisms play an important part in the decay and decomposition of plant residue. By reducing raw material to soil humus, they release plant nutrients, enhance soil structure, and improve the general physical condition of the surface layer. Soil properties that favor biological activity in the soil are a high percentage of organic matter, medium acid to neutral reaction, aeration, low bulk density, and medium texture. Of the soils in St. Francois County, the Ashton, Carr, Elsah, and Haymond soils have the most noticeable evidence of burrowing rodents, earthworms, and insects.

Intensive cultivation, clearing of trees, and other activities of man also influence soil formation. In places, cultivation has mixed the surface layer with the subsurface layer, lowered the organic matter content, reduced biological activity in the soil, decreased the stability of soil structure, and in many places has increased runoff and erosion. Erosion has, in some places, removed the original surface layer, thereby lowering the fertility and productivity of the soil. By introducing new crops and by adding chemicals, such as fertilizer and lime, man alters soil formation.

climate

Climate has been an important factor in the formation of the soils of St. Francois County. The humid continental climate is marked by distinct seasonal temperature changes and a predictable rainfall distribution. The climatic pattern has been generally stable for the brief period of recorded history (*20*).

Variations in temperature from high to low elevations have had only a slight influence on soil development. Temperature differences due to aspect are more observable. Thinner horizons, inferior tree species, and slower tree growth have been recorded on warm slopes of Goss and Irondale soils. Precipitation has been adequate to leach bases, lower natural fertility and reaction, and translocate silicate clays in upland soils.

Some evidence suggests that there have been variations in climate over geologic time. Geologic erosion, stone lines, loess deposition (*9*), vegetative changes, and abrupt textures in alluvial deposits indicate conditions different from those prevalent today. However, the modern climate has prevailed during soil formation. The universal warm climate indicated by all of the sedimentary strata (*12, 13, 14, 26*) no doubt changed before or during the time of the formation of the major landforms and had little or no influence on the formation of the soils. Additional information on present climate is given in the section "General nature of the survey area."

relief

Relief refers to the lay of the land. The term is used to describe the general unevenness of the land surface, the variations in height, and the nature of the slopes in between. The difference in elevation from the ridgetop to the adjacent valley varies from one landform to another. Relief is highest, about 700 feet, in the mountainous areas. On the dissected Salem Plateau relief averages about 300 feet, and on the Farmington Plain it averages about 150 feet. Slopes are characteristically steep in the mountains, in contrast to the moderate and gentle slopes on the Farmington Plain.

Relief results from natural forces that create inequities in land surfaces. The St. Francois Mountains were formed by volcanism. The Salem Plateau is the plain of a former base level grossly dissected by geologic erosion. The Farmington Plain appears to be part of a later base level interrupted by faulting, folding, and erosion. Initial erosion of the freshly exposed sediment resulted in deep entrenchment of streams as the base level was lowered. Reduced rainfall and runoff and leveling of most streams have caused lateral erosion and the widening and filling of valleys.

Relief affects soil formation through its effect on climate, rate of erosion, and other processes of soil formation. Steepness of slope influences the amount of runoff, water infiltration, rate of leaching, clay movement, and thickness of the solum. Soil temperature is directly related to aspect and steepness of slope.

The rate of erosion depends on the nature of the soil material, the steepness of slope, and the amount of

runoff. The Gasconade and Ramsey soils, on valley slopes, are limited in depth because of geologic erosion. In contrast, the Crider, Delassus, Hildebrecht, Jonca, Lebanon, and Nicholson soils, on stable landscapes, are deep.

time

Time is important only as it allows climate, living organisms, and relief to exert their influence on parent material. The active forces of climate and living organisms begin altering soil properties as soon as parent material comes together. The degree to which soil forming processes have changed the parent material determines the age of a soil. A soil's maturity or relative age is, therefore, inferred from its morphology. The practical implication of soil aging is in how the changes in parent material affect a soil's productivity, use, and management.

Some soil properties that are used to determine aging in the soils of St. Francois County include low base saturation, presence of the argillic horizon, fragipan development, and depth of weathering (*9*).

The youngest soils in St. Francois County formed in alluvial deposits. Carr, Elsah, Haymond, Midco, and Wilbur soils are examples of young soils.

Low base saturation and the accompanying acid reaction is an indication of age that is evident in soils such as Irondale, Knobtop, Lily, and Syenite.

Auxvasse and Loughboro (fig. 19) soils have a distinct argillic horizon that is high in content of translocated clays. This property indicates age.

Fragipans are considered to be soil horizons which imply age. Delassus, Nicholson, Jonca, Lebanon, Hildebrecht, and Wilderness soils have a distinct fragipan. Although the genesis of the fragipan is obscure (*25*), it is clear that some time is required for its formation.

Figure 19.—Loughboro silt loam, 0 to 3 percent slopes, has very distinct layers, a result of extensive weathering. Depth is shown in feet.

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glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

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.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

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.

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.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

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) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

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.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.

Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.

Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.

Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the

building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 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.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

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 upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics.

The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

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 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

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 groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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 wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained*

(each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile 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.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in the rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

[Recorded in the period 1951-74 at Farmington, Missouri]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	42.9	21.2	32.1	70	-9	0	2.10	.70	3.20	4	2.6
February---	47.8	25.0	36.4	74	-2	11	2.67	1.49	3.63	5	3.0
March------	56.0	32.3	44.2	83	7	79	3.81	1.79	5.45	7	3.2
April------	69.4	43.9	56.6	89	20	223	4.63	2.60	6.28	8	.5
May--------	77.5	51.7	64.6	91	31	453	4.40	2.61	6.00	8	.0
June-------	85.5	60.4	73.0	97	42	690	3.80	1.78	5.44	6	.0
July-------	89.7	63.9	76.9	101	46	834	3.52	1.46	5.18	6	.0
August-----	88.5	61.9	75.2	101	45	781	3.22	1.62	4.52	5	.0
September--	81.6	54.6	68.1	97	34	543	3.54	1.43	5.23	6	.0
October----	71.5	43.1	57.3	89	23	251	2.34	.76	3.60	4	.0
November---	56.8	33.3	45.1	78	10	39	3.46	1.54	5.02	5	1.0
December---	45.6	25.8	35.7	72	1	10	3.05	1.09	4.61	5	1.8
Yearly:											
Average--	67.7	43.1	55.4	---	---	---	---	---	---	---	---
Extreme--	---	---	---	102	-10	---	---	---	---	---	---
Total----	---	---	---	---	---	3,914	40.54	32.86	47.83	69	12.1

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Farmington, Missouri]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 17	April 29	May 8
2 years in 10 later than--	April 12	April 23	May 3
5 years in 10 later than--	April 3	April 13	April 22
First freezing temperature in fall:			
1 year in 10 earlier than--	October 21	October 4	September 29
2 years in 10 earlier than--	October 25	October 9	October 3
5 years in 10 earlier than--	November 3	October 19	October 12

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Farmington, Missouri]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	195	166	150
8 years in 10	201	173	157
5 years in 10	213	188	172
2 years in 10	225	203	187
1 year in 10	231	211	194

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
10A	Ashton silt loam, 0 to 3 percent slopes	690	0.2
11A	Auxvasse silt loam, 0 to 3 percent slopes	4,033	1.4
12B	Caneyville silt loam, 2 to 5 percent slopes	3,292	1.1
12C	Caneyville silt loam, 5 to 9 percent slopes	19,210	6.6
12D	Caneyville silt loam, 9 to 14 percent slopes	9,977	3.4
13E	Caneyville stony silt loam, 14 to 20 percent slopes	5,344	1.8
14A	Carr fine sandy loam, 0 to 2 percent slopes	1,229	0.4
15B	Crider silt loam, 2 to 5 percent slopes	12,772	4.4
15C	Crider silt loam, 5 to 9 percent slopes	16,207	5.5
15D	Crider silt loam, 9 to 14 percent slopes	1,649	0.6
16B	Delassus silt loam, 2 to 5 percent slopes	8,669	3.0
16C	Delassus silt loam, 5 to 9 percent slopes	8,457	2.9
17C	Delassus bouldery silt loam, 5 to 9 percent slopes	5,633	1.9
18	Dumps, mine	349	0.1
19A	Elsah silt loam, 0 to 3 percent slopes	6,105	2.1
20C	Fourche silt loam, 5 to 9 percent slopes	14,777	5.1
20D	Fourche silt loam, 9 to 14 percent slopes	626	0.2
21E	Gasconade flaggy silty clay loam, 9 to 35 percent slopes	6,083	2.1
22E	Goss very cherty silt loam, 14 to 35 percent slopes	39,289	13.4
23A	Haymond silt loam, 0 to 2 percent slopes	9,139	3.1
24B	Hildebrecht silt loam, 2 to 5 percent slopes	4,056	1.4
24C	Hildebrecht silt loam, 5 to 9 percent slopes	20,277	6.9
24D	Hildebrecht silt loam, 9 to 14 percent slopes	2,596	0.9
25F	Irondale extremely stony silt loam, 15 to 40 percent slopes	16,898	5.8
26B	Jonca silt loam, 2 to 5 percent slopes	5,277	1.8
26C	Jonca silt loam, 5 to 9 percent slopes	9,184	3.1
27C	Knobtop silt loam, 3 to 9 percent slopes	743	0.3
28C	Lamotte silt loam, 5 to 9 percent slopes	1,383	0.5
28D	Lamotte silt loam, 9 to 14 percent slopes	4,206	1.4
29C	Lebanon silt loam, 3 to 9 percent slopes	5,775	2.0
30C	Lily-Ramsey complex, 3 to 9 percent slopes	1,701	0.6
31A	Loughboro silt loam, 0 to 3 percent slopes	2,255	0.8
32A	Midco cherty silt loam, 0 to 3 percent slopes	1,922	0.7
33A	Midco very gravelly sandy loam, 0 to 4 percent slopes	568	0.2
34B	Nicholson silt loam, 2 to 5 percent slopes	8,973	3.1
35	Pits-Orthents complex	638	0.2
36C	Psamments, sloping	2,908	1.0
37E	Ramsey very stony sandy loam, 14 to 35 percent slopes	4,021	1.4
38E	Syenite extremely bouldery silt loam, 10 to 25 percent slopes	13,764	4.7
39A	Wilbur silt loam, 0 to 2 percent slopes	2,445	0.8
40C	Wilderness cherty silt loam, 5 to 9 percent slopes	1,740	0.6
40D	Wilderness cherty silt loam, 9 to 20 percent slopes	4,787	1.6
	Water (greater than 40 acres)	725	0.2
	Water (less than 40 acres)	2108	0.7
	Total	292,480	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Grain sorghum	Winter wheat	Alfalfa hay	Grass-legume hay	Grass-clover
	Bu	Bu	Bu	Bu	Ton	Ton	AUM*
10A---------- Ashton	110	40	100	45	5.0	4.5	9.0
11A---------- Auxvasse	85	31	65	35	---	3.2	6.4
12B---------- Caneyville	85	25	70	30	---	3.5	7.0
12C---------- Caneyville	70	21	64	25	---	3.0	6.0
12D---------- Caneyville	---	---	50	20	---	2.5	5.0
13E---------- Caneyville	---	---	---	---	---	---	3.8
14A---------- Carr	70	27	75	30	3.5	3.0	5.6
15B---------- Crider	100	38	90	40	5.0	4.2	8.5
15C---------- Crider	95	35	85	40	5.0	4.2	8.5
15D---------- Crider	85	30	80	35	4.5	4.0	8.0
16B---------- Delassus	77	27	65	31	---	3.5	7.0
16C---------- Delassus	58	20	46	24	---	2.6	5.3
17C---------- Delassus	---	---	---	---	---	2.3	4.8
18. Dumps							
19A---------- Elsah	85	30	80	34	4.0	3.6	6.2
20C---------- Fourche	85	32	75	35	4.5	3.8	7.5
20D---------- Fourche	77	28	66	32	4.0	3.5	7.0
21E---------- Gasconade	---	---	---	---	---	---	---
22E---------- Goss	---	---	---	---	---	---	5.0
23A---------- Haymond	90	39	90	35	5.0	3.7	6.0
24B---------- Hildebrecht	82	32	74	36	---	3.8	7.4
24C---------- Hildebrecht	74	26	70	32	---	3.6	7.0

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Grain sorghum	Winter wheat	Alfalfa hay	Grass-legume hay	Grass-clover
	Bu	Bu	Bu	Bu	Ton	Ton	AUM*
24D---------- Hildebrecht	65	23	55	27	---	3.0	6.0
25F---------- Irondale	---	---	---	---	---	---	2.9
26B---------- Jonca	83	30	70	34	---	3.6	7.3
26C---------- Jonca	62	22	55	26	---	2.8	5.5
27C---------- Knobtop	70	27	65	31	---	3.5	6.9
28C---------- Lamotte	78	28	75	32	4.2	3.5	7.0
28D---------- Lamotte	62	22	55	26	4.0	3.0	6.0
29C---------- Lebanon	50	24	60	32	---	3.2	6.4
30C---------- Lily-Ramsey	---	---	---	---	---	2.5	5.0
31A---------- Loughboro	74	25	60	26	---	3.2	6.4
32A, 33A---------- Midco	---	---	---	30	---	2.8	5.2
34B---------- Nicholson	85	42	74	35	---	3.5	7.0
35---------- Pits-Orthents	---	---	---	---	---	---	2.5
36C. Psamments							
37E---------- Ramsey	---	---	---	---	---	---	2.0
38E---------- Syenite	---	---	---	---	---	---	3.0
39A---------- Wilbur	100	40	100	40	---	4.1	8.2
40C---------- Wilderness	---	---	---	17	---	2.0	4.0
40D---------- Wilderness	---	---	---	---	---	1.4	2.8

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
10A---------- Ashton	1o	Slight	Slight	Slight	Severe	Northern red oak----	85	Eastern white pine, black walnut, sweetgum, cherrybark oak.
						Pin oak----------	103	
						Sweetgum----------	77	
						Shumard oak---------	94	
11A---------- Auxvasse	4w	Severe	Moderate	Moderate	Severe	Pin oak----------	76	Pin oak, yellow-poplar, white oak, green ash, eastern cottonwood, silver maple, black willow, sweetgum.
						Northern red oak----	---	
						Silver maple--------	---	
						Green ash----------	---	
						American sycamore---	---	
						Shumard oak---------	---	
12B, 12C, 12D------ Caneyville	4c	Slight	Moderate	Slight	Slight	Northern red oak----	69	Eastern redcedar, eastern white pine, shortleaf pine.
						Eastern redcedar----	45	
13E---------- Caneyville	4r	Moderate	Moderate	Slight	Slight	Northern red oak----	69	Eastern redcedar, eastern white pine, shortleaf pine.
						Black oak----------	75	
						Eastern redcedar----	45	
						Hickory----------	45	
14A---------- Carr	3o	Slight	Slight	Slight	Slight	Eastern cottonwood--	90	Eastern cottonwood, American sycamore, black walnut.
						American sycamore---	---	
15B, 15C, 15D------ Crider	3o	Slight	Slight	Slight	Moderate	Northern red oak----	70	Eastern white pine, black walnut, shortleaf pine, white ash.
						Shortleaf pine------	---	
16B, 16C---------- Delassus	4o	Slight	Slight	Slight	Slight	Northern red oak----	60	Shortleaf pine, northern red oak, white oak, black oak.
						Shortleaf pine------	---	
						White oak----------	---	
						Black oak----------	---	
17C---------- Delassus	4x	Moderate	Slight	Slight	Slight	Northern red oak----	60	Shortleaf pine, northern red oak, white oak, black oak.
						Shortleaf pine------	---	
						White oak----------	---	
						Black oak----------	---	
19A---------- Elsah	3f	Slight	Moderate	Slight	Moderate	Eastern cottonwood--	95	Green ash, shortleaf pine, eastern cottonwood.
						American sycamore---	---	
						Sweetgum----------	---	
						Red maple----------	---	
20C, 20D---------- Fourche	3o	Slight	Slight	Slight	Slight	White oak----------	63	White oak, shortleaf pine, eastern white pine, southern red oak, green ash, black oak.
						Green ash----------	72	
21E---------- Gasconade	5d	Severe	Moderate	Moderate	Slight	Eastern redcedar----	30	Eastern redcedar, shortleaf pine.
						Chinkapin oak-------	---	
						White ash----------	---	
						Sugar maple---------	---	
						Mockernut hickory---	---	
						Post oak-----------	---	
						Blackjack oak-------	---	
22E---------- Goss	4f	Severe	Moderate	Slight	Slight	White oak----------	60	Green ash, shortleaf pine, yellow-poplar.
						Shortleaf pine------	---	
						Post oak-----------	---	
						Blackjack oak-------	---	
						Black oak----------	---	
23A---------- Haymond	1o	Slight	Slight	Slight	Moderate	White oak----------	90	Eastern white pine, black walnut, yellow-poplar.
						Black walnut--------	70	

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	
24B, 24C, 24D----- Hildebrecht	4o	Slight	Slight	Slight	Slight	Scarlet oak---------	56	Shortleaf pine, scarlet oak.
						Northern red oak----	---	
						Black oak----------	---	
						White oak----------	---	
25F---------- Irondale	5x	Severe	Moderate	Slight	Slight	White oak----------	45	Shortleaf pine, eastern redcedar.
						Black oak----------	48	
						Northern red oak----	45	
						Shortleaf pine------	---	
26B, 26C---------- Jonca	4o	Slight	Slight	Slight	Slight	White oak----------	58	Shortleaf pine, black oak, white oak.
						Black oak----------	65	
						Northern red oak----	---	
27C---------- Knobtop	5o	Slight	Slight	Slight	Slight	Black oak----------	45	Shortleaf pine, eastern redcedar, northern red oak, black oak.
						Northern red oak----	47	
28C, 28D---------- Lamotte	3o	Slight	Slight	Slight	Moderate	White oak----------	62	Black oak, shortleaf pine, scarlet oak, white oak, black walnut.
						Black oak----------	---	
						Northern red oak----	82	
						Shortleaf pine------	64	
29C---------- Lebanon	4d	Slight	Moderate	Moderate	Slight	White oak----------	55	Shortleaf pine, white oak, black oak.
						Black oak----------	60	
						Shortleaf pine------	55	
30C*: Lily----------	4o	Slight	Slight	Slight	Slight	Shortleaf pine------	63	Shortleaf pine, white oak.
Ramsey----------	4x	Severe	Moderate	Severe	Slight	White oak----------	---	Shortleaf pine, eastern white pine.
						Shortleaf pine------	56	
31A---------- Loughboro	4w	Severe	Moderate	Moderate	Severe	White oak----------	52	Pin oak, white oak, green ash, sweetgum.
						Northern red oak----	---	
32A, 33A---------- Midco	4f	Slight	Moderate	Slight	Slight	White oak----------	55	White oak, shortleaf pine.
						American sycamore---	---	
						Shortleaf pine------	---	
						Black oak----------	60	
34B---------- Nicholson	3o	Slight	Slight	Slight	Severe	Northern red oak----	80	Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash.
37E---------- Ramsey	4x	Severe	Moderate	Severe	Slight	White oak----------	---	Shortleaf pine, eastern white pine.
						Shortleaf pine------	56	
38E---------- Syenite	5x	Severe	Moderate	Slight	Slight	White oak----------	46	Shortleaf pine, white oak, northern red oak.
						Northern red oak----	---	
						Black oak----------	---	
39A---------- Wilbur	1o	Slight	Slight	Slight	Moderate	Eastern cottonwood--	---	Eastern white pine, black walnut, yellow-poplar.
						Green ash----------	78	
						American sycamore---	87	
						Yellow-poplar-------	100	
40C, 40D---------- Wilderness	4d	Slight	Moderate	Moderate	Slight	White oak----------	55	White oak, shortleaf pine, black oak.
						Black oak----------	---	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--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
10A. Ashton					
11A---------- Auxvasse	Silky dogwood-----	Amur honeysuckle, Russian-olive.	Eastern red cedar, Amur maple.	Norway spruce, pin oak, green ash.	Eastern cottonwood, European alder.
12B, 12C, 12D, 13E---------- Caneyville	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar, Russian-olive.	American sycamore, eastern white pine.	Eastern cottonwood, European alder, silver maple.
14A---------- Carr	Silky dogwood-----	American plum-----	Ponderosa pine, silver maple, Russian-olive.	Siberian elm, honeylocust.	---
15B, 15C, 15D----- Crider	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar.	American sycamore, eastern white pine, green ash.	Eastern cottonwood, European alder, silver maple.
16B, 16C, 17C----- Delassus	Silky dogwood-----	Autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash.	Scotch pine, shortleaf pine, pin oak, jack pine, eastern white pine.	---
18*. Dumps					
19A---------- Elsah	Silky dogwood-----	Autumn-olive, silky dogwood.	Amur maple, Russian-olive, baldcypress.	Eastern white pine, Norway spruce.	Eastern cottonwood, red maple, American sycamore.
20C, 20D---------- Fourche	---	American plum, autumn-olive, Amur honeysuckle.	Amur maple, eastern redcedar.	Scotch pine, green ash, Norway spruce, eastern white pine, pin oak.	Eastern cottonwood, European alder.
21E---------- Gasconade	Mockorange, winged euonymus.	American plum, Amur honeysuckle, autumn-olive, lilac, Tatarian honeysuckle.	Eastern redcedar, jack pine, Siberian elm, Amur maple.	Green ash---------	---
22E---------- Goss	Winged euonymus---	Flowering dogwood, eastern redbud, Amur honeysuckle, autumn-olive, American plum.	Eastern redcedar, jack pine, green ash.	Shortleaf pine, shadblow serviceberry, eastern white pine.	---
23A---------- Haymond	Silky dogwood-----	Amur honeysuckle, autumn-olive.	Russian-olive, eastern redcedar.	Eastern white pine, Norway spruce, honeylocust.	European alder.

See footnote at end of table.

TABLE 7.--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
24B, 24C, 24D----- Hildebrecht	Silky dogwood-----	American plum, autumn-olive, Amur honeysuckle.	Eastern redcedar, oriental arborvitae, Amur maple, Russian-olive.	Eastern white pine, Scotch pine.	Silver maple, European alder.
25F---------- Irondale	Silky dogwood-----	Autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, common hackberry.	Scotch pine, shortleaf pine, jack pine, eastern white pine.	---
26B, 26C---------- Jonca	---	American plum, Amur honeysuckle, Tatarian honeysuckle, autumn-olive.	Black locust, Russian-olive, eastern redcedar, green ash.	Scotch pine, shortleaf pine, pin oak.	---
27C---------- Knobtop	Silky dogwood-----	Autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, common hackberry.	Scotch pine, shortleaf pine, jack pine, eastern white pine.	---
28C, 28D---------- Lamotte	---	American plum-----	Black locust, autumn-olive, Amur maple.	Green ash, red pine, pin oak, ponderosa pine.	Yellow-poplar, silver maple, eastern cottonwood.
29C---------- Lebanon	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar.	Eastern white pine, green ash, shortleaf pine, Scotch pine.	Pin oak, silver maple.
30C*: Lily----------	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar, Russian-olive.	Eastern cottonwood, European alder, eastern white pine, silver maple.	European alder.
Ramsey.					
31A---------- Loughboro	Silky dogwood-----	Autumn-olive, Amur honeysuckle.	Amur maple, eastern redcedar, jack pine, green ash.	Pin oak, American sycamore, Scotch pine, eastern white pine, European alder.	---
32A, 33A---------- Midco	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar.	Eastern white pine, green ash, shortleaf pine, Scotch pine.	Pin oak, silver maple.
34B---------- Nicholson	Silky dogwood-----	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar, Russian-olive.	American sycamore, eastern cottonwood, European alder, eastern white pine, silver maple.	---
35*: Pits.					
Orthents.					

See footnote at end of table.

TABLE 7.--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
36C*. Psamments					
37E. Ramsey					
38E---------- Syenite	Silky dogwood-----	Autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, common hackberry.	Scotch pine, shortleaf pine, jack pine, eastern white pine.	---
39A---------- Wilbur	Silky dogwood-----	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern redcedar	Norway spruce, honeylocust, eastern hemlock.	Eastern white pine.
40C, 40D---------- Wilderness	Fragrant sumac----	Flowering dogwood, eastern redbud, Amur honeysuckle, eastern redcedar, jack pine, autumn-olive, green ash, Amur honeysuckle.	Black locust------	Pin oak, white oak	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--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
10A Ashton	Severe: floods.	Slight	Slight	Slight	Slight.
11A Auxvasse	Severe: floods, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
12B Caneyville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Severe: erodes easily.	Moderate: thin layer.
12C Caneyville	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
12D Caneyville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
13E Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
14A Carr	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
15B Crider	Slight	Slight	Moderate: slope.	Slight	Slight.
15C Crider	Slight	Slight	Severe: slope.	Slight	Slight.
15D Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
16B Delassus	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: large stones.
16C Delassus	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: large stones.
17C Delassus	Severe: percs slowly.	Severe: percs slowly.	Severe: large stones, slope, percs slowly.	Severe: erodes easily.	Moderate: large stones.
18*. Dumps					
19A Elsah	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
20C Fourche	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness.
20D Fourche	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
21E--- Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: large stones.	Severe: large stones, slope, thin layer.
22E--- Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
23A--- Haymond	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
24B--- Hildebrecht	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
24C--- Hildebrecht	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
24D--- Hildebrecht	Moderate: wetness, percs slowly, slope.	Moderate: wetness, percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
25F--- Irondale	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
26B--- Jonca	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight---	Slight.
26C--- Jonca	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Severe: slope.	Slight---	Slight.
27C--- Knobtop	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
28C--- Lamotte	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight---	Slight.
28D--- Lamotte	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight---	Moderate: slope.
29C--- Lebanon	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness.
30C*:					
Lily---	Slight---	Slight---	Severe: slope.	Slight---	Moderate: thin layer.
Ramsey---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight---	Severe: thin layer.
31A--- Loughboro	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
32A, 33A--- Midco	Severe: floods.	Moderate: floods, small stones.	Severe: small stones, floods.	Moderate: floods.	Severe: droughty, floods.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
34B---------- Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
35*: Pits.					
Orthents.					
36C*. Psamments					
37E---------- Ramsey	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones.	Moderate: large stones, slope.	Severe: slope, thin layer.
38E---------- Syenite	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.	Severe: slope.
39A---------- Wilbur	Severe: floods.	Moderate: floods.	Severe: floods.	Severe: erodes easily.	Severe: floods.
40C---------- Wilderness	Severe: wetness.	Moderate: wetness, small stones.	Severe: slope, small stones, wetness.	Moderate: wetness.	Severe: droughty.
40D---------- Wilderness	Severe: wetness.	Moderate: slope, wetness, small stones.	Severe: slope, small stones, wetness.	Moderate: wetness.	Severe: droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--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
10A---------- Ashton	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
11A---------- Auxvasse	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
12B, 12C---------- Caneyville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
12D---------- Caneyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
13E---------- Caneyville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
14A---------- Carr	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
15B, 15C---------- Crider	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
15D---------- Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
16B, 16C---------- Delassus	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
17C---------- Delassus	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
18*. Dumps										
19A---------- Elsah	Fair	Fair	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
20C, 20D---------- Fourche	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
21E---------- Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
22E---------- Goss	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
23A---------- Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
24B---------- Hildebrecht	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
24C---------- Hildebrecht	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
24D---------- Hildebrecht	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
25F---------- Irondale	Very poor.	Poor	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
26B---------- Jonca	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
26C---------- Jonca	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
27C---------- Knobtop	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
28C---------- Lamotte	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
28D---------- Lamotte	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
29C---------- Lebanon	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
30C*:										
Lily----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ramsey----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
31A---------- Loughboro	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
32A, 33A---------- Midco	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
34B---------- Nicholson	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
35*:										
Pits.										
Orthents.										
36C*.										
Psamments										
37E---------- Ramsey	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
38E---------- Syenite	Very poor.	Poor	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
39A---------- Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
40C, 40D---------- Wilderness	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
10A Ashton	Slight	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength.	Slight.
11A Auxvasse	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness.	Severe: floods, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
12B Caneyville	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength.	Moderate: thin layer.
12C Caneyville	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.
12D Caneyville	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
13E Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
14A Carr	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
15B Crider	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
15C Crider	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
15D Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
16B Delassus	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Slight.
16C, 17C Delassus	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: large stones.
18*. Dumps						
19A Elsah	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
20C Fourche	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.
20D Fourche	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: wetness, slope.

See footnote at end of table.

TABLE 10.--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
21E---------- Gasconade	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.
22E---------- Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
23A---------- Haymond	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
24B---------- Hildebrecht	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Slight.
24C---------- Hildebrecht	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Slight.
24D---------- Hildebrecht	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
25F---------- Irondale	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
26B---------- Jonca	Moderate: dense layer, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Slight.
26C---------- Jonca	Moderate: dense layer, wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: low strength.	Slight.
27C---------- Knobtop	Severe: depth to rock, wetness.	Moderate: wetness, shrink-swell, depth to rock.	Severe: wetness, depth to rock.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer.
28C---------- Lamotte	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
28D---------- Lamotte	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
29C---------- Lebanon	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action, low strength.	Moderate: wetness.
30C*: Lily----------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Moderate: thin layer.
Ramsey----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.

See footnote at end of table.

TABLE 10.--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
31A---------- Loughboro	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
32A, 33A---------- Midco	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: droughty, floods.
34B---------- Nicholson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
35*: Pits.						
Orthents.						
36C*. Psamments						
37E---------- Ramsey	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: slope, thin layer.
38E---------- Syenite	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope, large stones.
39A---------- Wilbur	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Severe: floods.
40C---------- Wilderness	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: droughty.
40D---------- Wilderness	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: slope.	Severe: droughty, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10A Ashton	Moderate: floods.	Moderate: seepage.	Moderate: floods.	Moderate: floods.	Good.
11A Auxvasse	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
12B Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
12C, 12D Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
13E Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
14A Carr	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Fair: thin layer.
15B Crider	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
15C Crider	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
15D Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
16B Delassus	Severe: wetness, percs slowly.	Moderate: slope.	Severe: depth to rock.	Moderate: wetness.	Fair: area reclaim, wetness.
16C, 17C Delassus	Severe: wetness, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: area reclaim, wetness.
18*. Dumps					
19A Elsah	Severe: floods, large stones.	Severe: seepage, floods, large stones.	Severe: floods, seepage, large stones.	Severe: floods, seepage.	Poor: seepage, large stones.
20C Fourche	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
20D Fourche	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
21E---------- Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
22E---------- Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, small stones.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
23A---------- Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
24B---------- Hildebrecht	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: small stones.
24C---------- Hildebrecht	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: small stones.
24D---------- Hildebrecht	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, too clayey, slope.	Moderate: wetness, slope.	Poor: small stones.
25F---------- Irondale	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
26B---------- Jonca	Severe: percs slowly, wetness.	Moderate: seepage, slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
26C---------- Jonca	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
27C---------- Knobtop	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope, wetness.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
28C---------- Lamotte	Moderate: percs slowly, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: area reclaim.
28D---------- Lamotte	Moderate: percs slowly, depth to rock, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: slope, area reclaim.
29C---------- Lebanon	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey, wetness.	Moderate: wetness.	Fair: too clayey, small stones.
30C*:					
Lily----------	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Ramsey----------	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: Area reclaim.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoons	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
31A---------- Loughboro	Severe: wetness, percs slowly.	Slight----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
32A, 33A---------- Midco	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: seepage, small stones.
34B---------- Nicholson	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
35*: Pits.					
Orthents.					
36C*. Psamments					
37E---------- Ramsey	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
38E---------- Syenite	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
39A---------- Wilbur	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: wetness.
40C, 40D---------- Wilderness	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
10A---------- Ashton	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
11A---------- Auxvasse	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
12B, 12C, 12D---------- Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
13E---------- Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
14A---------- Carr	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
15B, 15C---------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
15D---------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
16B, 16C---------- Delassus	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: large stones, area reclaim.
17C---------- Delassus	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.
18*. Dumps				
19A---------- Elsah	Fair: large stones.	Improbable: small stones, excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
20C, 20D---------- Fourche	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
21E---------- Gasconade	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, thin layer.
22E---------- Goss	Fair: low strength, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
23A---------- Haymond	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
24B, 24C, 24D---------- Hildebrecht	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
25F---------- Irondale	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope, area reclaim.
26B, 26C---------- Jonca	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, area reclaim, too clayey.
27C---------- Knobtop	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, large stones, thin layer.
28C, 28D---------- Lamotte	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
29C---------- Lebanon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
30C*: Lily----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, thin layer.
Ramsey----------	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
31A---------- Loughboro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
32A, 33A---------- Midco	Fair: large stones.	Improbable: small stones.	Probable----------	Poor: small stones, area reclaim.
34B---------- Nicholson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
35*: Pits.				
Orthents.				
36C*. Psamments				
37E---------- Ramsey	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
38E---------- Syenite	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope, area reclaim.
39A---------- Wilbur	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
40C, 40D---------- Wilderness	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
10A---------- Ashton	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
11A---------- Auxvasse	Slight---------	Moderate: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
12B, 12C---------- Caneyville	Moderate: depth to rock, slope.	Severe: thin layer, hard to pack.	Deep to water	Depth to rock, slope, erodes easily.	Depth to rock	Depth to rock.
12D, 13E---------- Caneyville	Moderate: depth to rock, slope.	Severe: thin layer, hard to pack.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock.	Slope, depth to rock.
14A---------- Carr	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, floods.	Soil blowing---	Favorable.
15B, 15C---------- Crider	Moderate: seepage.	Moderate: piping, hard to pack.	Deep to water	Slope----------	Favorable------	Favorable.
15D---------- Crider	Moderate: seepage.	Moderate: piping, hard to pack.	Deep to water	Slope----------	Slope----------	Slope.
16B, 16C---------- Delassus	Moderate: slope.	Moderate: piping, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.
17C---------- Delassus	Moderate: slope.	Moderate: piping, large stones.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Large stones, erodes easily, percs slowly.	Large stones, erodes easily, rooting depth.
18*. Dumps						
19A---------- Elsah	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones---	Large stones---	Large stones.
20C---------- Fourche	Moderate: slope.	Moderate: hard to pack, wetness.	Slope----------	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
20D---------- Fourche	Severe: slope.	Moderate: hard to pack, wetness.	Slope----------	Wetness, slope, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
21E---------- Gasconade	Severe: depth to rock, slope.	Severe: large stones, thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
22E---------- Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
23A---------- Haymond	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
24B, 24C---------- Hildebrecht	Moderate: seepage, slope.	Moderate: piping, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
24D--- Hildebrecht	Severe: slope.	Moderate: piping, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
25F--- Irondale	Severe: slope.	Severe: large stones.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
26B, 26C--- Jonca	Moderate: seepage, slope.	Moderate: wetness, piping.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
27C--- Knobtop	Severe: slope.	Severe: thin layer.	Depth to rock, frost action, slope.	Wetness, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
28C--- Lamotte	Moderate: seepage, depth to rock, slope.	Moderate: thin layer.	Deep to water	Slope---	Favorable---	Favorable.
28D--- Lamotte	Severe: slope.	Moderate: thin layer.	Deep to water	Slope---	Slope---	Slope.
29C--- Lebanon	Moderate: slope.	Moderate: wetness.	Percs slowly, slope.	Wetness, rooting depth, percs slowly.	Erodes easily, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.
30C*: Lily---	Severe: seepage.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
Ramsey---	Severe: seepage, depth to rock.	Severe: thin layer, piping.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty.
31A--- Loughboro	Slight---	Moderate: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
32A, 33A--- Midco	Severe: seepage.	Severe: seepage.	Deep to water	Large stones, droughty.	Large stones---	Large stones, droughty.
34B--- Nicholson	Slight---	Moderate: hard to pack, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
35*: Pits.						
Orthents.						
36C*. Psamments						
37E--- Ramsey	Severe: seepage, depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
38E--- Syenite	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, large stones.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
39A--- Wilbur	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
40C--- Wilderness	Moderate: slope.	Moderate: large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Large stones, wetness, percs slowly.	Large stones, wetness, rooting depth.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
40D---------- Wilderness	Severe: slope.	Moderate: large stones, wetness.	Percs slowly, large stones, slope.	Large stones, wetness, droughty.	Slope, large stones, wetness.	Large stones, wetness, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--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	
10A---------- Ashton	0-14	Silt loam--------	ML, CL	A-4	0	95-100	90-100	75-100	60-95	<35	NP-10
	14-48	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	80-100	25-42	5-20
	48-72	Silt loam, loam, fine sandy loam.	ML, CL, SM, CL-ML	A-4, A-6	0-5	90-100	85-100	65-95	40-90	<40	NP-20
11A---------- Auxvasse	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	13-28	Silty clay, clay	CH	A-7	0	100	100	95-100	90-100	50-65	30-40
	28-70	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	90-96	35-45	20-25
12B, 12C, 12D---- Caneyville	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	7-27	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	27-31	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
13E---------- Caneyville	0-7	Stony silt loam	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	7-27	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	27-31	Clay, silty clay	CH	A-7	0-15	75-100	75-100	70-100	65-100	50-75	30-45
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
14A---------- Carr	0-6	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	70-100	35-75	10-25	2-10
	6-52	Stratified loamy fine sand to loam.	SM, SC, ML, CL	A-4	0	100	95-100	70-100	35-65	10-25	2-10
	52-60	Loamy sand, loamy fine sand, sand.	SM	A-2-4	0	98-100	85-100	65-95	20-30	---	NP
15B, 15C, 15D---- Crider	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	7-40	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	40-72	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
16B, 16C---------- Delassus	0-7	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0-15	95-100	90-100	80-90	65-75	21-35	4-15
	7-26	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0-15	95-100	90-100	85-95	70-85	35-45	15-21
	26-31	Silt loam, loam	CL	A-4, A-6	0-15	95-100	90-100	75-90	55-75	25-35	7-15
	31-61	Silt loam, loam, sandy loam.	CL	A-4, A-6	0-15	95-100	90-100	70-85	50-75	25-35	7-15
	61	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
17C---------- Delassus	0-7	Bouldery silt loam.	CL-ML, CL, ML	A-4, A-6	15-30	90-100	85-100	75-90	65-75	21-35	4-15
	7-24	Bouldery silt loam, bouldery silty clay loam, bouldery clay loam.	CL	A-6, A-7	15-30	90-100	85-100	80-95	70-85	35-45	15-21
	24-68	Silt loam, loam	CL	A-4, A-6	0-15	95-100	90-100	70-85	50-75	25-35	7-15
	68	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 14.--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	
18*. Dumps											
19A---------- Elsah	0-18	Silt loam--------	CL, ML	A-4, A-6	0-15	95-100	90-100	90-100	85-100	20-32	5-15
	18-60	Very cherty loam	GM, GP-GM	A-1	5-20	20-50	20-45	20-40	10-25	<30	NP-6
20C, 20D--------- Fourche	0-14	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	90-100	85-95	25-35	5-15
	14-33	Silty clay loam	CL	A-7, A-6	0	100	95-100	90-100	85-95	35-45	15-25
	33-80	Silty clay, clay, silty clay loam.	CL, CH	A-7	0-5	85-100	75-100	70-100	60-95	40-60	25-40
	80	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---
21E---------- Gasconade	0-8	Flaggy silty clay loam.	CL	A-6	20-70	75-90	70-85	60-75	55-65	30-40	15-25
	8-13	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
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
22E---------- Goss	0-4	Very cherty silt loam.	ML, CL, GC, GM	A-2	5-30	40-70	20-60	15-60	10-55	20-30	2-8
	4-15	Very cherty silt loam, very cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	15-85	Cherty silty clay loam, cherty silty clay, very cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
23A---------- Haymond	0-10	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	10-41	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	41-76	Fine sandy loam, silt loam, loam.	ML, SM	A-4	0	95-100	90-100	80-100	35-90	27-36	4-10
24B, 24C, 24D---- Hildebrecht	0-8	Silt loam--------	ML, CL-ML,	A-4	0	100	100	95-100	90-100	20-30	3-10
	8-28	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	85-100	30-45	12-22
	28-53	Silt loam, very cherty silt loam, very cherty clay loam.	GC, CL, SC, SM-SC	A-6, A-2, A-4, A-7	0-10	60-95	30-80	30-75	25-70	25-45	6-22
	53-80	Very cherty clay, clay, cherty silty clay.	CL, CH, SC, GC	A-7, A-2-7	0-10	60-100	30-100	30-100	25-95	45-75	22-40
25F---------- Irondale	0-4	Extremely stony silt loam.	CL-ML, GM-GC, GC, CL	A-4	10-25	55-95	45-90	40-75	35-70	20-33	4-10
	4-28	Very cobbly silt loam, very cobbly silty clay loam.	CL-ML, CL	A-4, A-6	25-40	75-90	70-85	60-70	50-65	25-40	7-18
	28-36	Very cobbly loam, very cobbly silty clay loam.	CL-ML, CL, SM, SM-SC	A-4, A-6	25-40	75-90	70-85	55-70	45-60	20-40	4-18
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--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	
26B, 26C---------- Jonca	0-7	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	100	80-100	65-90	23-32	5-11
	7-30	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	100	80-100	65-90	34-50	15-30
	30-48	Loam, sandy clay loam.	CL, SC	A-4, A-6	0	95-100	90-100	70-90	45-85	25-40	8-20
	48-68	Sandy loam, sandy clay loam, clay loam.	SC, CL, SM, ML	A-6, A-7, A-4	0-10	90-100	75-95	60-85	40-80	32-50	8-22
	68	Weathered bedrock	---	---	---	---	---	---	---	---	---
27C---------- Knobtop	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	90-100	85-100	20-35	5-15
	5-29	Silty clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	85-100	35-45	15-22
	29-34	Silty clay loam, cobbly silt loam, clay loam.	CL, SM	A-6	0-25	85-100	80-100	70-90	45-85	30-40	10-18
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
28C, 28D---------- Lamotte	0-15	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	80-100	60-90	20-32	5-11
	15-39	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0	100	95-100	80-95	40-80	30-50	15-30
	39-60	Loam, sandy clay loam, sandy loam.	CL, SC	A-6, A-4	0-15	85-95	70-85	60-95	30-80	30-40	12-22
	60-72	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---
29C---------- Lebanon	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	85-100	85-100	80-95	60-75	22-35	5-15
	6-10	Silt loam, silty clay loam.	CL	A-6	0-5	85-95	80-95	75-95	60-75	30-40	11-20
	10-23	Silty clay loam, silty clay.	CL	A-7	0-5	85-95	70-95	65-90	55-75	40-50	20-30
	23-61	Cherty silt loam, cherty silty clay loam, silty clay loam.	CL, SC, GC	A-7, A-2, A-6	0-10	60-95	40-95	35-90	30-70	35-45	15-20
	61-72	Cherty silty clay, silty clay loam.	CL, CH, SC, GC	A-7	0-10	65-95	50-90	45-75	40-70	45-80	25-45
30C*: Lily----------	0-11	Loam----------	ML	A-4	0-5	90-100	85-100	70-95	55-75	<35	NP-7
	11-25	Clay loam, sandy clay loam, loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	75-100	40-80	<35	3-15
	25-35	Sandy clay loam, clay loam, gravelly sandy clay loam.	SM, SC, ML, CL	A-4, A-2, A-6, A-1	0-10	65-100	50-100	40-95	20-75	<35	3-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
30C*: Ramsey----------	0-15	Sandy loam-------	SM, SC, ML, CL	A-4, A-2	15-30	75-90	65-85	50-75	34-65	15-25	2-8
	15-20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
31A---------- Loughboro	0-15	Silt loam--------	CL	A-6	0	100	100	90-100	80-90	28-35	10-15
	15-39	Silty clay loam, silty clay, clay loam.	CH	A-7	0-5	95-100	95-100	90-100	85-90	50-65	30-40
	39-67	Silt loam, loam, silty clay loam.	CL	A-7	0-5	90-100	85-100	80-90	60-85	40-50	20-28

See footnote at end of table.

TABLE 14.--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	
32A---------- Midco	0-11	Cherty silt loam	GM, SM	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-10
	11-30	Cherty loam, very cherty loam, very cherty sandy loam.	SM, SM-SC, GM, GM-GC	A-2-4, A-1	5-25	35-70	30-65	30-60	20-35	<25	2-7
	30-60	Very cherty loam, very cherty sandy loam.	GM, GP-GM	A-1	5-30	15-40	10-35	10-30	5-20	<20	NP-4
33A---------- Midco	0-3	Very gravelly sandy loam.	SM, SM-SC, GM, GM-GC	A-2-4, A-1	5-20	60-80	55-75	25-45	15-30	<20	NP-7
	3-20	Very gravelly loam, very gravelly sandy loam.	SM, SM-SC, GM, GM-GC	A-2-4, A-1	5-25	35-70	30-65	30-60	20-35	<25	2-7
	20-60	Very gravelly sandy loam, very gravelly loamy sand.	GM, GP-GM	A-1	5-30	15-40	10-35	10-30	5-20	<20	NP-4
34B---------- Nicholson	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-100	25-35	5-10
	8-25	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	80-100	25-45	5-20
	25-39	Silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-15
	39-64	Silty clay, clay, silty clay loam.	CH, CL	A-7, A-6	0	85-100	75-100	70-100	65-95	34-70	16-40
35*: Pits.											
Orthents.											
36C*. Psamments											
37E---------- Ramsey	0-16	Very stony sandy loam, sandy loam, cobbly sandy loam.	SM, SC, ML, CL	A-4, A-2	15-30	75-90	65-85	50-75	34-65	15-25	2-8
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
38E---------- Syenite	0-8	Extremely bouldery silt loam, silt loam.	CL-ML, CL, ML	A-4, A-6	3-25	90-100	85-100	70-90	60-85	25-35	5-15
	8-21	Silt loam, clay loam, sandy clay loam.	SC, CL	A-6, A-7	0-5	90-100	75-100	70-90	45-80	35-45	15-22
	21-30	Silt loam, loam, sandy clay loam.	SC, CL	A-4, A-6	0-5	85-100	75-100	60-85	45-80	25-35	7-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
39A---------- Wilbur	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	6-70	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
40C, 40D---------- Wilderness	0-11	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
	11-22	Very cherty silty clay loam, 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
	22-37	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
	37-60	Very cherty silty clay, cherty clay, cherty silty clay loam, silty clay loam.	GC, GP-GC	A-2-6	10-40	30-60	10-45	10-40	5-35	25-40	15-25

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/Hr	In/in	pH					Pct
10A	0-14	10-25	1.20-1.40	0.6-2.0	0.16-0.23	5.6-7.3	Low	0.28	4	5	2-4
Ashton	14-48	18-34	1.20-1.50	0.6-2.0	0.18-0.23	5.6-7.3	Low	0.43			
	48-72	10-40	1.25-1.55	0.6-2.0	0.14-0.20	5.6-7.3	Low	0.43			
11A	0-13	8-16	1.30-1.45	0.6-2.0	0.22-0.24	5.6-6.5	Low	0.43	3	6	.5-1
Auxvasse	13-28	35-50	1.35-1.50	<0.06	0.09-0.11	4.5-5.5	High	0.43			
	28-70	25-40	1.35-1.50	0.2-0.6	0.18-0.20	4.5-5.5	Moderate	0.43			
12B, 12C, 12D, 13E	0-7	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low	0.43	3	5	2-4
Caneyville	7-27	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate	0.28			
	27-31	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate	0.28			
	31	---	---	---	---	---	---	---			
14A	0-6	5-15	1.50-1.75	2.0-6.0	0.14-0.20	7.4-8.4	Low	0.24	5	3	<1
Carr	6-52	5-15	1.50-1.75	2.0-6.0	0.13-0.18	7.4-8.4	Low	0.24			
	52-60	2-8	1.20-1.60	6.0-20	0.06-0.09	7.4-8.4	Low	0.15			
15B, 15C, 15D	0-7	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low	0.32	4	6	2-4
Crider	7-40	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low	0.28			
	40-72	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.0	Moderate	0.28			
16B, 16C	0-7	10-25	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	4	5	1-2
Delassus	7-26	24-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-6.0	Moderate	0.37			
	26-31	15-25	1.40-1.60	0.2-0.6	0.06-0.12	3.6-5.0	Low	0.37			
	31-61	15-25	1.60-1.80	<0.06	0.01-0.10	3.6-5.0	Low	0.37			
	61	---	---	---	---	---	---	---			
17C	0-7	10-25	1.20-1.40	0.6-2.0	0.18-0.22	5.6-7.3	Low	0.37	4	8	1-2
Delassus	7-24	24-35	1.30-1.50	0.6-2.0	0.10-0.16	3.6-6.0	Moderate	0.37			
	24-68	15-25	1.60-1.80	<0.06	0.01-0.10	3.6-5.0	Low	0.37			
	68	---	---	---	---	---	---	---			
18*. Dumps											
19A	0-18	20-27	1.20-1.40	0.6-2.0	0.17-0.24	5.6-7.3	Low	0.37	3	5	1-2
Elsah	18-60	5-15	1.50-1.70	2.0-6.0	0.06-0.11	5.6-7.3	Low	0.17			
20C, 20D	0-14	10-25	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37	5	5	1-2
Fourche	14-33	27-35	1.40-1.60	0.2-0.6	0.16-0.20	4.5-6.0	Moderate	0.37			
	33-80	35-55	1.30-1.60	0.2-0.6	0.09-0.13	4.5-7.8	Moderate	0.37			
	80	---	---	---	---	---	---	---			
21E	0-8	35-50	1.35-1.50	0.6-2.0	0.10-0.12	6.1-7.8	Moderate	0.20	2	8	2-4
Gasconade	8-13	40-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate	0.20			
	13	---	---	---	---	---	---	---			
22E	0-4	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low	0.24	2	6	1-2
Goss	4-15	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low	0.24			
	15-85	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate	0.24			
23A	0-10	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5	1-3
Haymond	10-41	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37			
	41-76	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.37			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
24B, 24C, 24D----	0-8	8-20	1.35-1.45	0.6-2.0	0.20-0.22	4.5-6.0	Low----------	0.43	4	5	1-2
Hildebrecht	8-28	20-35	1.40-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.43			
	28-53	12-35	1.60-1.80	0.06-0.2	0.03-0.05	3.6-5.5	Low----------	0.43			
	53-80	35-70	1.30-1.40	0.2-0.6	0.11-0.15	4.5-6.0	Moderate-----	0.28			
25F----------	0-4	7-20	1.00-1.30	0.6-2.0	0.06-0.14	4.5-6.0	Low----------	0.17	4	8	1-2
Irondale	4-28	15-30	1.10-1.40	0.6-2.0	0.08-0.13	3.6-5.5	Low----------	0.17			
	28-36	23-35	1.20-1.50	0.6-2.0	0.6-2.0	0.0-0.1	----------	LOW			
	36	---	---	---	---	---	----------	----			
26B, 26C---------	0-7	12-18	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43	4	5	1-2
Jonca	7-30	25-35	1.30-1.50	0.2-0.6	0.15-0.18	4.5-5.5	Moderate-----	0.43			
	30-48	18-25	1.60-1.90	0.06-0.2	0.01-0.10	3.6-5.0	Low----------	0.43			
	48-68	15-35	1.40-1.60	0.2-2.0	0.01-0.10	4.5-6.5	Low----------	0.43			
	68	---	---	---	---	---	----------	----			
27C----------	0-5	12-25	1.30-1.50	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.37	4	6	.5-1
Knobtop	5-29	25-35	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate-----	0.37			
	29-34	20-30	1.40-1.60	0.2-0.6	0.12-0.18	3.6-5.0	Low----------	0.37			
	34	---	---	---	---	---	----------	----			
28C, 28D---------	0-15	10-20	1.20-1.40	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.32	4	5	.5-1
Lamotte	15-39	25-35	1.40-1.60	0.2-2.0	0.15-0.20	3.5-6.0	Moderate-----	0.32			
	39-60	20-25	1.40-1.60	0.2-2.0	0.12-0.18	3.5-5.5	Low----------	0.32			
	60-72	---	---	---	---	---	----------	----			
29C----------	0-6	10-20	1.2-1.5	0.6-2.0	0.20-0.22	5.6-6.5	Low----------	0.43	3	5	1-3
Lebanon	6-10	20-30	1.3-1.5	0.6-2.0	0.14-0.19	4.5-5.5	Low----------	0.43			
	10-23	35-45	1.3-1.5	0.6-2.0	0.10-0.16	4.5-5.5	Moderate-----	0.32			
	23-61	25-40	1.6-1.8	0.06-0.2	0.08-0.14	4.5-5.5	Low----------	0.32			
	61-72	40-80	1.4-1.6	0.06-0.2	0.06-0.12	4.5-5.5	Moderate-----	0.32			
30C*:											
Lily----------	0-11	7-27	1.20-1.40	0.6-6.0	0.13-0.18	3.6-5.5	Low----------	0.28	3	5	.5-4
	11-25	18-35	1.25-1.55	2.0-6.0	0.12-0.18	3.6-5.5	Low----------	0.28			
	25-35	20-35	1.25-1.55	2.0-6.0	0.08-0.17	3.6-5.5	Low----------	0.17			
	35	---	---	---	---	---	----------	----			
Ramsey----------	0-15	10-20	1.20-1.40	6.0-20	0.06-0.10	4.5-5.5	Low----------	0.17	1	3	---
	15-20	---	---	---	---	---	----------	----			
31A----------	0-15	12-18	1.20-1.40	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.37	4	5	1-3
Loughboro	15-39	36-48	1.30-1.50	0.06-0.2	0.10-0.20	3.6-5.5	High---------	0.37			
	39-67	24-35	1.50-1.60	0.2-0.6	0.10-0.15	3.6-5.5	Moderate-----	0.37			
32A----------	0-11	15-25	1.10-1.30	2.0-6.0	0.09-0.13	5.6-6.5	Low----------	0.24	4	8	.5-2
Midco	11-30	15-25	1.20-1.40	2.0-6.0	0.05-0.11	5.1-6.0	Low----------	0.24			
	30-60	15-25	1.10-1.30	2.0-6.0	0.02-0.06	5.1-6.0	Low----------	0.24			
33A----------	0-3	10-20	1.10-1.30	2.0-6.0	0.07-0.11	5.6-6.5	Low----------	0.24	4	8	.5-2
Midco	3-20	15-25	1.20-1.40	2.0-6.0	0.05-0.11	5.1-6.0	Low----------	0.24			
	20-60	15-25	1.10-1.30	2.0-6.0	0.02-0.06	5.1-6.0	Low----------	0.24			
34B----------	0-8	12-30	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low----------	0.43	3	6	2-4
Nicholson	8-25	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Low----------	0.43			
	25-39	18-35	1.50-1.70	0.06-0.2	0.07-0.12	4.5-6.5	Low----------	0.43			
	39-64	40-60	1.40-1.60	0.06-0.6	0.07-0.12	5.1-7.8	Moderate-----	0.37			
35*:											
Pits.											
Orthents.											
36C*.											
Psamments											
37E----------	0-16	10-22	1.20-1.40	6.0-20	0.06-0.10	4.5-5.5	Low----------	0.17	1	8	.5-1
Ramsey	16-20	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
38E----------	0-8	12-25	1.20-1.40	0.6-2.0	0.12-0.20	5.1-6.5	Low----------	0.28	4	8	1-2
Syenite	8-21	25-35	1.30-1.50	0.2-0.6	0.10-0.18	3.6-5.5	Low----------	0.28			
	21-30	15-27	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.0	Low----------	0.28			
	30	---	---	---	---	---	----------	----			
39A----------	0-6	10-17	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
Wilbur	6-70	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
40C, 40D---------	0-11	18-27	1.20-1.45	2.0-6.0	0.07-0.12	4.5-6.5	Low----------	0.28	2-1	8	.5-2
Wilderness	11-22	25-35	1.30-1.50	0.6-2.0	0.03-0.10	4.5-6.0	Low----------	0.28			
	22-37	20-35	1.70-2.00	0.06-0.2	---	4.5-5.0	Low----------	0.28			
	37-60	40-70	1.50-1.70	0.2-0.6	---	4.5-5.5	Moderate-----	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--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	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				
10A---------- Ashton	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
11A---------- Auxvasse	D	Rare--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High-----	High.
12B, 12C, 12D, 13E---------- Caneyville	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Moderate.
14A---------- Carr	B	Frequent	Very brief	Dec-May	>6.0	---	---	>60	---	Low------	Low------	Low.
15B, 15C, 15D----- Crider	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
16B, 16C, 17C----- Delassus	C	None--------	---	---	2.0-3.0	Perched	Nov-May	>48	Hard	Moderate	High-----	High.
18*. Dumps												
19A---------- Elsah	B	Frequent----	Very brief	Dec-May	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
20C, 20D---------- Fourche	B	None--------	---	---	1.5-3.0	Perched	Nov-May	>60	---	Moderate	Moderate	Moderate.
21E---------- Gasconade	D	None--------	---	---	>6.0	---	---	7-20	Hard	Moderate	High-----	Low.
22E---------- Goss	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
23A---------- Haymond	B	Frequent----	Very brief	Jan-May	>6.0	---	---	>60	---	Moderate	Low------	Low.
24B, 24C, 24D----- Hildebrecht	C	None--------	---	---	2.0-2.5	Perched	Nov-May	>60	---	Moderate	Moderate	High.
25F---------- Irondale	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	High.
26B, 26C---------- Jonca	C	None--------	---	---	2.0-3.0	Perched	Nov-May	>60	---	Moderate	Moderate	High.
27C---------- Knobtop	C	None--------	---	---	2.0-3.0	Perched	Nov-May	20-40	Hard	Moderate	Moderate	High.

See footnote at end of table.

TABLE 16.--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				
28C, 28D---------- Lamotte	B	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Moderate	High.
29C---------- Lebanon	C	None--------	---	---	1.5-3.0	Perched	Dec-Mar	>60	---	Moderate	Moderate	High.
30C*:												
Lily----------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
Ramsey----------	D	None--------	---	---	>6.0	---	---	7-20	Hard	Moderate	Low------	Moderate.
31A---------- Loughboro	C	None--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moderate	High-----	High.
32A, 33A---------- Midco	A	Frequent----	Very brief	Nov-Apr	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
34B---------- Nicholson	C	None--------	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	Moderate	High-----	Moderate.
35*: Pits.												
Orthents.												
36C*. Psamments												
37E---------- Ramsey	D	None--------	---	---	>6.0	---	---	7-20	Hard	Moderate	Low------	Moderate.
38E---------- Syenite	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
39A---------- Wilbur	C	Frequent----	Brief-----	Oct-Jun	3.0-6.0	Apparent	Mar-Apr	>60	---	Moderate	Moderate	Moderate.
40C, 40D---------- Wilderness	C	None--------	---	---	1.0-2.0	Perched	Dec-Mar	>60	---	Moderate	Low------	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Ashton	Fine-silty, mixed, mesic Mollic Hapludalfs
Auxvasse	Fine, montmorillonitic, mesic Aeric Albaqualfs
Caneyville	Fine, mixed, mesic Typic Hapludalfs
Carr	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Delassus	Fine-loamy, mixed, mesic Typic Fragiudults
Elsah	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Fourche	Fine-silty, mixed, mesic Glossic Paleudalfs
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Hildebrecht	Fine-silty, mixed, mesic Typic Fragiudalfs
Irondale	Loamy-skeletal, mixed, mesic Typic Hapludults
Jonca	Fine-loamy, mixed, mesic Typic Fragiudalfs
Knobtop	Fine-silty, mixed, mesic Aquic Hapludults
Lamotte	Fine-loamy, mixed, mesic Ultic Hapludalfs
Lebanon	Fine, mixed, mesic Typic Fragiudalfs
Lily	Fine-loamy, siliceous, mesic Typic Hapludults
Loughboro	Fine, montmorillonitic, mesic Aeric Glossaqualfs
Midco	Loamy-skeletal, siliceous, nonacid, mesic Typic Udifluvents
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Orthents	Loamy-skeletal and clayey-skeletal, mesic Typic Udorthents
Psamments	Carbonatic, mesic Typic Udipsamments
Ramsey	Loamy, siliceous, mesic Lithic Dystrochrepts
Syenite	Fine-loamy, mixed, mesic Typic Hapludults
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Wilderness	Loamy-skeletal, siliceous, mesic Typic Fragiudalfs

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