SOIL SURVEY OF

New Madrid County, Missouri

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Missouri Agricultural Experiment Station

COMPLIMENTS OF YOUR CONGRESSMAN

Bill D Burlison

TENTH DISTRICT, MISSOURI

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. 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 who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1968–72. Soil names and descriptions were approved in 1973. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1972. This survey was made cooperatively by the Soil Conservation Service and the Missouri Agricultural Experiment Station. It is part of the technical assistance furnished to the New Madrid County Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of New Madrid County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the woodland groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Recreation."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about the soils in the section "Formation and Classification of Soils."

Newcomers in the area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication.

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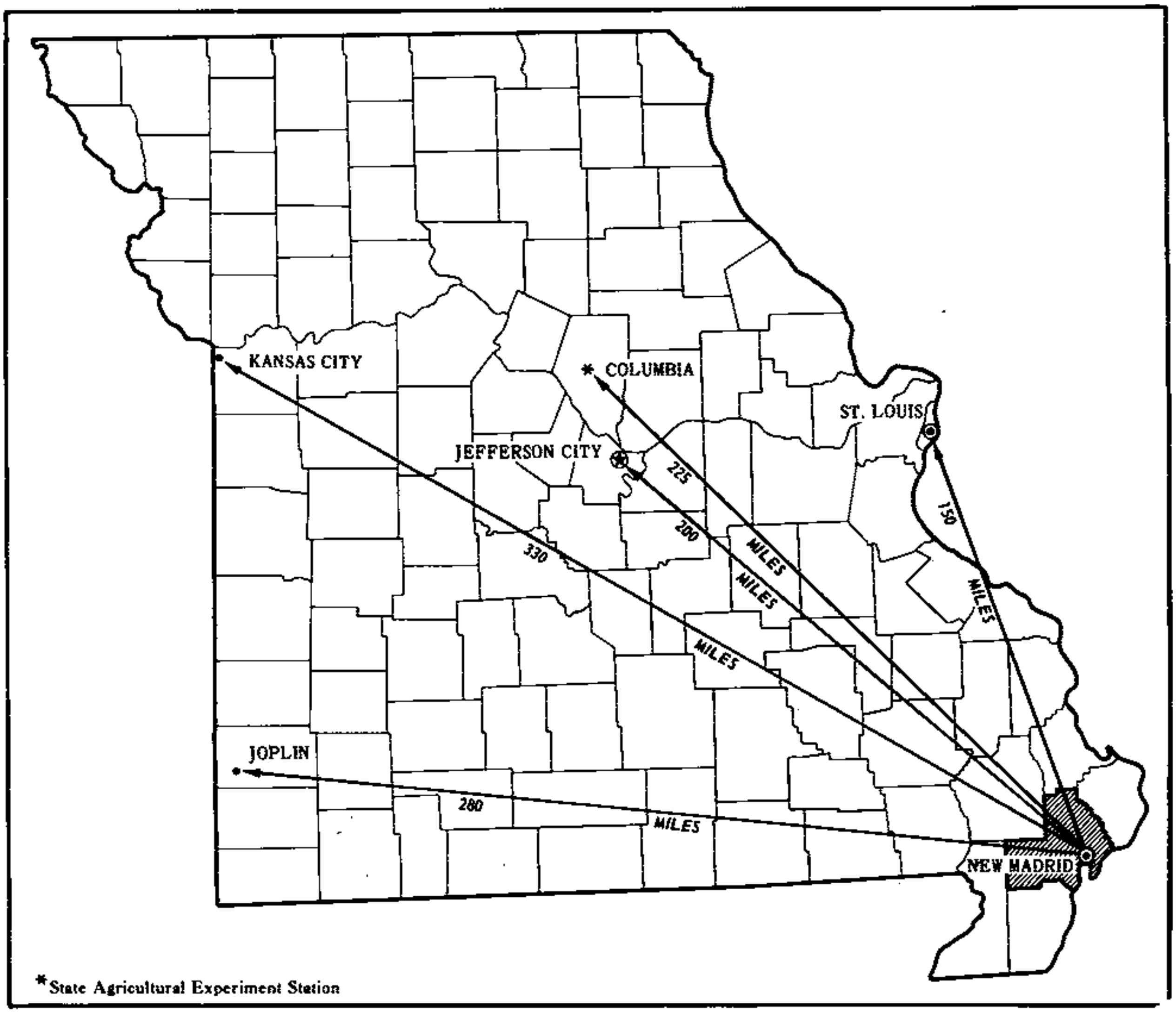
Issued August 1977

Summary of Tables



Location of New Madrid County in Missouri.

SOIL SURVEY OF NEW MADRID COUNTY, MISSOURI

By Burton L. Brown, Soil Scientist, Soil Conservation Service

Fieldwork by Burton L. Brown, Phil D. Gurley, Kees W. Vandermeer, Frederick E. Horn, and M. C. Wilbur, Soil Conservation Service

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

NEW MADRID COUNTY is in the southeastern part of Missouri near the center of the delta part of the State. It covers an area of 680 square miles, or 434,560 acres. It is irregularly shaped and has a maximum length of about 33 miles and a maximum width of about 35 miles. The city of New Madrid is the county seat. In 1970, the population of the county was 23,420.

The Mississippi River forms nearly 40 miles of meandering boundary between New Madrid County and the States of Kentucky and Tennessee on the east. The Mississippi and Ohio Rivers have deposited alluvium throughout the county. The relief is nearly level.

The county is characterized by fertile soils and intensive farming. A large supply of ground water is available for farming, irrigation, and municipal and industrial uses. Most soils contain moderate to large amounts of plant nutrients. Eighty-two percent of the county is used for crops (*14*).[1] The main crops are soybeans, corn, cotton, and wheat.

The rainfall is more than is needed for most crops but is distributed unevenly during the year. In many areas drainage is needed in winter and spring to dispose of excess water. Wetness is the major concern in farming these soils. Supplemental irrigation is beneficial to most crops in summer when the water supply is limited.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in New Madrid County, where they are located, and how they can be used. The soil scientists went into the county knowing they were likely to find many soils they had already seen and perhaps some they had not. They observed landforms, changes in elevation, old stream channels, native plants or crops, the texture of soils, and many other facts about the soils. They dug many holes to expose 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 that has not been changed much by leaching or by the action of plant roots.

[1] Italic numbers in parentheses refer to Literature Cited, p. 68.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. Bosket and Sharkey, for example, are the names of two soil series. Canalou, Farrenburg, Gideon, Lilbourn, and Sikeston are all names of soil series that were first mapped in New Madrid County. They were named after a town near where they were mapped and described. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Crevasse sand, 0 to 3 percent slopes, is one of several phases within the Crevasse series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

In most areas surveyed there are places where the soil material is so disturbed, rocky, or severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called miscellaneous areas and are given descriptive names. Borrow pits is a miscellaneous area in New Madrid County.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the survey area. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations, but in different patterns.

A map showing soil associations is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning on a watershed, a wooded tract, or a wildlife area or for broad planning of recreation facilities, community developments, and such engineering works as transportation corridors. It is not a suitable map for detailed planning for management of a farm or field or for selecting a site for a road or building or other structure, because the soils within an association ordinarily vary in slopes, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey area are described on the pages that follow.

1. *Sharkey-Alligator association*

Poorly drained, nearly level soils that are clayey; in broad, slack water areas

This soil association (fig. 1) consists of broad basins and former channels of the Mississippi and Ohio Rivers. The main areas of this association are along the flood plain of Little River and in St. Johns Basin. A few sloughs, bayous, lakes, and potholes are scattered throughout the association. The clayey sediment was deposited by still water in backswamp areas. The soils of this association are described as gumbo soils. They are at the lowest elevation in the county. When wet, these soils are sticky and plastic, and when dry, they crack.

This association makes up 28 percent of the county. About 79 percent of the association consists of Sharkey soils and 16 percent of Alligator soils. The rest is made up of Commerce, Cairo, Gideon, and Roellen soils.

Sharkey soils are poorly drained and are in the lowest areas of the association. Their surface layer typically is very dark gray clay 6 inches thick, and their subsoil is dark-gray and gray, neutral clay about 38 inches thick. The underlying material is gray clay.

Alligator soils are in slightly higher areas than Sharkey soils and are along the edge of the association. They have a surface layer of very dark grayish-brown clay 5 inches thick and a subsoil of gray and dark-gray, strongly acid clay 59 inches thick. The underlying material is olive-gray silty clay.

Commerce, Cairo, Gideon, and Roellen soils are in small areas along the fringes of the association. These soils, except for the Cairo soils, are at a higher elevation than the major soils of this association. The Cairo soils are in old channels and depressions.

Most of this association is used for soybeans, and a far less extensive acreage is used for cotton, grain, sorghum, pasture, rice, wheat, and corn. Several hundred acres are wooded and are mainly in oak, cottonwood, and cypress.

The available water capacity is moderate to high. Although wet during much of the year, the soils occasionally lack an adequate supply of water for crops during part of the growing season. Only a small part of the acreage is irrigated. Wetness is the major problem in managing these soils, and good drainage is essential for the growing of field crops. Landforming is widely used to eliminate the potholes and provide effective, uniform drainage. Drainage ditches extend to all parts of the association.

Only isolated homesteads are in this association because the soils are occasionally flooded and are not suitable for septic tank filter fields, foundations, and other related uses.

2. *Wardell-Lilbourn-Dundee association*

Poorly drained and somewhat poorly drained, nearly level soils that are mostly loamy; on natural levees

This soil association (fig. 2) is in scattered low areas of natural levees that formed between braided streams that once flowed through the county. Many tracts appear as islands on the landscape in the western and northern parts of the county. The soils formed in the

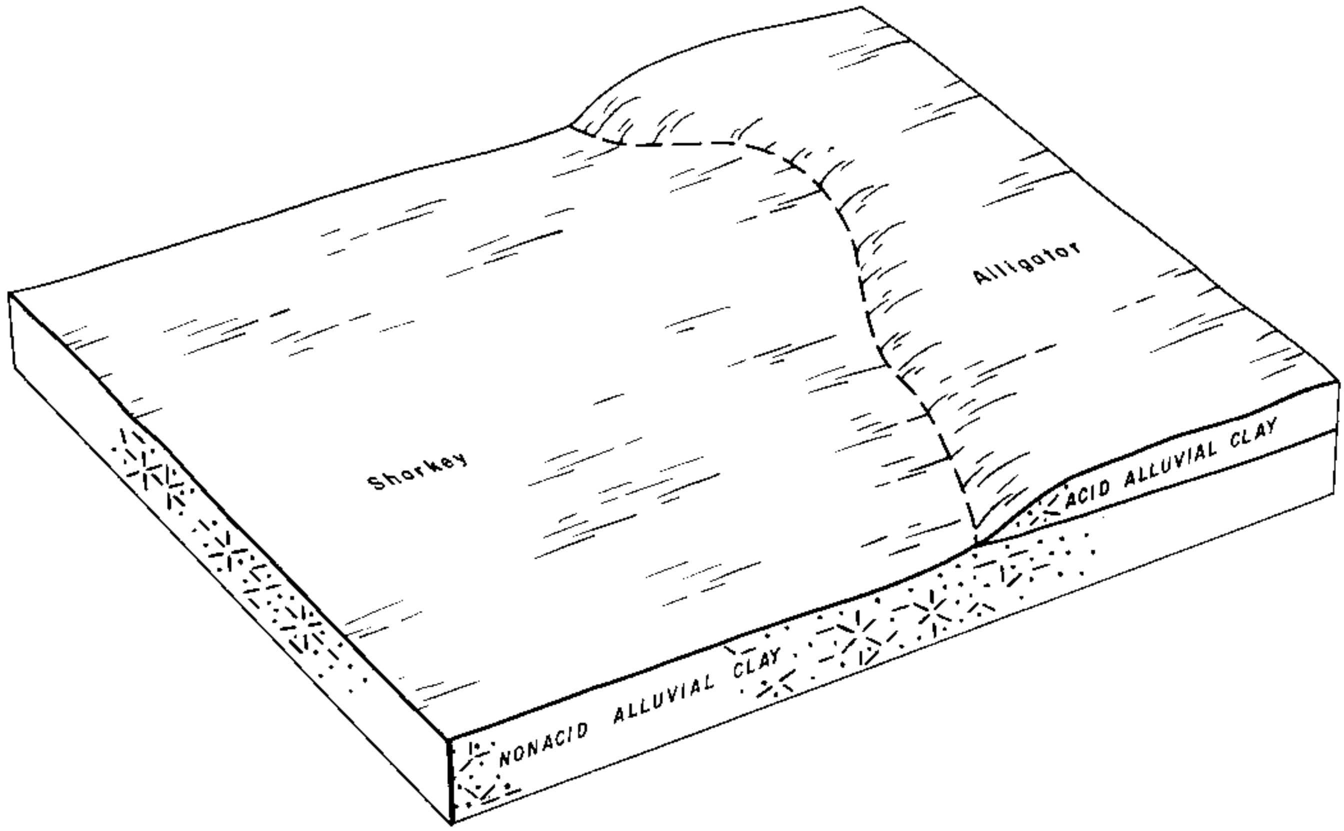


Figure 1.—Typical pattern of soils in association 1.

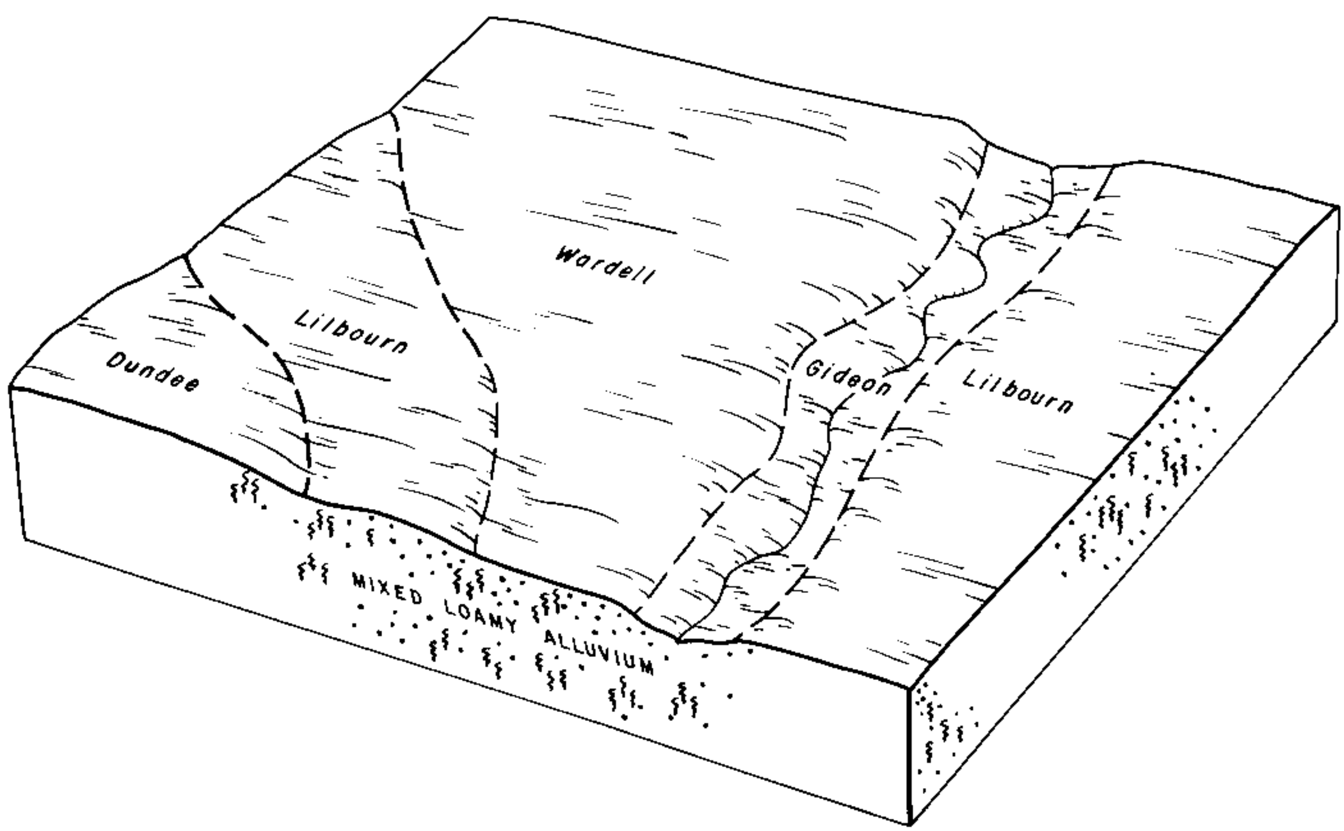


Figure 2.—Typical pattern of soils in association 2.

loamy sediment mostly deposited by the Mississippi River. Relief is nearly level, but there are a few shallow channels.

This association makes up 14 percent of the county. About 35 percent of the association consists of Wardell soils, 33 percent of Lilbourn soils, and 13 percent of Dundee soils. The rest is made up of Gideon, Sharkey, Canalou, and Crevasse soils.

Wardell soils are in the lowest places and are poorly drained. They have a surface layer of very dark grayish brown loam 8 inches thick and a subsoil of light brownish gray sandy clay loam about 31 inches thick. The underlying material consists of loamy sand and sandy clay loam in shades of gray.

Lilbourn soils are somewhat poorly drained. They formed in loamy alluvium at a slightly higher elevation than the Wardell soils. They have a surface layer of brown and dark grayish-brown fine sandy loam about 15 inches thick. Below this a grayish-brown fine sandy loam 22 inches thick. Next is a subsoil of grayish-brown heavy loam that is 15 inches thick and part of a buried soil. Below this are stratified layers of dark yellowish-brown sandy loam, grayish-brown very fine sandy loam, and dark yellowish-brown sand.

Dundee soils are at the highest elevation and somewhat poorly drained. They are considered as remnants of an older landscape. Except for the surface layer, these soils are less sandy than Wardell or Lilbourn soils. They have a surface layer of dark grayish-brown silt loam about 8 inches thick and a subsoil of grayish-brown and dark grayish-brown silty clay loam about 50 inches thick. Below this is dark grayish-brown or dark-gray silty clay loam.

Gideon and Sharkey soils are poorly drained, are at a low elevation, and occupy old braided channels. Canalou and Crevasse soils are sandier, better drained, and at a higher elevation than the other soils in this association.

This association is used for cotton, soybeans, corn, and wheat; only a small acreage is in grain sorghum and pasture. The soils have moderate to high available water capacity. They are acid, and lime is needed for most crops. A fluctuating water table affects the internal drainage of the soils, but flooding is not generally a problem. Landforming is a well suited practice and is widely used to provide uniform drainage and facilitate row irrigation. Double cropping is practiced extensively and the cropping system includes wheat followed by a late crop of soybeans. Blowing is a slight concern in managing the Lilbourn soils.

3. *Gideon-Sharkey-Sikeston association*

Poorly drained, nearly level soils that are loamy and clayey

This soil association has a landscape formed by the braided channels of the Mississippi River. The soils (fig. 3) originally were ponded, and the water table

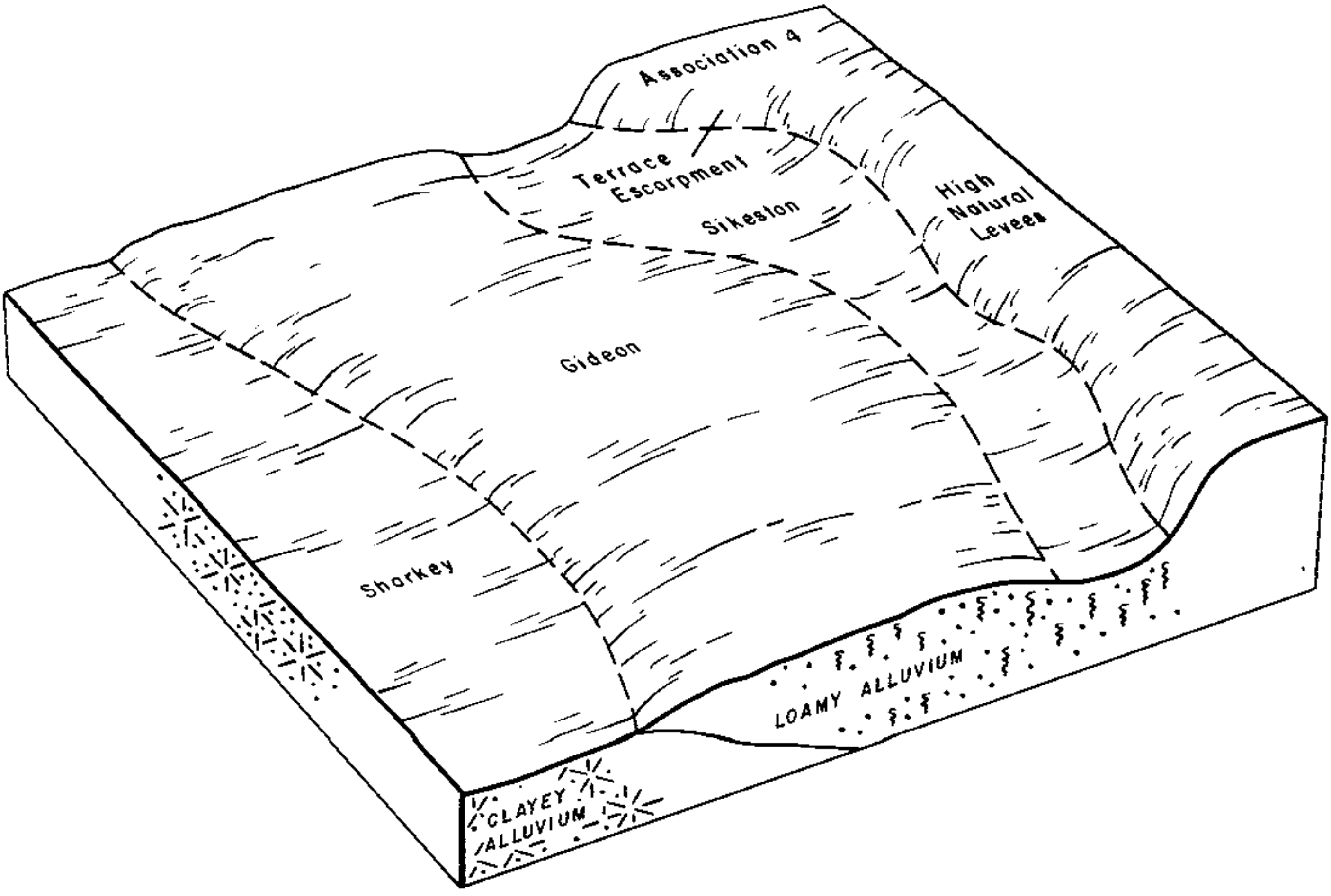


Figure 3.—Typical pattern of soils in association 3.

was near the surface for several months. The loamy sediment was deposited mainly by the Mississippi River, but there is evidence near the channels of the Castor and Little Rivers that they were also sources of alluvium. After this area was abandoned by the Mississippi River, other streams have mixed silt and clays with the original sediment. In some areas organic matter accumulated in swampy stagnant pools, and consequently the present soils are dark colored.

This association makes up 26 percent of the county. About 64 percent of the association is Gideon soils, 13 percent is Sharkey soils and 9 percent is Sikeston soils. The rest is made up of Roellen, Cooter, Wardell, Lilbourn, and Cairo soils and the ditches and spoils of the Little River drainage system.

Gideon soils formed in loamy sediment at a low elevation or in channel-like positions. They have a surface layer of very dark grayish-brown loam about 9 inches thick. Below this, to a depth of 70 inches or more, is gray, dark-gray, very dark gray, and olive-gray clay loam and sandy clay loam.

Sharkey soils formed in clayey alluvium in the lowest swales or channels. They typically have a surface layer of very dark gray clay about 6 inches thick and a subsoil of dark-gray or gray clay about 38 inches thick. Below this is gray clay.

Sikeston soils formed in dark-colored loamy and sandy sediment in depressions and ponded areas. These areas typically are adjacent to the escarpments of high natural levees. The surface layer of these soils is 42 inches thick. In the upper 12 inches, it is very dark gray sandy clay loam, and in the lower 30 inches, it is black clay loam. The next layer is dark grayish brown sandy clay loam about 8 inches thick. Beneath this is thinly stratified alluvium of dark grayish-brown sandy loam and dark reddish-brown loamy sand.

Roellen soils are poorly drained and formed in dark clayey sediment at a low elevation. Cooter and Cairo soils are also at a low elevation. Wardell and Lilbourn are at a slightly higher elevation than any of the other soils in this association.

The major crops are soybeans, corn, and cotton. Some wheat and grain sorghum are grown, and there are only a few small fields of pasture and trees. The organic-matter content and fertility of these soils are above the average for the county. The soils have high to moderate available water capacity. Wetness is the main problem in managing these soils. In their natural state, these soils are in low areas where runoff accumulates and the water table fluctuates near the surface. Presently, improved drainage extends to all areas and, except after unusually heavy rains, adequately disposes of runoff. Landforming is extensively used to provide effective uniform drainage and to facilitate row irrigation.

4. *Bosket-Broseley-Dubbs association*

Well drained, nearly level to strongly sloping soils that formed in loamy and sandy alluvium; on old natural levees

This association (fig. 4) consists of high terraces or

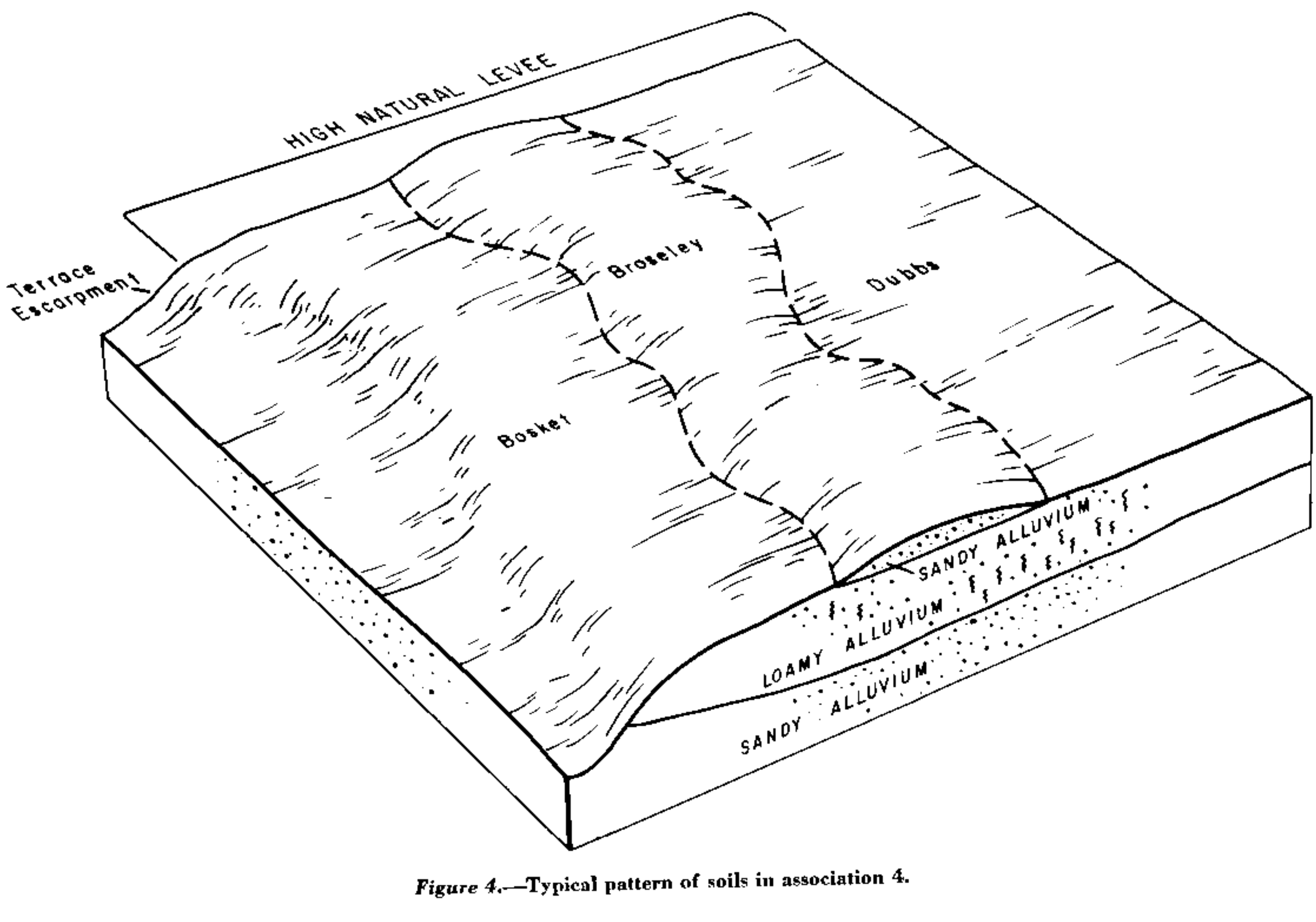


***Figure 4.*—Typical pattern of soils in association 4.**

natural levees. Most areas are nearly level, but a few are gently sloping or undulating. The edge of this association is marked by an abrupt escarpment that is gently sloping to strongly sloping. Most if not all the soil material was derived from an alluvial fan of the Ohio River. In this association are some of the older and better drained soils of the county.

This association makes up 12 percent of the county. About 54 percent of the association consists of Bosket soils, 19 percent of Broseley soils, and 15 percent of Dubbs soils. The rest is made up of Farrenburg, Tiptonville, Dundee, and other soils.

The Bosket soils are nearly level to gently sloping and well drained. They formed in loamy alluvium. They have a surface layer of very dark grayish-brown and dark yellowish-brown fine sandy loam about 25 inches thick and a subsoil of dark-brown clay loam and sandy clay loam about 33 inches thick. Below this is yellowish-brown fine sandy loam.

The Broseley soils are nearly level to strongly sloping. They are typically at a higher elevation than Bosket or Dubbs soils. They have a surface layer of dark-brown and brown loamy fine sand 37 inches thick and a subsoil of dark-brown and dark yellowish-brown fine sandy loam 26 inches thick. The underlying material is yellowish-brown loamy fine sand.

The Dubbs soils are nearly level and well drained, and they formed in loamy sediment. They have a surface layer of dark grayish-brown and brown silt loam about 11 inches thick and a subsoil of brown silty clay loam in the upper 27 inches and yellowish-brown silt loam and loam in the lower 28 inches. They are underlain by brown sand.

Farrenburg and Dundee soils are in lower areas than the other soils of this association.

Cotton, corn, soybeans, wheat, and pasture crops are commonly grown. The soils have high or moderate available water capacity. They are acid, and good management includes the applications of lime for most crops. There are no major limitations for crop production to the use of the Bosket and Dubbs soils, but the Broseley soils are slightly to moderately droughty. Soil blowing is a hazard on unprotected soils. Runoff accumulates in depressed areas, but the areas are generally free of water within 24 hours. Landforming and irrigation are used extensively to increase crop yields. Erosion is a severe hazard on the strongly sloping Broseley soils, which are along the terrace escarpments.

This association is favored for building sites, roads, and urban development as well as for crops.

5. *Crevasse-Canalou association*

Excessively drained, nearly level to strongly sloping soils that are sandy and moderately well drained, nearly level soils that have sandy and loamy layers

This soil association (fig. 5) is on hummocky sand

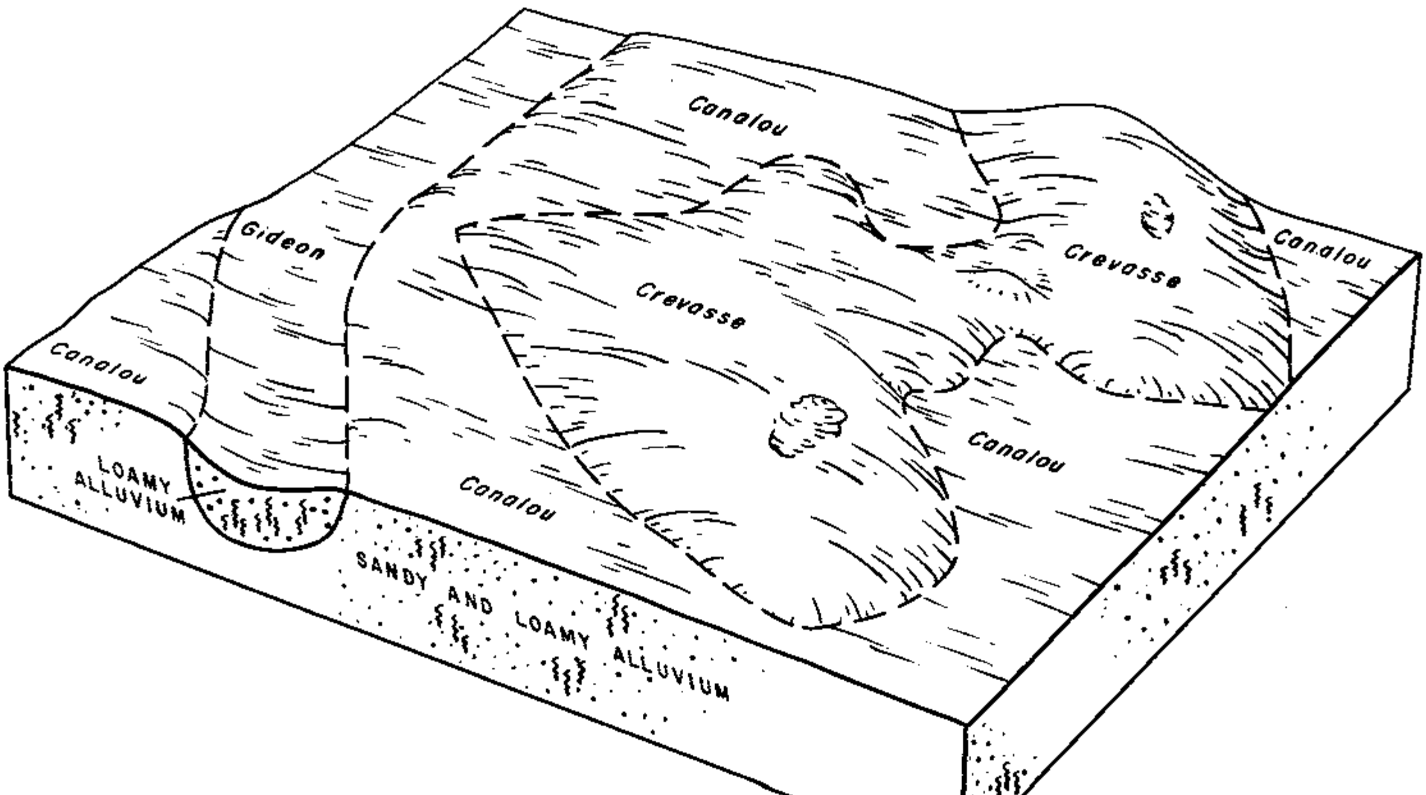


Figure 5.—Typical pattern of soils in association 5.

ridges and the surrounding sandy plain in the northeastern part of the county. The sandy parent material derived from the old Ohio River alluvial fan, and the present topography was shaped as the Mississippi River later cut across and reworked the alluvial deposits. The maximum height of these deposits, on "sandhills," is 30 to 40 feet above the nearby lowlands. Sloping areas commonly have blowouts or spots where soil blowing has taken place.

Other areas in the association, where the setting and origin are different, include the "washout" area north of the town of Lilbourn. That area was created when the Mississippi River flowed across Sikeston Ridge and deposited a sandy alluvial fan. Some Crevasse soils adjacent to the Mississippi River formed in recent sandy deposits. These soils are subject to flooding, scouring, and deposition.

This association makes up only 3 percent of the county. About 54 percent of the association consists of Crevasse soils, 23 percent of Canalou soils, and 15 percent of Gideon soils. The rest is made up of Roellen and Sikeston soils and Sandy alluvial land.

Crevasse soils are on the flood plain along the Mississippi River channel and are nearly level and excessively drained. They have a surface layer of dark grayish-brown material about 5 inches thick and are underlain by grayish-brown and dark grayish-brown sand that extends to a depth of 60 inches or more. On natural levees, these soils have a surface layer of dark-brown loamy sand about 9 inches thick and are underlain by dark yellowish-brown and yellowish-brown sand.

Canalou soils are moderately well drained and nearly level. They are in slightly lower areas than Crevasse soils but in higher areas than Gideon soils. They have a surface layer of dark-brown loamy sand 13 inches thick. The subsoil is about 35 inches thick. In the upper 7 inches it is dark yellowish-brown loamy sand, in the middle 20 inches it is dark-brown sandy loam, and in the lower 8 inches it is grayish-brown sandy loam. The underlying material is dark yellowish-brown sand.

Gideon, Roellen, and Sikeston soils are poorly drained and are in the shallow channels and swales that dissect the association. Sandy alluvial land is made up of the sand bars and towheads within the Mississippi River channel and the deposits adjoining the bank.

The major crops are wheat, soybeans, cotton, and corn. Some watermelons, grain sorghum, and trees are also grown, and some rye is grown as a cover crop. These soils are moderately suited to poorly suited to row crops. They have low available water capacity. They absorb most of the rainfall. Drainage is needed only for the channels and swales between the sand ridges. The organic-matter content is low. Soil blowing is a problem, especially in undulating areas. Crevasse soils are best suited to small grain, watermelons, and selected perennial plants. Irrigation is needed for most row crops if yields are to be profitable. Sprinkler irrigation should be used; furrow irrigation or flood irrigation should not be used because these soils have rapid infiltration. Landforming is not needed for either drainage or irrigation and is detrimental to the soils.

6. *Dundee-Forestdale association*

Somewhat poorly drained and poorly drained, nearly level soils that formed in loamy and clayey alluvium; on old natural levees

This soil association (fig. 6) consists of natural levees and the adjacent lowlands. In some areas, there are old channels and depressions where runoff is slow to ponded. It is nearly level in most areas, but slight ridges and swales occur in some areas. The soil material of the natural levees was derived from a former Ohio River alluvial fan, and the adjacent lowlands are made up of more recent truncations and deposits by the Mississippi River. Soils of this association are at a lower elevation and are wetter than those of soil association 4.

This association makes up 10 percent of the county. About 71 percent of the association consists of Dundee soils and 21 percent of Forestdale soils. The rest is made up mostly of Commerce, Dubbs, and Farrenburg soils.

Dundee soils are somewhat poorly drained and are in higher areas than Forestdale soils. Their surface layer typically is dark grayish-brown silt loam about 8 inches thick, and their subsoil is grayish-brown and dark grayish-brown silty clay loam about 50 inches thick. The underlying material is dark-gray and dark grayish-brown silty clay loam.

Forestdale soils are poorly drained and are in depressions and low areas mostly on Sikeston Ridge. They have a surface layer of dark grayish-brown silt loam or silty clay loam 8 inches thick and a subsoil of grayish-brown clay and clay loam about 38 inches thick. The underlying material is brown sandy clay loam and sandy loam.

Dubbs and Farrenburg soils are in higher areas than either Dundee or Forestdale soils. Commerce soils are in shallow channels and swales and are surrounded by Dundee soils in the southern part of the county.

The major crops are cotton, corn, soybeans, and pasture grasses. The soils are acid and lime is needed if optimum yields of most crops are to be obtained. They have high to moderate available water capacity. Wetness is the major management problem for most uses. Runoff is slow except on Forestdale soils in some depressional areas where it is very slow to ponded. Ditches are not adequate to provide surface drainage in some parts of the association, but the surface drainage is adequate in most areas for the successful growth of the common crops. Landforming and irrigation are not used extensively. Permanent pasture is grown in some of the wettest areas, and a few woodlots remain.

7. *Commerce-Caruthersville association*

Somewhat poorly drained and moderately well drained, nearly level soils that formed in loamy alluvium; on the flood plain of the Mississippi River

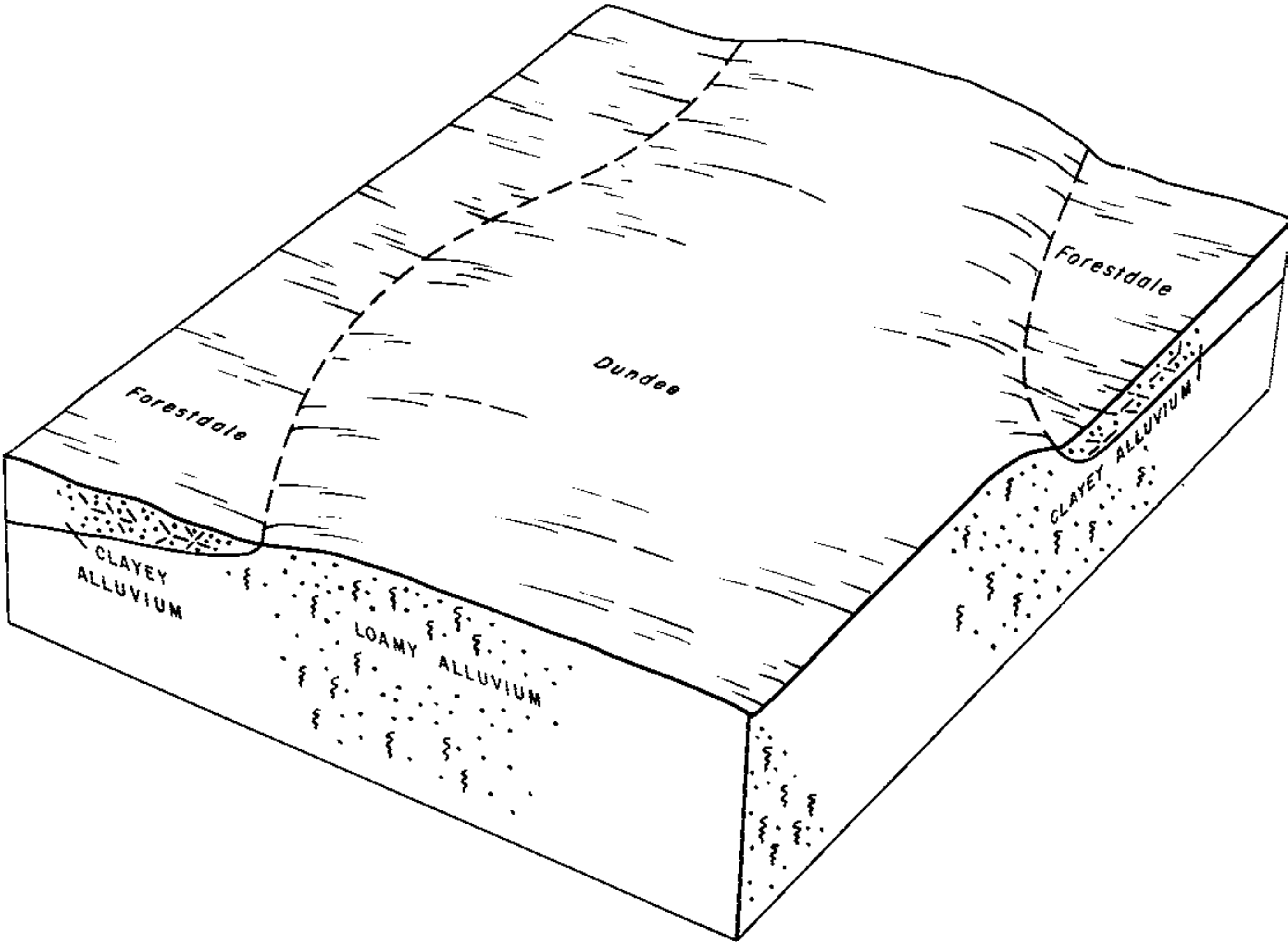


Figure 6.—**Typical pattern of soils in association 6.**

This soil association (fig. 7) is a 1- to 3-mile-wide strip bordering the channel of the Mississippi River. The soil material is stratified loamy alluvium recently deposited by the river. Most of the area is subject to flooding and to deposition of alluvium, but a small part is protected from flooding by a levee.

This association makes up 7 percent of the county. About 62 percent of the association consists of Commerce soils and 12 percent of Caruthersville soils. The rest is made up of Bowdre, Sharkey, Crevasse, and Sikeston soils and a fairly large acreage of levees, borrow pits, lakes, chutes, and bayous.

The Commerce soils are somewhat poorly drained and are commonly in the lowest areas farthest from the river channel. They have a surface layer of dark grayish-brown silty clay loam about 8 inches thick. Below this are 52 inches of stratified layers of grayish-brown silt loam, very fine sandy loam, and dark grayish-brown silty clay loam.

The Caruthersville soils are moderately well drained and are in high areas bordering the river bank. They are slightly convex. They have a surface layer of dark grayish-brown very fine sandy loam 10 inches thick. They are underlain by 55 inches of grayish brown and dark brown very fine sandy loam and grayish-brown silt loam. Below this is pale-brown loamy fine sand.

Bowdre, Sharkey, and Sikeston are in lower areas than Commerce and Caruthersville soils. Crevasse soils have a sandy or loamy surface layer and are in high areas near the river channel.

These soils are fertile and are used mostly for growing soybeans. The acreage of corn, cotton, and small grain is small because of the risk of flooding in spring. In most years the flooding occurs late in winter, in spring, or early in summer. The soils have high and very high available water capacity. Drainage ditches, landforming, and irrigation have limited use, but some artificial drainage is needed on the Commerce soils. The largest acreage of trees is in this association, and several thousand acres have been planted to cottonwoods. There are few homesteads because of the flooding.

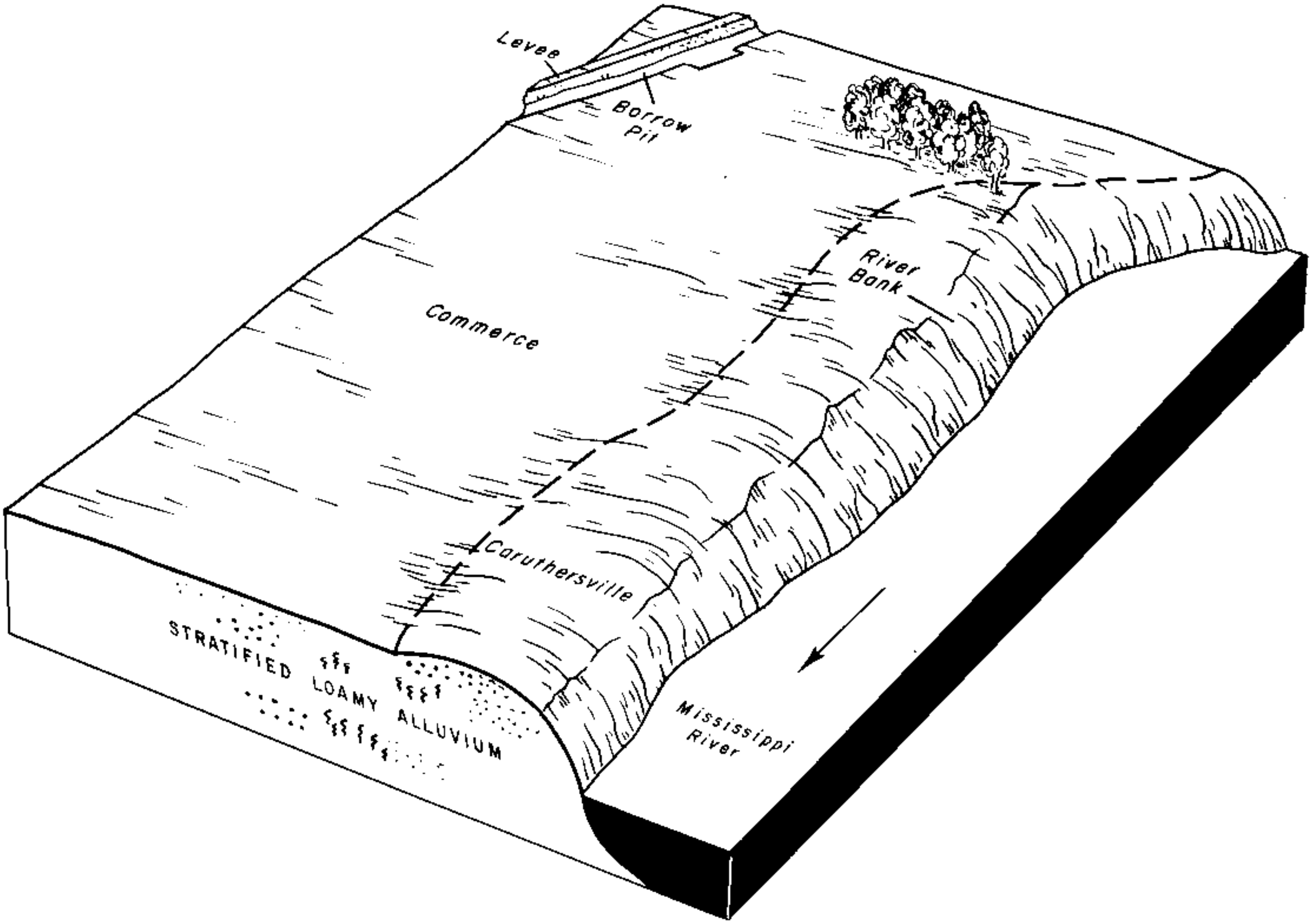


Figure 7.—Typical pattern of soils in association 7.

Descriptions of the Soils

This section describes the soil series and mapping units in New Madrid County. Each soil series is described in detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to 60 inches or more. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Borrow pits, for example, does not belong to a soil series, but is nevertheless listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is the symbol that identifies the mapping unit on the detailed soil map at the back of this survey. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page for the description of each capability unit can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*18*).

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil name	Area	Extent
	Acres	*Percent*
Acadia silt loam, loamy substratum	3,520	0.8
Alligator silty clay loam	10,510	2.4
Alligator clay	8,610	2.0
Borrow pits	2,220	.5
Bosket fine sandy loam, 0 to 1 percent slopes	28,690	6.6
Bosket fine sandy loam, 1 to 5 percent slopes	800	.2
Bowdre silty clay	1,630	.4
Broseley loamy fine sand, 0 to 2 percent slopes	9,100	2.1
Broseley soils, 8 to 12 percent slopes	810	.2
Cairo clay	1,820	.4
Canalou loamy sand	3,740	.9
Caruthersville very fine sandy loam	3,590	.8
Commerce silt loam	5,520	1.3
Commerce silty clay loam	14,500	3.3
Cooter silty clay	3,440	.8
Crevasse sand, 0 to 3 percent slopes	1,390	.3
Crevasse loamy sand, 0 to 4 percent slopes	3,790	.9
Crevasse loamy sand, 4 to 12 percent slopes	580	.1
Crevasse loam, overwash, 0 to 3 percent slopes	1,190	.3
Dubbs silt loam	8,210	1.9
Dundee silt loam	34,680	8.0
Dundee silty clay loam	2,530	.6
Farrenburg fine sandy loam	6,380	1.4
Forestdale silt loam	6,710	1.5
Forestdale silty clay loam	2,400	.5
Gideon loam	62,770	14.4
Gideon clay loam	15,820	3.6
Lilbourn fine sandy loam	21,930	5.1
Roellen clay	7,060	1.6
Sandy alluvial land	740	.2
Sharkey silty clay loam	82,640	19.1
Sharkey clay	37,200	8.6
Sikeston sandy clay loam	10,860	2.5
Tiptonville fine sandy loam	1,020	.2
Wardell loam	22,390	5.2
Levees	1,700	.4
Little River drainage ditches and spoil banks	3,020	.7
Water areas	1,050	.2
Total	434,560	100.0

Acadia Series

The Acadia series consists of deep, nearly level, somewhat poorly drained soils in depressions, or old channels of natural levees. These soils formed in silty and clayey alluvium over loamy sediment. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam about 5 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is firm and is about 32 inches thick. The upper part of it is reddish-brown silty clay, the middle part is dark grayish-brown clay, and the lower part is grayish-brown clay loam. The underlying material, to a depth of 60 inches or more, is brown sandy loam.

Permeability is very slow. The available water capacity is moderate, natural fertility is medium, and organic-matter content is low. Runoff is slow.

Severe wetness greatly affects the use of Acadia soils. Most areas of these soils are used for row crops, but there is some pasture and a few small woodlots.

Representative profile of Acadia silt loam, loamy substratum, in a small wooded area 60 feet east of U.S. Highway 61, 1,300 feet north and 175 feet east of the southwest corner of sec. 28, T. 24 N., R. 13 E., about 2 miles northeast of Kewanee.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; few, fine, black concretions; many fine roots; common fine pores; neutral; abrupt, smooth boundary.

A2—5 to 7 inches, brown (10YR 5/3) silt loam; weak, fine, granular and weak, very fine, subangular blocky structure; friable; many fine roots; few fine pores; common, fine, black concretions; medium acid; abrupt, smooth boundary.

B1—7 to 9 inches, brown (7.5YR 5/4) silty clay loam; moderate, very fine, subangular blocky structure; friable; many fine roots; common fine pores; common, fine, black concretions; strongly acid; clear, wavy boundary.

B21t—9 to 14 inches, reddish-brown (5YR 5/3) silty clay; few, fine, distinct, red (10R 5/8) and few, medium, faint, reddish-gray (5YR 5/2) mottles; moderate, fine and very fine, subangular blocky structure; firm, plastic; many fine roots; few fine pores; thick clay films on surfaces of most peds; very strongly acid; clear, smooth boundary.

B22tg—14 to 28 inches, dark grayish-brown (10YR 4/2) clay; many, coarse, faint, grayish-brown (10YR 5/2) mottles; common, fine, prominent, red (2.5YR 5/8) mottles; and common, medium, distinct, yellowish-red (5YR 5/8) mottles; moderate, fine, subangular blocky structure; firm; common fine roots; few fine pores; thick patchy clay films; very strongly acid; clear, smooth boundary.

B3tg—28 to 39 inches, grayish-brown (2.5Y 5/2) heavy clay loam; common, medium, faint, dark grayish-brown (10YR 4/2) mottles and common, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, fine, subangular blocky structure; weak, thin, platy strata in lower part; firm; few fine roots; clay films on vertical ped surfaces; strongly acid; gradual boundary.

IIC—39 to 60 inches, brown (10YR 4/3) sandy loam; massive; faint stratification; friable; slightly acid.

The solum in Acadia soils ranges from 30 to 60 inches in thickness. The A1 or Ap horizon is dark grayish brown, very dark grayish brown, or brown. The A2 and B1 horizons have been mixed into the Ap horizon in most cultivated fields. Depth to the B21t horizon ranges from 7 to 12 inches. The B21t horizon is brown, yellowish brown, strong brown, or reddish brown. The B22t horizon ranges from clay to silty clay. The B3 horizon is clay loam and sandy clay loam to loam. The C horizon is commonly mottled with shades of gray and ranges from sandy loam to loamy sand. Reaction in the surface layer varies with amount of lime added, but the B horizon is extremely acid to strongly acid and the C horizon is strongly acid to mildly alkaline.

Acadia soils in New Madrid County are redder in the upper part of the Bt horizon and are more loamy in the C horizon than is defined as the range for the series. These differences do not alter the usefulness or behavior of the soils.

Acadia soils are on the same landscape and formed in the same kind of material as Forestdale soils. They have soil drainage that is similar to that of the Dundee soils. They are redder than the Dundee and Forestdale soils.

Ad—Acadia silt loam, loamy substratum. This soil is in flat to slightly convex depressions or old channels on natural levees. This soil is between the poorly drained soils in the low depressions and the well drained soils in higher areas. It has a slope of 0 to 1 percent. The areas are irregularly shaped and several hundred acres in size.

Included with this soil in mapping is a small area of Forestdale silt loam. Also included are a few sandy spots.

Wetness is a major problem in managing this soil because permeability is very slow, runoff is slow, and position on the landscape is low. Drainage outlets are lacking. Accumulation of runoff is common in places. This soil has a seasonal perched water table in winter and spring.

The subsoil is very acid and limits the growth of roots on most field crops and is not suitable for seedbeds if exposed at the surface, unless it is adequately managed. Large amounts of lime are needed. Most crop yields could be significantly increased by removing excess water, proper liming and fertilizing, and maintaining tilth.

This soil is suited to rice. Most areas are cleared and used for row crops, and some are used for pasture. This soil is only moderately suited to farming. Capability unit IIIw–2.

Alligator Series

The Alligator series consists of deep, poorly drained, nearly level soils on slack-water flats. These soils formed in clayey alluvium that was acid in the upper 40 inches. The native vegetation was oak, hickory, cypress, and some tupelo gum.

In a representative profile the surface layer is very dark grayish-brown clay 5 inches thick. The subsoil is gray and dark-gray, firm, plastic clay about 59 inches thick. The underlying material is olive-gray silty clay.

Permeability is very slow. The available water capacity is moderate, natural fertility is medium, and organic-matter content is low. Runoff is very slow.

Severe wetness is a management problem that, along with clay properties, restricts the use of Alligator soils. Most areas of these soils are used for row crops, but a few areas remain wooded.

Representative profile of Alligator clay, in a cultivated field 75 feet south and 600 feet west of northeast corner of sec. 3, T. 23 N., R. 5 E., about 6 miles northeast of the town of New Madrid.

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) clay; weak, medium, subangular blocky structure; firm, very sticky, plastic; few fine roots and dark-colored concretions; neutral; abrupt, smooth boundary.

B1g—5 to 13 inches, gray (5Y 5/1) clay; common, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; firm, very sticky, plastic; few fine roots, pores, and dark-colored concretions; strongly acid; clear, smooth boundary.

B21g—13 to 40 inches, dark-gray (10YR 4/1) clay; few, fine, distinct, dark-brown (10YR 3/3) mottles; weak, medium, subangular blocky structure; firm, very sticky, plastic; common fine roots; few fine pores and dark-colored concretions; few slickensides; very strongly acid; clear, smooth boundary.

B22g—40 to 49 inches, dark-gray (5Y 4/1) clay; moderate, medium and fine, subangular blocky structure; firm, very sticky, plastic; a few fine roots, pores, and dark-colored concretions; medium acid; abrupt, smooth boundary.

B23g—49 to 64 inches, dark-gray (5Y 4/1) clay; common, fine, faint, pale-olive (5Y 6/3) mottles; weak, fine, subangular blocky structure; firm, very sticky, plastic; few fine pores and dark-colored concretions; few fine roots in upper part; neutral; clear, smooth boundary.

Cg—64 to 79 inches, olive-gray (5Y 5/2) silty clay; many, fine, faint, pale-olive (5Y 6/4) and common, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, fine, subangular blocky structure to massive; firm, plastic; common fine pores and channels; common, fine, dark-colored concretions; mildly alkaline.

The Ap horizon is very dark grayish-brown or dark grayish-brown clay or silty clay loam 4 to 9 inches thick. The B21g horizon is 60 to 85 percent clay and ranges from very strongly acid to mildly alkaline.

Alligator soils formed in clayey material similar to that in which Forestdale and Sharkey soils formed. They contain more clay than Forestdale soils, and they do not have loamy texture in the lower part of the subsoil. Alligator soils have more acid B21g and B22g horizons than Sharkey soils.

Ag—Alligator silty clay loam. This soil is nearly level and near slack-water areas, but it is not subject to flooding. Areas of this soil are commonly several hundred acres in size, irregularly shaped, and generally elongated in a north-south direction. This soil has a profile similar to the one described as representative of the series, but the surface layer is overwash consisting of medium to heavy silty clay loam.

Included with this soil in mapping are a few hundred acres, bordering the Dundee soils, of a soil that has a silty surface layer over a light-gray silty subsurface layer that tongues into the gray, clayey subsoil. Also included is a small acreage where sand spots are on the surface and there are a few wet potholes. These areas make up about 5 percent of the total acreage.

Removing excess surface water is the major management concern. Moderate difficulty in tillage and poor aeration are associated problems. Severe production problems develop in fields where landforming is practiced. The subsoil is very strongly acid, and a large amount of lime is needed for crop production.

This soil is moderately suited to farming, if excess water is removed. Wheat and all row crops common to the area are grown. Capability unit IIIw–14.

At—Alligator clay. This soil is in broad, smooth, slack-water areas. It is in depressed areas and is subject to occasional flooding. The areas range from 10 to 1,000 acres or more in size. Slopes are 0 to 1 percent. This soil has the profile described as representative of the series.

Included with this soil in mapping are Sharkey soils in slight depressions or swales. These areas make up about 10 percent of the acreage. A few spots where soils are sandy on the surface and a few wet potholes are included.

The main concern of management is removing excess surface water. The surface layer of firm, plastic, and clayey material that has a high shrink-swell potential hinders cultivation and seedbed preparation. This soil is strongly acid and very strongly acid, and consequently, lime is needed, especially in fields where landforming is practiced. When dry, this soil contracts and cracks; when wet, it expands and the cracks are sealed.

Maintaining tilth and preparing a seedbed are difficult because of the high content and kind of clay in the soil. This soil can be cultivated only within a narrow range of moisture content.

Most of the acreage is used for row crops. Most of the acreage is in soybeans, but some is in grain sorghum, cotton, and trees. This soil is poorly suited to deep-rooted crops, such as alfalfa, fruit trees, corn, and small grain, but it is suited to rice. It also provides excellent sites for ponds or other water impoundments. Capability unit IIIw–14.

Borrow Pits

Bp—Borrow pits. These areas consist of excavated pits that are about 10 to more than 100 acres in size and from which 3 to 10 feet of soil material has been removed, mainly for constructing highways and levees. Most areas are long, narrow bands that parallel the highways and levees (fig. 8).

Figure 8.—**Borrow pits generally parallel highways and levees, and most hold runoff from adjacent areas.**

The soil material consists mostly of loamy and sandy sediments that are mainly gray and grayish brown but are commonly mottled in shades of brown. It is stratified with soil material that shows the original rock structure of the parent alluvium. Included in mapping are some small, permanent water holes.

Permeability commonly ranges from moderately slow to rapid. The available water capacity is low to high, even within short distances. Fertility is low to high, and the organic-matter content is low or very low.

Most Borrow pits are occasionally flooded or intermittently hold water that runs off adjacent areas. The vegetation consists of cottonwood, willow, cattails, and other native plants. Cottonwood, sycamore, sweetgum, and pine have been planted in some places. Some pits that dry up in spring or early in summer are used for row crops. Other areas are pastured. Capability unit Vw.

Bosket Series

The Bosket series consists of deep, well-drained, nearly level to gently sloping soils on natural levees. These soils formed in loamy alluvium. The native vegetation was mixed hardwoods and an understory of vines and canes.

In a representative profile (fig. 9) the surface layer

Figure 9.—**Bosket fine sandy loam, 0 to 1 percent slopes, has little color contrast between the layers, which are uniformly brown.**

is fine sandy loam about 25 inches thick. The upper 9 inches is a very dark grayish-brown plow layer, and the lower 16 inches is dark yellowish brown. The subsoil is dark brown and friable and is about 33 inches thick. It is clay loam in the upper part and sandy clay loam in the lower part. The underlying material, to a depth of 78 inches, is yellowish-brown fine sandy loam that has bands of brown fine sand and dark-brown fine sandy loam.

Permeability is moderate. The available water capacity is high, natural fertility is medium, and organic-matter content is moderately low. Runoff is slow and medium.

Bosket soils are well suited to farming. Nearly all of these soils are cultivated.

Representative profile of Bosket fine sandy loam, 0 to 1 percent slopes, in a cultivated field 40 feet south and 1,060 feet west of northeast corner of sec. 32, T. 24 N., R. 14 E., about 6 miles north of New Madrid.

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak, fine and medium, granular structure; friable; slightly compacted in the lower 3 inches; common fine roots; few fine pores; neutral; abrupt, wavy boundary.

A3—9 to 25 inches, dark yellowish-brown (10YR 4/4) fine sandy loam, pale brown (10YR 6/3) dry; weak, fine, subangular blocky or weak, coarse, granular structure; very friable; common fine roots; abundant fine pores; slightly acid, wavy boundary.

B21t—25 to 48 inches, dark-brown (7.5YR 4/4) light clay loam; weak, medium, subangular blocky structure; friable; patchy clay films on peds and very dark-brown coatings in pores and channels; few fine roots; common fine pores; medium acid; clear, wavy boundary.

B22t—48 to 58 inches, dark-brown (7.5YR 4/4) light sandy clay loam; few, faint, brown mottles; weak, medium and fine, subangular blocky structure; friable; clay flows and bridgings along channels; few, thin, patchy clay films on peds; few fine roots; common fine pores; strongly acid; abrupt, wavy boundary.

C&B—58 to 78 inches, yellowish-brown (10YR 5/4) fine sandy loam that is massive and very friable, and brown (10YR 5/3) fine sand that is single grained and loose; about 30 percent lamellae or bands of dark-brown (7.5YR 3/2) fine sandy loam; weak, medium, subangular blocky structure; friable; bands 2 to 4 inches thick in the upper part and wavy, discontinuous lamellae ⅛ inch to ½ inch thick in the lower part; few fine pores; slightly acid.

The solum in Bosket soils ranges from 30 inches to more than 50 inches in thickness. The A horizon is slightly acid to moderately alkaline, and the B2t and C&B horizons are slightly acid to strongly acid throughout. The A horizon ranges from 7 inches to about 30 inches in thickness but averages about 24 inches thick or somewhat thicker than is typical of the series. The Ap horizon is dark brown, very dark brown, and very dark grayish brown; in the lower part it is a compacted tillage pan that in many places has platy structure. The A3 horizon ranges from 0 to 24 inches in thickness, but is commonly 10 to 20 inches thick. The B2 horizon is dark brown or dark yellowish brown, and it ranges from clay loam or sandy clay loam to heavy sandy loam or, in places, loam.

Bosket soils formed in materials similar to those in which Farrenburg soils formed, but they are not light brownish-gray in the subsoil. They contain less sand and commonly have a thinner A horizon than Broseley soils.

BtA—Bosket fine sandy loam, 0 to 1 percent slopes. This soil is on the broad, nearly level tops of natural levees. Most of the acreage is on Sikeston Ridge. Most areas range from several hundred acres to several thousand acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Broseley soils. These areas make up about 10 percent of the acreage. Some of these areas are indicated on the map by the symbol for a sand spot. Also included are small areas of somewhat poorly drained Dundee soils in potholes and depressions. Also included is dark reddish-brown clay loam in a few, long, narrow depressions.

No major problems are associated with the use of this soil for farming. Landforming is widely used to prepare fields for irrigation. Drainage is a slight temporary problem in areas where water accumulates, runoff is slow, and there are no drainage outlets. Cover crops, strip crops, or the direction and the means of tillage can reduce or eliminate soil blowing. A moderate to large amount of lime is needed.

Areas of this soil were among the first in the county to be cleared and cultivated, and most of the acreage is still under continuous cultivation. The major crops are corn, cotton, soybeans, and wheat. This soil is also suited to alfalfa and other deep-rooted crops. This soil is a favorite building site, and urban expansion is taking place near Sikeston and New Madrid. Capability unit I–1.

BtB—Bosket fine sandy loam, 1 to 5 percent slopes. This soil is on natural levees that are near to or part of the terrace escarpment. Areas of this soil are small and in some places narrow and elongated. They wind along the edge of natural levees. This soil has a profile similar to the one described as representative of the series, but the surface layer is commonly only 8 to 14 inches thick.

Included with this soil in mapping are soils that have more sand throughout. These soils are on the low part of the slope and make up about 15 percent of the acreage.

The main hazard in cultivated areas is erosion. Runoff is medium. Where surface water accumulates and flows across this soil, erosion is prevalent. The eroded spots have low organic-matter content.

The main concern of management is controlling erosion, but fertility is also a concern. Because the soil is acid, a large amount of lime is needed.

Most of this soil is cleared and used for crops. This soil is well suited to corn, cotton, soybeans, and wheat, and it is also suited to alfalfa, pasture, and trees. Capability unit IIe–1.

Bowdre Series

The Bowdre series consists of somewhat poorly drained, nearly level soils of the flood plain. These soils formed in alluvium deposited by the Mississippi River. More than half the acreage is protected by levees. The native vegetation is mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown silty clay 5 inches thick. The subsoil is very dark grayish-brown, firm, plastic silty clay 9 inches thick. The underlying material, to a depth of 60 inches or more, is dark grayish-brown very fine sandy loam and silt loam.

Permeability is slow in the upper part of the profile and moderate in the lower part. The available water capacity and natural fertility are high. The organic-matter content is commonly moderate. Runoff is slow.

Bowdre soils are well suited to farming if excess water is removed. Most areas are used for row crops; a few areas remain wooded.

Representative profile of Bowdre silty clay, in a cultivated field about 1,300 feet east and 490 feet north of the southwest corner of sec. 18, T. 23 N., 16 E., about 8 miles east of New Madrid.

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; strong, fine, granular and very fine, subangular blocky structure; firm, plastic; many fine roots; neutral; clear, smooth boundary.

B2—5 to 14 inches, very dark grayish-brown (10YR 3/2) silty clay, grayish brown (10YR 5/2) dry; moderate, fine, subangular blocky structure; weak platy structure is evident in places, compacted; firm, plastic; common fine roots; mildy alkaline; clear, smooth boundary.

IIC1—14 to 23 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; common, fine, faint, grayish-brown mottles and few, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, fine, granular structure; friable; common fine pores and worm casts; common fine roots; moderately alkaline; clear, smooth boundary.

IIC2—23 to 52 inches, dark grayish-brown (10YR 4/2) very fine sandy loam that has thin lenses of silt loam and fine sandy loam; many, fine, faint, grayish-brown mottles and common, distinct, dark-brown (7.5YR 4/4) mottles; stratified with weak, coarse, platy material; massive; very friable; few fine roots and pores; moderately alkaline; clear, smooth boundary.

IIC3—52 to 78 inches, stratified dark grayish-brown (10YR 4/2) silt loam and very fine sandy loam; common, fine, faint, gray mottles and common, medium, distinct, dark-brown (7.5YR 4/4) mottles; moderate thin strata, massive; friable; few dark-colored concretions; few fine pores; moderately alkaline.

Depth to the IIC horizon ranges from 12 to 20 inches. The A horizon is medium acid to mildly alkaline, and the other horizons are slightly acid to moderately alkaline. The A horizon is very dark grayish brown, very dark gray, or very dark brown. The B horizon ranges from silty clay or light clay to heavy silty clay loam. The IIC2 and IIC3 horizons range from dark grayish brown to light brownish gray. The IIC3 horizon is silt loam to loamy fine sand. In some places the C horizon has a few thin strata of silty clay loam.

Bowdre soils are near Caruthersville soils, and they are somewhat similar to Cooter soils. Bowdre soils have clayey A and B horizons, but the Caruthersville soils have very fine sandy loam throughout. The lower part of the solum of the Bowdre soils formed in loamy alluvium, and the Cooter soils formed in sandy alluvium.

Bw—Bowdre silty clay. This soil is on the Mississippi River flood plain. It commonly is on the low ridges in very gently undulating to nearly level areas. The slope is 0 to 1 percent. Most areas are elongated, narrow, and 20 to several hundred acres in size.

Included with this soil in mapping are areas of Caruthersville soils. These areas make up about 10 percent of the acreage. Also included are a few small spots of Crevasse soils.

Wetness is a slight to moderate problem. It is caused by slow surface runoff, slow permeability, and a clayey surface. Tillage is also a moderate concern because the surface layer is clayey. This soil is occasionally flooded unless it is protected by a levee. The main concern of management is removing excess surface water.

Most areas are used for soybeans and cotton. The growth of cottonwood trees in wooded areas is excellent. This soil is suited to alfalfa if excess surface water is removed and the soil is protected from flooding. Capability unit IIw-2.

Broseley Series

The Broseley series consists of deep, well-drained, nearly level to strongly sloping soils on natural levees. These soils formed in sandy alluvium. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark-brown and brown loamy fine sand about 37 inches thick. The subsoil is dark-brown and dark yellowish-brown fine sandy loam about 26 inches thick. The underlying material is yellowish-brown loamy fine sand that has thin bands of dark yellowish-brown fine sandy loam.

Permeability is moderately rapid. Available water capacity is moderate, natural fertility is medium, and organic-matter content is moderately low and low. Runoff is slow and medium.

The degree of limitation to the use of Broseley soils for farming is slight to moderate because the soils are droughty. Most areas are used for the common row crops and wheat.

Representative profile of Broseley loamy fine sand, 0 to 2 percent slopes, in a cultivated field, 400 feet west and 1,320 feet north of the southeast corner of sec. 27, T. 24 N., R. 14 E., about 1½ miles north of La Forge.

Ap—0 to 10 inches, dark-brown (10YR 3/3) loamy fine sand, light yellowish brown (10YR 6/4) dry; weak, fine, granular structure; very friable; many fine roots; compacted traffic pan in the lower 3 inches; medium acid; clear, smooth boundary.

A3—10 to 37 inches, brown (10YR 4/3) loamy fine sand; thin, 3- to 5-millimeter, dark-brown lamellae at depths between 12 and 16 inches; weak, medium, granular structure; very friable; common fine roots and pores; slightly acid; abrupt, wavy boundary.

B21t—37 to 50 inches, dark-brown (7.5YR 4/4) fine sandy loam; few, fine, distinct, grayish-brown (10YR 5/2) mottles; weak, fine, subangular blocky structure; friable; few fine roots and pores; very dark brown (10YR 3/3) organic and clay coatings on sand grains and clay bridgings between grains; medium acid; clear, smooth boundary.

B22t—50 to 57 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; many, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, fine, subangular blocky structure; friable; few fine roots and pores; clay bridgings between sand grains and dark coatings on a few peds; fine pores and channels; strongly acid; clear smooth boundary.

B23t—57 to 63 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; common, medium, faint brown mottles and dark-brown (7.5YR 3/2) coatings and bridgings; weak, fine, subangular blocky structure; friable; few fine pores; strongly acid; abrupt, smooth boundary.

C&B—63 to 75 inches, yellowish-brown (10YR 5/4) loamy fine sand; massive breaking to single grained; very friable; 25 percent lamellae and bands of dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, subangular blocky structure; friable; wavy lamellae 1/16 inch to ¾ inch thick; few fine pores; slightly acid.

The solum in Broseley soils ranges from 48 to 72 inches in thickness. The A horizon is 24 to 40 inches thick. The B horizon is brown, dark-brown, reddish-brown or yellowish-brown fine sandy loam, sandy clay loam, or clay loam. It is very strongly to slightly acid throughout.

Broseley soils are near Bosket and Farrenburg soils. Broseley soils have a sandier A horizon than those soils. They also lack light brownish-gray color which Farrenburg soils have.

ByA—Broseley loamy fine sand, 0 to 2 percent slopes. This soil is on natural levees. It is slightly higher than the adjoining soils and is commonly on a low ridge. The areas of this soil are small to several hundred acres in size, are mostly elongated and narrow, and border former water courses. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of Bosket soils, which make up 15 percent of the acreage. Areas of soils that are sandy throughout make up 5 percent, and gently sloping areas make up about 2 percent. Also included are a few spots where the surface layer is black and associated with artifacts. All these areas are commonly too small to map separately.

Slight to moderate droughtiness is the major limitation to the use of this soil for farming. Soil blowing is a hazard unless the soil is protected from drying winds in spring (fig. 10).

Deep-rooted cotton and wheat are well suited because these crops make better use of soil moisture than other crops. Corn and soybeans are not so well suited unless they are irrigated. Grain sorghum is well suited, but the soil is not used much for this crop. Capability unit IIs–1.

ByC—Broseley soils, 8 to 12 percent slopes. These soils are sloping and strongly sloping and are on breaks and escarpments of the natural levees. Areas are narrow, elongated, and follow the winding edge of the natural levees. On the upper part of the slopes are soils that are similar to Broseley loamy fine sand, 0 to 2 percent slopes and that make up about 25 percent of the unit. On the lower part of the slopes are generally eroded or truncated Broseley soils that make up about 50 percent of the unit.

The surface layer is loamy fine sand, fine sandy loam, sandy clay loam, or loamy sand. The subsoil is increasingly thinner downslope until it is only a few thin bands or lamellae of dark yellowish-brown fine sandy loam. Between and below the bands is yellowish-brown loamy fine sand. Included with this soil in mapping are areas of Bosket and Farrenburg soils. These soils make up about 25 percent of the unit.

Erosion is the major hazard, and some gullies have formed. The soils are also droughty, acid, and generally low in organic-matter content and medium in natural fertility.

Diversion terraces are used to intercept runoff, and landforming has been used in some areas. In landforming, the upper part of the slope is cut several feet, and that material is used to fill the lower part of the slope. The new soil material generally has a slope of only 3 to 5 percent.

Most areas are pastured or idle, but some areas are cropped and a small part is wooded. These soils are not well suited to cultivation. Even though extensively leveled, sheet and rill erosion of the slopes pollutes water and clogs ditches. Small grain and a few row crops can be grown safely in the less sloping areas if

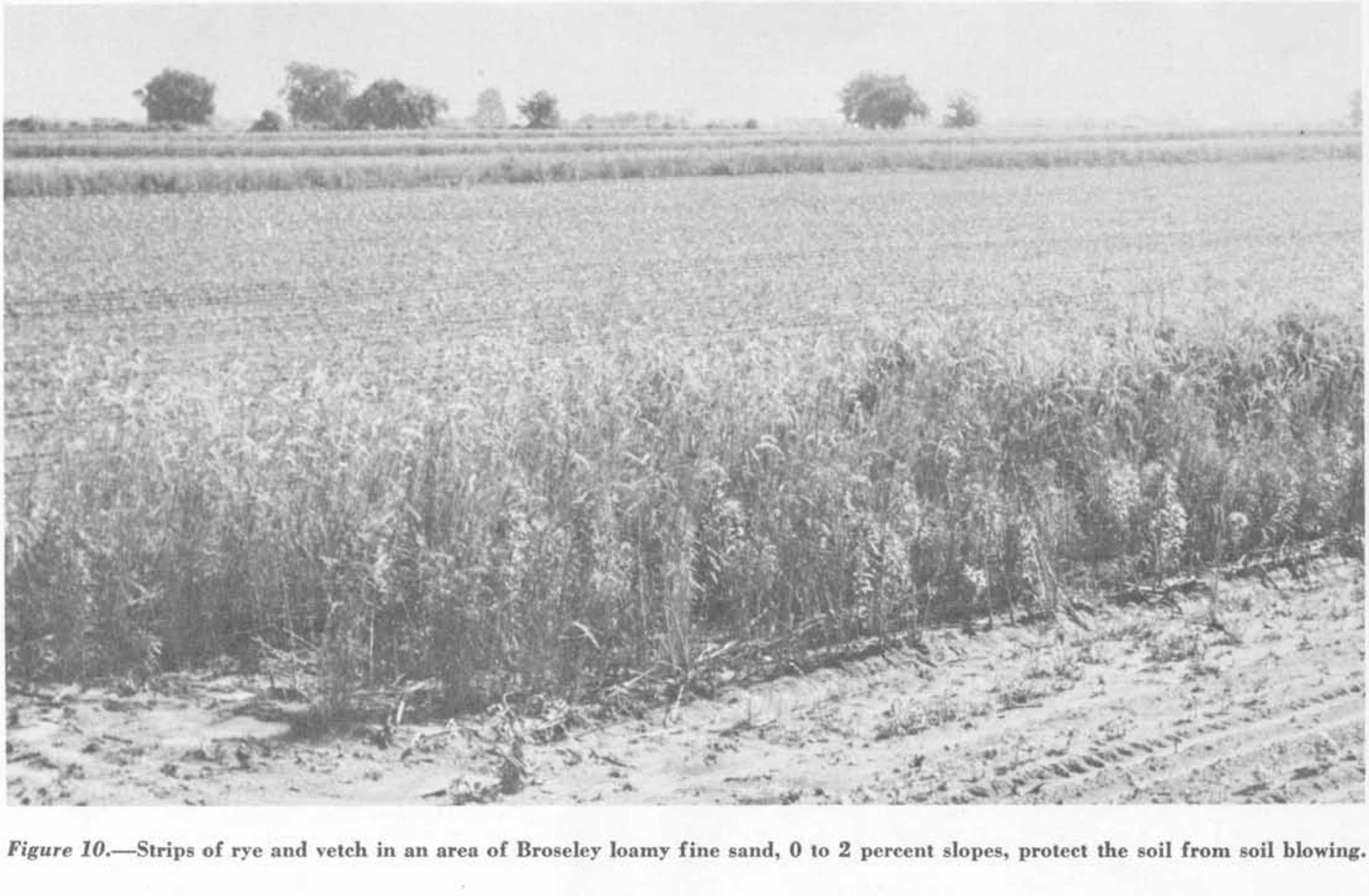


Figure 10.—**Strips of rye and vetch in an area of Broseley loamy fine sand, 0 to 2 percent slopes, protect the soil from soil blowing.**

the soils are protected from erosion. These soils are suited to grasses, alfalfa, orchards, woodland, and some kinds of wildlife habitat and recreation. Capability unit IVe–1.

Cairo Series

The Cairo series consists of deep, poorly drained, nearly level soils in old channels and depressions. These soils formed in slack-water clay and the underlying sandy alluvium. The native vegetation was cypress and water-tolerant hardwoods.

In a representative profile the surface layer is very dark gray clay about 16 inches thick. The subsoil is about 16 inches thick. The upper part of it is very firm clay, and the lower part is dark grayish-brown, friable sandy loam. The underlying material, to a depth of 60 inches or more, is dark grayish-brown loamy sand.

Permeability is very slow in the upper part and rapid in the lower part. The available water capacity is moderate. Natural fertility and the organic-matter content are high. Runoff is slow.

Cairo soils are suited to farming if excess water is removed, but crop failure caused by flooding is common. Most of these soils are used for farming, but a few are wooded.

Representative profile of Cairo clay, about 200 feet west and 20 feet north of the southeast corner of the NE¼NW¼ sec. 25, T. 24 N., R. 14 E., about 1½ miles north of Farrenburg.

Ap—0 to 5 inches, very dark gray (10YR 3/1) clay, very dark gray (10YR 4/1) dry; moderate, very fine, subangular blocky structure; firm; many fine roots; slightly acid; abrupt, smooth boundary.

A12—5 to 16 inches, very dark gray (N 3/6) or black (10YR 2/1) clay; common, medium, distinct, dark-brown (7.5YR 3/2) mottles; weak, medium, subangular blocky structure; firm, plastic; common fine roots; neutral; clear, wavy boundary.

B2g—16 to 27 inches, dark-gray (N 4/0) clay; common, medium, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium and fine, subangular blocky structure; very firm; plastic; some very dark gray streaks and coatings; few fine roots; neutral; clear, smooth boundary.

IIB3g—27 to 32 inches, dark grayish brown (2.5Y 4/2) sandy loam; few thin lenses of dark-gray silty clay loam or clay loam; common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, fine, subangular blocky structure to massive; friable; common fine roots; mildly alkaline; clear, wavy boundary.

IIC—32 to 60 inches, dark grayish-brown (2.5Y 4/2) loamy sand, wet; few thin lenses of dark-gray silty loam in upper part; weakly stratified; massive; nonsticky; mildly alkaline.

Cairo soils are slightly acid to mildly alkaline throughout. Depth to the IIC horizon ranges from 24 to 40 inches. The dark-colored A horizon is 10 to 24 inches thick. The IIC horizon is saturated by a water table most of the year.

Cairo soils formed in material similar to that in which Cooter soils formed, and they are in similar positions on the landscape. They differ from Cooter soils in having a subsoil of clay and sandy loam. They have a thicker surface layer than Sharkey soils and a sandy rather than clayey substratum.

Ca—Cairo clay. This soil is in depressions on slack-water flats that were once channels, shallow lakes, or swamps on the flood plain of the Mississippi River. The slope is 0 to 1 percent. Areas are 20 to several hundred acres in size. Included with this soil in mapping are areas of Cooter soils, which make up about 10 percent of the acreage.

Wetness is a severe problem and is caused by flooding very slow permeability, slow runoff, and a high water table. Because the surface layer is clayey, tillage is a moderate concern. The main concern in managing this soil is removing excess water.

Most of the cultivated acreage is in row crops, mainly soybeans. An estimated 15 percent remains wooded. Capability unit IIIw–14.

Canalou Series

The Canalou series consists of deep, moderately well drained, nearly level soils on natural levees. These soils formed in sandy and loamy alluvium that consists mostly of reworked material derived from an alluvial fan of the Ohio River. The native vegetation was mostly mixed hardwoods, but some areas were once prairies.

In a representative profile the surface layer is dark-brown loamy sand 13 inches thick. The subsoil is 35 inches thick. In the upper 7 inches it is very friable, dark yellowish-brown loamy sand; in the middle 20 inches it is very friable, dark-brown sandy loam; and in the lower 8 inches it is very friable grayish-brown sandy loam. The underlying material, to a depth of 60 inches or more, is dark yellowish-brown sand.

Permeability is rapid. The available water capacity is low, natural fertility is medium, and the organic-matter content is low. Runoff is slow, but most precipitation is absorbed by the soil.

Canalou soils are suited to farming, but droughtiness is a problem. Most areas are used for the common row crops and small grain.

Representative profile of Canalou loamy sand, about 100 feet west and 50 feet south of the northeast corner of sec. 22, T. 25 N., R. 14 E., about 5 miles southeast of the city of Sikeston across the road in front of Little Vine Church.

Ap—0 to 13 inches, dark-brown (10YR 3/3) loamy sand, pale brown (10YR 6/3) dry; weak, fine and medium, granular structure; very friable; common fine and very fine roots; few fine pores; very strongly acid; abrupt, wavy boundary.

B1—13 to 20 inches, dark yellowish-brown (10YR 4/4) loamy sand; common, medium, distinct, dark-brown (7.5YR 4/4) mottles and few, fine, faint, brown mottles; weak, medium, subangular blocky structure; very friable; common fine roots and pores; medium acid; clear, wavy boundary.

B21—20 to 40 inches, dark-brown (10YR 4/3) sandy loam; many, medium, distinct, grayish-brown (10YR 5/2) mottles and common, medium, faint, brown (10YR 5/3) mottles; weak, fine and medium, subangular blocky structure; very friable; few fine roots; common fine pores; few, fine and medium, dark-brown concretions; medium acid; clear, wavy boundary.

B22—40 to 48 inches, grayish-brown (10YR 5/2) sandy loam; many, medium, faint and distinct, strong-brown (7.5YR 5/6), brown (10YR 5/3), and gray (10YR 5/1) mottles; weak, medium, subangular blocky structure; very friable; few fine roots; common fine pores; strongly acid; abrupt, smooth boundary.

C—48 to 63 inches, dark yellowish-brown (10YR 4/4) sand; few, fine, distinct, grayish-brown (10YR 5/2) mottles; weakly stratified, single grained; loose; neutral.

The A horizon is dark-brown or very dark grayish-brown loamy sand. The B1 horizon is dark brown, brown, or dark yellowish brown and has faint or distinct, pale-brown to dark-brown mottles. The B horizon is slightly acid to strongly acid. The B2 horizon is sandy loam that is 8 to about 14 percent clay. The C horizon is medium acid to neutral.

Canalou soils are near Crevasse soils. They have a subsoil of sandy loam and grayish-brown or light grayish-brown mottles at a depth of less than 40 inches, but Crevasse soils are sandy throughout and are not mottled.

Cd—Canalou loamy sand. This soil is in broad areas bordering the sandhills in the northeastern part of the county. Areas of this soil are wide and slightly elongated and are about 20 to several hundred acres in size.

Included with this soil in mapping are small areas of excessively drained Crevasse soils, which make up about 15 percent of the unit.

This soil is subject to blowing and has only medium fertility. It is droughty.

Droughtiness is the major limitation for farming. The main concern of management is to conserve moisture or supply supplemental water and to maintain cover and fertility.

This soil is used for small grain and row crops. Capability unit IIIs-1.

Caruthersville Series

The Caruthersville series consists of deep, moderately well drained, nearly level soils on the flood plain along the Mississippi River. These soils formed in recently deposited loamy and sandy sediment. The native vegetation was cottonwood, willow, boxelder, red maple, and similar trees and shrubs and an understory of paw paw, vines, and canes.

In a representative profile the surface layer is dark grayish-brown very fine sandy loam about 10 inches thick. It is underlain by stratified grayish-brown and very fine sandy loam and dark grayish-brown silt loam to a depth of 55 inches. Below this is pale-brown loamy fine sand.

Permeability is moderate, and the available water capacity is very high. Natural fertility is high, and the organic-matter content is low. Runoff is slow.

Caruthersville soils are well suited to farming. The major limitation is occasional flooding in unprotected areas. Flooding commonly occurs late in winter or in spring. Most areas are used for row crops, but some areas are wooded.

Representative profile of Caruthersville very fine sandy loam, 100 feet west of the bank of the Mississippi River, 2,140 feet east and 1,320 feet south of northwest corner of the SW¼ sec. 36, T. 23 N., 15 E., about 7 miles east of New Madrid.

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; light brownish gray (10YR 6/2) dry; weak, fine, granular structure; friable; abundant fine roots; few mica flakes; mildly alkaline; clear, smooth boundary.

AC—6 to 10 inches, dark grayish-brown (10YR 4/2) very fine sandy loam; very weak, fine, granular structure; friable; common, fine roots; few worm casts and fine pores; few mica flakes; moderately alkaline, slight effervescence; clear, smooth boundary.

C1—10 to 18 inches, grayish-brown (10YR 5/2) very fine sandy loam; massive; faint bedding planes; very friable; common fine roots; few fine pores and worm casts; common mica flakes; moderately alkaline, slight effervescence; clear, smooth boundary.

C2—18 to 28 inches, thinly stratified dark grayish-brown (10YR 4/2) silt loam and brown (10YR 5/3) very fine sandy loam; few, faint, dark-brown and gray mottles; thin, platy bedding planes, massive between bedding planes; friable; common fine roots and pores; few worm casts; common mica flakes; moderately alkaline, slight effervescence; clear, smooth boundary.

C3—28 to 55 inches, grayish-brown (10YR 5/2) very fine sandy loam; few, fine, distinct, dark-brown mottles; massive; weakly stratified bedding planes; very friable; few fine roots and pores; common mica flakes; moderately alkaline, strong effervescence; clear, smooth boundary.

IIC4—55 to 70 inches, pale-brown (10YR 6/3) loamy fine sand; massive but breaking to single grained; very friable to loose; moderately alkaline, slight effervescence.

The A horizon is slightly acid to moderately alkaline, and the C horizon is mildly or moderately alkaline and effervescent throughout. The A horizon ranges from brown or dark grayish brown to very dark grayish brown. There is no AC horizon in some places. The C horizon ranges from grayish-brown or dark grayish-brown to brown and is very fine sandy loam, silt loam, or loam. The IIC horizon is grayish-brown, pale-brown, or brown loamy fine sand and is commonly fine sand at a depth of more than 40 inches. Stratification generally becomes more prominent as depth increases. Distinct graying occurs at a depth of more than 36 inches in some places.

Caruthersville soils are on the same landscape with Bowdre and Commerce soils. They lack a silty clay surface layer, which the Bowdre soils have. They do not have strata of silty clay loam, which Commerce soils have.

Ce—Caruthersville very fine sandy loam. This soil is nearly level and is in high places on the flood plain adjoining the channel of the Mississippi River. The slope is 0 to 1 percent. Areas of this soil are commonly several hundred acres in size, but a few areas are smaller.

Included with this soil in mapping are areas of a soil that is similar to this Caruthersville soil, but it has a sandy subsoil between depths of 20 and 40 inches. These areas make up about 10 percent of the acreage. Also included are areas where the surface layer is silty clay loam and loamy sand. These areas make up less than 10 percent of the acreage.

This soil is well suited to farming, but most of the acreage is subject to flooding by the Mississippi River. The main concern in management is maintaining good fertility and tilth. Most of the cultivated acreage is used continuously for row crops. Capability unit I-1.

Commerce Series

The Commerce series consists of deep, somewhat poorly drained, nearly level soils on the flood plain of the Mississippi River, and most areas are subject to flooding. These soils formed in recently deposited, loamy alluvium that shows stratification of texture and color. The native vegetation was mixed hardwood.

In a representative profile the surface layer is dark grayish-brown silty clay loam about 8 inches thick.

Below this is 52 inches of stratified grayish-brown friable silt loam, and very fine sandy loam and dark grayish-brown friable to firm silty clay loam.

Permeability is moderately slow, and the available water capacity is high. Natural fertility is high, and organic-matter content is generally low. Runoff is slow.

Commerce soils are well suited to farming. They are slightly to moderately wet; improved surface drainage is needed in the lower areas, swales, and potholes. Row crops are grown continuously.

Representative profile of Commerce silty clay loam, in a cultivated field protected by a levee, about 850 feet west and 660 feet south of the northeast corner of sec. 35, T. 23 N., R. 15 E., about 6½ miles east of New Madrid.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silty clay loam; moderate, fine, granular structure; friable; many fine roots; few worm casts; neutral; abrupt, smooth boundary.

C1—8 to 23 inches, thinly stratified grayish-brown (2.5Y 5/2) silt loam and very fine sandy loam and about 20 percent dark grayish-brown (10YR 4/2) silty clay loam; common, medium, distinct mottles of brown (7.5YR 4/4) and yellowish-red (5YR 4/6); thin, platy bedding planes; massive to weak, fine, subangular blocky structure between bedding planes; friable; common fine roots and pores; few mica flakes; moderately alkaline; clear, smooth boundary.

C2—23 to 31 inches, stratified dark grayish-brown (2.5Y 4/2) light silty clay loam; common, medium, faint, grayish-brown mottles; weak, fine, subangular blocky structure; friable; few fine roots and pores; few, fine, dark-brown soft masses; mildly alkaline; clear, smooth boundary.

C3—31 to 37 inches, grayish-brown (10YR 5/2) silt loam; common, fine and medium, dark reddish-brown (2.5YR 3/4) and yellowish-red (5YR 4/6) mottles; weak, fine, subangular blocky structure; friable; few fine roots; common fine pores; mildly alkaline; clear, smooth boundary.

C4—37 to 52 inches, dark grayish-brown (10YR 4/2) silty clay loam; common, medium, distinct, brown (7.5YR 4/4) mottles and few, medium, faint, grayish-brown mottles; moderate, medium, subangular blocky structure; firm; common fine pores; few, fine, dark-brown soft masses; mildly alkaline; clear, smooth boundary.

C5—52 to 60 inches, grayish-brown (10YR 5/2) silt loam; common, fine, distinct, strong-brown (7.5YR 4/6) mottles; faint bedding planes, massive; friable; few fine pores; mildly alkaline.

Commerce soils are slightly acid to moderately alkaline throughout. In some places there is slight effervescence, generally in the upper part. The A horizon is dark grayish brown and grayish brown and, in areas where the surface layer is silty clay loam, very dark grayish brown or dark gray. Silty clay is in some profiles at a depth of more than 30 inches.

These Commerce soils have more stratification in the upper part of the profile than is within the range defined for the series. This difference does not alter use and behavior of the soils.

Commerce soils are on the same landscape with Bowdre and Caruthersville soils, and they border the Sharkey soils. They lack a surface layer of silty clay, which Bowdre soils have. Commerce soils have stratified layers of silty clay loam and silt loam, which Caruthersville soils lack. They lack clay texture, which the Sharkey soils have.

Cm—Commerce silt loam. This soil is nearly level or very gently sloping and is in large areas of the flood plain within 2 miles of the Mississippi River. Most areas are subject to flooding by the Mississippi River. The slope is 0 to 2 percent. Where this soil is near Dundee soils, it is in small depressions and narrow, shallow drainageways. Areas of this soil are commonly several hundred acres in size. This soil has a profile similar to the one described as representative of the series, but the surface layer is silt loam.

Included with this soil in mapping are a few areas of the moderately well drained Caruthersville very fine sandy loam. Also included are some areas of sandy overwash, which make up nearly 10 percent of the acreage.

Runoff is slow, and a few shallow field ditches are needed to remove excess water. Periods of high water occasionally delay fieldwork or destroy early crops.

Continuous row crops are grown on most of this soil. A small part is wooded. The main concern in management is removing excess water. Capability unit IIw–1.

Cn—Commerce silty clay loam. This soil is nearly level and is in areas of the flood plain, generally within 2 miles of the Mississippi River. Most areas are subject to occasional flooding. The slope is 0 to 1 percent. Areas of this soil are about 100 acres to several thousand acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas of a similar, somewhat poorly drained soil that is more clayey. These areas make up about 10 percent of the acreage. Also included are areas of Bowdre soils, which make up 5 percent, and some sandy and wet spots, which are shown on the soil map by a symbol.

Wetness is a moderate hazard because of flooding, slow runoff, and runoff received from nearby soils. The surface layer is moderately difficult to till and prepare for a seedbed. Wetness delays fieldwork a few days longer than on the adjacent Commerce silt loam. Surface ditches are important to removing surface water. The main concern in management is removing excess water.

Most of the cleared areas are continuously in row crops, mainly soybeans. An estimated 20 percent remains wooded. Capability unit IIw–1.

Cooter Series

The Cooter series consists of moderately well drained, nearly level soils. These soils formed in thin clayey sediment and in underlying sandy alluvium of former channels and depressions. The native vegetation was mixed hardwoods and cypress.

In a representative profile the surface layer is black silty clay 15 inches thick. Below this is 45 inches of dark grayish-brown loamy sand and sand.

Permeability is slow in the clayey upper part and rapid in the sandy lower part. The available water capacity is low. Natural fertility is medium, the organic-matter content is high, and runoff is slow.

Cooter soils are suited to farming if excess water is removed. Occasional flooding from local runoff occurs in most areas unless landforming is used. Most areas of these soils are used for row crops.

Representative profile of Cooter silty clay, in a cultivated field 200 feet east and 50 feet south of the northwest corner of NE¼ sec. 16, T. 25 N., R. 14 E., about 3½ miles south of the eastern edge of the city of Sikeston.

Ap—0 to 7 inches, black (10YR 2/1) gritty silty clay, very dark gray (10YR 3/1) dry; weak, coarse, granular and medium, subangular blocky structure; firm; trace of sand (estimated 10 percent); common fine roots; slightly acid; abrupt, smooth boundary.

A12—7 to 15 inches, black (10YR 2/1) silty clay, black when dry; common, medium, faint, dark reddish-brown (5YR 2/2) mottles; moderate, fine, subangular blocky structure; firm; common to abundant fine roots; trace of sand; neutral; clear, wavy boundary.

IIC—15 to 60 inches, dark grayish-brown (10YR 4/2) loamy sand and sand; massive breaking to single grained; very friable to loose; water table at a depth of 36 inches; mildly alkaline.

Cooter soils are slightly acid to moderately alkaline throughout. Depth to the sandy IIC horizon ranges from 12 to 20 inches. The dark colored A horizon is 10 to 20 inches thick. It is black, very dark gray, or very dark grayish-brown silty clay, clay, or heavy silty clay loam and in some places heavy clay loam. The IIC horizon is loamy fine sand to medium sand, but in places it has thin loamy or clayey lenses to a depth of 40 inches or more. These lenses make up less than 10 percent of the soil material in this horizon.

Cooter soils formed in material similar to that in which Cairo soils formed, and they resemble the Bowdre soils. They lack a subsoil of clay and sandy loam, which Cairo soils have. They have a sandier substratum than Bowdre soils.

Co—Cooter silty clay. This soil is nearly level and is in areas of abandoned channels. The major areas of this soil are adjacent to natural levees and are narrow and several miles long. The slope is 0 to 1 percent.

Included with this soil in mapping are soils that are similar to Cooter soils, but they have significant clayey bands between depths of 15 and 60 inches. These bands cause the soils to be wetter. Also included is a small area of a soil that has a dark-colored surface layer less than 10 inches thick.

Wetness is the major concern, but the soil is also droughty. Because this soil is in depressions, runoff accumulates from other areas. In some places the water table is within 24 inches of the surface for 3 months or more. During the growing season, droughtiness develops because the available water capacity is low.

Most areas of this soil are used for row crops, especially soybeans. This soil is moderately suited to farming if excess water is removed. Capability unit IIw–2.

Crevasse Series

The Crevasse series consists of deep, excessively drained, nearly level to strongly sloping sandy soils on the flood plain of the Mississippi River and on natural levees. These soils formed in sandy alluvium that consists mostly of medium sand. The native vegetation is mostly bramble, cottonwood, and willow.

In a representative profile the surface layer is dark grayish-brown sand about 5 inches thick. The underlying material, to a depth of 60 inches or more, is grayish-brown and dark grayish-brown loose sand.

Permeability is rapid. The available water capacity, natural fertility, and organic-matter content are low. Runoff is slow, but most precipitation is absorbed into the surface. These soils are subject to blowing and occasional flooding.

Crevasse soils are poorly suited to farming. Some areas are sparsely covered with trees, but most areas are used for pasture, small grains, and row crops. Some areas are idle. Droughtiness is a severe or very severe limitation.

Representative profile of Crevasse sand, 0 to 3 percent slopes, 1,150 feet north and 100 feet west of the southeast corner of sec. 4, T. 21 N., R. 14 E., about 7 miles south of New Madrid.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) sand; single grained; loose; common fine roots; neutral; clear, smooth boundary.

C1—5 to 42 inches, 90 percent grayish-brown (10YR 5/2) sand; 10 percent is strata of pale-brown (10YR 6/3) sand; single grained; loose; few fine roots in the upper part; neutral; clear, smooth boundary.

C2—42 to 60 inches, dark grayish-brown 10YR 4/2) sand; single grained; loose; neutral.

Crevasse soils commonly range from medium acid to mildly alkaline in all horizons, but in some places they have a moderately alkaline and mildly effervescent C horizon. The A horizon is grayish brown, dark grayish brown, very dark grayish brown, and brown. The C1 horizon is grayish brown, brown, dark yellowish brown, and yellowish brown. The C2 horizon is dark grayish brown, brown, pale brown, and light yellowish brown. Where these soils are near the washout area northwest of New Madrid, they commonly contain lenses or layers of sandy loam or finer textured material at a depth of more than 40 inches.

Crevasse soils are in positions on the landscape similar to those of Canalou soils. They lack loamy texture and distinct mottling, which Canalou soils have.

CrA—Crevasse sand, 0 to 3 percent slopes. This soil is mainly near the Mississippi River channel. It is nearly level to gently undulating at riverbends and places where the stream flow increases in velocity during flooding. This soil occurs in another large area, the washout north of Lilbourn, which is an alluvial fan that formed when the Mississippi River flowed across Sikeston Ridge. This soil has the profile described as representative of the series.

Besides low fertility, flooding, and blowing, there is a severe droughtiness problem.

This soil is poorly suited to general row crops and, because of the hazard of flooding, not suited to small grain. The plant cover is mostly weeds, grasses, bramble, and pricklypear, but there are some scattered trees. Most areas are idle and used for limited hunting and recreation. Most areas are not easily accessible and are in their native state. Cottonwood and sycamore trees are potentially productive, but seedling mortality is high. Capability unit IVs–1.

CsB—Crevasse loamy sand, 0 to 4 percent slopes. This soil is on nearly level to gently undulating natural levees, above the level of normal floods. The soil areas are oval or long, islandlike, and range from 10 to several hundred acres in size. It has a profile similar to the one described as representative of the series, but the surface layer is brown loamy sand about 9 inches thick and the underlying material is dark yellowish-brown sand. There are a few blowout spots. In about 10 percent of the areas there are a few thin bands of lenses of dark-brown sandy loam at depths between 40 and 60 inches.

Included with this soil in mapping are areas where the soil is mainly strong brown, reddish brown, and yellowish red and areas where the soil is strongly acid.

Droughtiness is a very severe problem because the available water capacity is not adequate for the successful growth of the common field crops. The main concerns of management are supplying adequate moisture to row crops, maintaining cover that protects the soil from blowing, and applying fertilizer properly. The soil is too porous for furrow or flood irrigation.

Wheat is grown in most of the cultivated areas, but row crops are also common. Truck crops, such as watermelons, are grown successfully in small acreages. Capability unit IVs–1.

CsC—Crevasse loamy sand, 4 to 12 percent slopes. This soil is on the hummocky sand ridges of natural levees. It is not subject to flooding. The areas are islandlike, oval, and 5 to 60 acres in size. They are on low hills as much as 30 feet above the adjacent lowlands. Some areas that have dunelike relief are gently undulating to rolling. This soil has a profile similar to the one described as representative of the series, but the surface layer is very dark brown loamy sand about 8 inches thick. Below this layer is strong-brown and yellowish-brown loose sand.

Included with this soil in mapping are soils that have sandy loam at a depth of less than 40 inches. These areas make up an estimated 10 percent of the acreage. Blowout spots are common in areas that have been cultivated. Also included are areas where the dominant colors in the soil profile are reddish brown and yellowish red and areas where the soil is strongly acid throughout.

Droughtiness is the major concern in managing this soil, but soil blowing is a severe hazard in cultivated areas. Management should protect the soil from blowing, conserve moisture, and supply adequate fertility. This soil is exposed to the prevailing winds and thus is subject to drying and blowing unless a cover is provided. It has low fertility, which is especially evident in blowouts. Roots grow mainly in the dark-colored surface layer, and re-establishing cover is difficult where the surface layer is gone. Capability unit VIs–1.

CvA—Crevasse loam, overwash, 0 to 3 percent slopes. This soil is nearly level to very gently undulating and is on the flood plain of the Mississippi River near the channel. It is subject to flooding. The areas are irregularly shaped and several hundred acres in size. This soil has a profile similar to the one described as representative of the series, but the surface layer is loam about 6 to 18 inches thick.

Included with this soil in mapping are small areas of Crevasse sand, 0 to 3 percent slopes, and a few spots where the loamy surface layer is thicker than 18 inches.

Droughtiness is the major concern in managing this soil. Windthrow is rather common when trees reach maturity. Root growth is largely restricted to the loamy surface layer.

This soil is only moderately suited to farming. It is used mostly as woodland. Some areas are cleared and used for small grain and row crops. Wheat is grown occasionally, but the soil is not well suited to wheat because it is subject to flooding during the growing season. Irrigation is not practiced because of the hazard of flooding. Capability unit IIIs–1.

Dubbs Series

The Dubbs series consists of deep, well-drained, nearly level soils on natural levees. These soils formed in loamy alluvium that contains a large amount of silt and very fine sand. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark grayish-brown and brown silt loam about 11 inches thick. The subsoil is friable to firm, brown silty clay loam in the upper 27 inches and yellowish-brown silt loam and loam in the lower 28 inches. The underlying material is brown sand.

Permeability is moderate. The available water capacity is high, natural fertility is medium, and the organic-matter content is moderately low. Runoff is slow.

Dubbs soils are well suited to all commonly grown crops. Nearly all of these soils are cultivated.

Representative profile of Dubbs silt loam, in a 15-year-old pasture of fescue and Ladino clover, 520 feet north and 50 feet west of the southeast corner of NE¼ sec. 22, T. 21 N., R. 13 E., about 4 miles northeast of Portageville.

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

A12—6 to 11 inches, brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; weak, medium, granular structure and weak, very fine, subangular blocky; friable; common fine roots and pores; strongly acid; clear, smooth boundary.

B21t—11 to 26 inches, brown (10YR 4/3) silty clay loam; moderate, fine and medium, subangular blocky structure; friable; common fine roots and pores; thin patchy clay films on surfaces of peds; medium acid; clear, smooth boundary.

B22t—26 to 38 inches, brown (10YR 4/3) silty clay loam; moderate, medium, subangular blocky structure; firm; common fine roots and pores; patchy clay films on surfaces of peds; medium acid; gradual boundary.

B23t—38 to 52 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; common fine roots; few fine pores; few, thin, patchy clay films on surfaces of peds and clay flows along vertical channels; very strongly acid; clear, smooth boundary.

B3t—52 to 66 inches, yellowish-brown (10YR 5/4) loam; few, faint, medium, pale-brown mottles; weak, fine, subangular blocky structure; friable; few fine roots and pores; few vertical clay flows; strongly acid; clear, smooth boundary.

IIC—66 to 76 inches, brown (10YR 4/3) sand; single grained; loose; few small gravel fragments; medium acid.

The solum is 30 to 70 inches thick. Dubbs soils are medium acid to very strongly acid throughout, except in areas that have been limed. The Ap horizon is brown, dark brown, or dark grayish brown. There is no A12 horizon in some profiles. The A horizon is 6 to 14 inches thick; it is somewhat thicker than is normal for the series. The B2t horizon is dark yellowish-brown loam or clay loam in some places. The B3t horizon is silt loam, loam, or sandy loam and has few to common grayish-brown mottles in some places. Sand in the B horizon is mostly very fine. The C horizon ranges from very fine sandy loam to sand.

Dubbs soils formed in material similar to that in which

Dundee soils formed, and they are in a landscape position similar to that of Bosket soils. Dubbs soils are browner throughout than Dundee soils. They have less fine sand to coarse sand in the subsoil than Bosket soils.

Db—Dubbs silt loam. This soil is on smooth, slightly convex natural levees. Many areas border the escarpment adjacent to ancient river channels. The slope ranges from 0 to 2 percent but is less than 2 percent in most places. Most areas range from 10 to 200 acres in size, are irregularly shaped, but commonly elongated, and parallel to the former stream channels.

Included with this soil in mapping is a moderately well drained soil similar to Dubbs soil, but dominantly grayish-brown in the lower part of the subsoil. This soil makes up about 5 percent of the acreage. Also included are a few small areas or spots of Tiptonville fine sandy loam or similarly dark-colored soils. Because of the artifacts, most of these spots can be identified as camps, homesites, or old refuse dumps of prehistoric people.

There are no major limitations to the use of this soil for farming. The main management concern is maintaining tilth and high fertility. All major crops grown in the county are well suited to this soil. The response to lime is good. Most areas of this soil are used for row crops. Capability unit I–1.

Dundee Series

The Dundee series consists of deep, somewhat poorly drained, nearly level soils on natural levees. These soils formed in loamy alluvium. The native vegetation was mixed hardwoods and an understory of vines and canes.

In a representative profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil is grayish-brown and dark grayish-brown, friable to firm silty clay loam about 50 inches thick. The underlying material is dark-gray and dark grayish-brown silty clay loam.

Permeability is moderately slow, and runoff is slow. The available water capacity is high, natural fertility is medium, and the organic-matter content is low.

Wetness is a moderate limitation to the use of these soils for farming but can easily be corrected by proper management in most areas. These soils are well suited to farming if excess water is removed. Nearly all the acreage is used for row crops.

Representative profile of Dundee silt loam, in a cultivated field, 150 feet west and 50 feet north of southeast corner of NW¼NE¼ sec. 16, T. 21 N., R. 13 E., about 3 miles northeast of Portageville.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; common fine roots; slightly acid; abrupt, smooth boundary.

B21t—8 to 16 inches, grayish-brown (10YR 5/2) light silty clay loam; common, fine, distinct, brown (7.5YR 4/4) mottles; moderate, fine, subangular blocky structure; friable; common fine roots and pores; few patchy clay films on surfaces of peds; few, fine, dark-colored concretions; medium acid; clear, smooth boundary.

B22t—16 to 28 inches, dark grayish-brown (10YR 4/2) silty clay loam; grayish-brown (10YR 5/2) ped interiors; common, fine, distinct, brown (7.5YR 4/4) mottles; moderate, fine, subangular blocky structure; firm; patchy clay films; common fine roots and pores; few, fine, dark-colored concretions; very strongly acid; gradual boundary.

B23t—28 to 38 inches, grayish-brown (2.5Y 5/2) light silty clay loam; common, fine, distinct, brown (7.5YR 4/4) mottles; weak, fine, subangular blocky structure; friable; dark grayish-brown (10YR 4/2) patchy clay films on surfaces of peds and along vertical cracks; few fine roots; common fine pores; very strongly acid; clear, smooth boundary.

B24t—38 to 47 inches, grayish-brown (10YR 5/2) silty clay loam; many, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine and medium, subangular blocky structure; firm; dark grayish-brown (10YR 4/2) patchy clay films on surfaces of peds and vertical flows; few fine roots, common fine pores; few, fine, brown and black concretions; strongly acid; clear, smooth boundary.

B3—47 to 58 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; firm; dark grayish-brown (10YR 4/2) coatings along vertical cracks; common fine pores; few, fine, dark-colored concretions; slightly acid; abrupt, smooth boundary.

C1—58 to 66 inches, dark-gray (10YR 4/1) silty clay loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, coarse, prismatic structure breaking to weak, fine, subangular blocky; firm; few fine pores and dark-colored concretions; neutral; clear, smooth boundary.

C2—66 to 77 inches, dark grayish-brown (2.5Y 4/2) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; very dark yellowish-brown (10YR 3/2) flows along some pores, channels, and vertical cracks; massive; firm; few, fine, dark-colored concretions; mildly alkaline.

The A horizon ranges from dark grayish brown to brown and very dark grayish brown, but is commonly dark grayish brown. The B horizon is clay loam or loam in some places. Sand particles in the upper 20 inches of the Bt horizon are mainly very fine; less than 15 percent are coarser. The B3 horizon is light gray in some places. In many places the B horizon is underlain by a buried soil. The C horizon is silty clay loam, loam, or sandy loam.

Dundee soils are associated with or occur alongside Acadia, Dubbs, Farrenburg, Forestdale, and Lilbourn soils. Dundee soils lack the red color of Acadia soils, contain less clay than Acadia or Forestdale soils, and are grayer and wetter than Dubbs and Farrenburg soils. Dundee soils contain less sand than Lilbourn soils.

De—Dundee silt loam. This soil generally is in large, smooth areas on natural levees. The slope is 0 to 1 percent. Areas of this soil are small to 1,000 acres or more in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas adjoining Sharkey silty clay loam that have a neutral or alkaline reaction throughout. These areas make up about 10 percent of the acreage. Spot symbols on the map indicate areas where there may be soluble salts. Also included are generally small areas of a soil, along old channels, that has a surface layer of grayish-brown silt loam and a subsurface layer of light brownish-gray silt loam and that is underlain by acid, gray silty clay. Areas of this soil make up 5 percent of the acreage. Also included are areas of a Dundee soil that has a surface layer of fine sandy loam and occurs mostly on the Morehouse lowland. The areas make up 20 percent of the acreage.

Wetness is a moderate problem but can be partly overcome by adequate surface drainage. Although landforming is a suitable practice on this soil, it is generally not necessary for adequate surface drainage. This soil is acid and benefits from liming. Removing excess water is the main concern in management.

Most of this soil is used for row crops. It is well suited to farming if excess water is removed. Row crops and small grain are especially well suited. Capability unit IIw-1.

Dn—Dundee silty clay loam. This soil is in low areas and depressions on natural levees. The slope is 0 to 1 percent. Areas of this soil are irregularly shaped and generally 100 acres or more in size. This soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam.

Included with this soil in mapping are small areas of a soil that has a surface layer of silty clay. Also included are a few sand spots.

Wetness is a problem because of slow runoff, moderately slow permeability, and the accumulation of runoff from adjacent areas. Tillage is a moderate concern because the surface layer is silty clay loam. The use of landforming and field ditch outlets is needed in places to provide adequate drainage. Removing excess water is the main concern of management.

Most areas of this soil are used for row crops. This soil is moderately well suited or well suited to farming if excess water is removed. Capability unit IIw-1.

Farrenburg Series

The Farrenburg series consists of deep, moderately well drained, nearly level soils on natural levees. These soils formed in loamy alluvium. Native vegetation was mixed hardwoods and an understory of vines and canes.

In a representative profie the surface layer is dark yellowish brown fine sandy loam 9 inches thick. The subsurface layer is yellowish-brown fine sandy loam about 10 inches thick. The subsoil is about 27 inches thick. In the upper 7 inches the subsoil is yellowish-brown, very friable fine sandy loam. In the middle 7 inches it is light brownish-gray, friable fine sandy loam, and in the lower 13 inches it is brown and light brownish-gray friable clay loam. The underlying material is brown and yellowish-brown sand over yellowish-brown loamy sand.

Permeability and the available water capacity are moderate. Runoff is slow. Natural fertility is medium, and the organic-matter content is moderately low.

Farrenburg soils have only slight limitations for farming. They have moderate internal wetness that affects the growth of some deep-rooted crops. Nearly all of these soils are used for row crops and small grains.

Representative profile of Farrenburg fine sandy loam, in a cultivated field, 200 feet north and 40 feet west of the southeast corner of SW¼ sec. 26, T. 24 N., R. 13 E., about 3 miles northwest of Kewanee.

Ap—0 to 9 inches, dark yellowish brown (10YR 4/4) fine sandy loam; light yellowish brown (10YR 6/4) dry; weak, fine, granular structure; very friable; many fine roots; few fine dark-colored concretions; very strongly acid; abrupt, smooth boundary.

A2—9 to 19 inches, yellowish brown (10YR 5/4) fine sandy loam; weak, medium, granular structure; very friable; common fine roots; few fine dark-colored concretions; very strongly acid; clear, wavy boundary.

B11—19 to 26 inches, yellowish brown (10YR 5/4) fine sandy loam; common, fine, faint, pale-brown (10YR 6/3) and few, fine, faint, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; very friable; common very fine fibrous roots; few fine pores, roots, and dark-colored concretions; strongly acid; gradual boundary.

A'2—26 to 33 inches, light brownish gray (2.5Y 6/2) fine sandy loam; many, medium, prominent, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; very friable; common, fine roots, pores, and dark-colored concretions; strongly acid; clear, wavy boundary.

B&A—33 to 46 inches, brown (7.5YR 4/4) and light brownish-gray (10YR 6/2) clay loam (B2t); weak, coarse, prismatic structure parting to moderate, fine, subangular blocky; coatings of light brownish-gray (10YR 6/2) fine sandy loam from the A2 horizon on all vertical surfaces and many lateral surfaces of peds, that are 1 to 5 millimeters thick; this same material from the A2 horizon occurs as interfingerings of continuous skeletons that are 2 to 8 millimeters thick along all major vertical structural surfaces and as fillings in cracks and old root channels; few, thin, patchy films of dark brown (7.5YR 3/2) clay on interior surface of peds and in fine pores; few fine roots, few fine dark-colored concretions; very strongly acid; clear, wavy boundary.

IIC1—46 to 63 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/8) sand; common, fine, faint, pale-brown and few, coarse, distinct, dark-brown (7.5YR 4/4) mottles; single grained, weak evidence of stratification; loose; medium acid; clear, wavy boundary.

IIC2—63 to 73 inches, light yellowish-brown (10YR 6/4) loamy sand; few, coarse, distinct, light-gray (10YR 7/2) mottles; massive; loose; slightly acid.

The solum is 40 to 80 inches thick. The fine sandy loam is 26 to 40 inches thick. The Ap horizon is very dark grayish brown, dark grayish brown, dark yellowish brown, brown, or dark brown. The B1 horizon ranges from yellowish brown to brown. The B&A horizon is gray, grayish brown, or light brownish gray and has bright mottles, or is brown and has grayish mottles. It is clay loam, sandy clay loam, or loam. Unless limed, the soil is medium acid to very strongly acid throughout the A and B horizons and medium acid to neutral in the C horizon.

Farrenburg soils formed in the same kind of material as that in which Lilbourn soils formed, and they are near Broseley and Dundee soils in some places. Farrenburg soils are browner and less wet than either Dundee or Lilbourn soils. They are not so sandy as Broseley soils.

Fa—Farrenburg fine sandy loam. This soil is on slightly convex natural levees, generally at a low elevation. The slope is 0 to 2 percent. Areas of this soil are oval or elongated and 10 to 200 acres in size.

Included with this soil in mapping are areas of a soil similar to this Farrenburg soil, but it lacks grayish mottles to a depth of about 30 inches. This soil makes up nearly 20 percent of the acreage. Also included are areas of Lilbourn fine sandy loam. These areas make up 5 percent of the acreage. A few small areas of a soil that has a dark-colored sandy surface layer is indicated on the detailed soil map by a special symbol.

In most areas the available water capacity is moderate. Soil blowing is a slight hazard in some fields. A perched water table can limit or affect growth of some deep-rooted crops. This soil is acid.

The crops benefit from supplemental irrigation. Soil blowing can be controlled by use of proper plant cover or other cultural practices. Liming improves the growth of most crops. Droughtiness is the major concern in farming this soil, but other slight limitations should be considered in managing it. Landforming is commonly used on this soil and causes more variations in thickness of the surface layer than is common in the undisturbed soil. This soil is used mainly for the common row crops and wheat. Capability unit IIs-1.

Forestdale Series

The Forestdale series consists of deep, poorly drained, nearly level soils in depressions on natural levees. These soils formed in silty and clayey sediment. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam 8 inches thick. The subsoil is firm and plastic and about 38 inches thick. The upper part is grayish-brown clay, and the lower part is grayish-brown clay loam. The underlying material is brown sandy clay loam and sandy loam.

Permeability is very slow, and the available water capacity is moderate. Natural fertility is medium, the organic-matter content is low, and runoff is slow to ponded.

Surface water accumulates on these soils, and disposal is inadequate because suitable drainage outlets are not available. The water table is at or near the surface for long periods in winter and spring and in extremely wet seasons.

Wetness is a severe problem and is a limitation to use. The limitations to these soils for most crops are severe. These soils are used mainly for row crops, pasture, and woodland, but some acreage is idle.

Representative profile of Forestdale silt loam, in a cultivated field, 100 feet west and 200 feet south of the northeast corner of SW¼ sec. 19, T. 22 N., R. 14 W., about 1½ miles northeast of Marston.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak, fine, granular structure; friable; hard when dry; few fine roots; neutral; clear, smooth boundary.

B2tg—8 to 29 inches, grayish-brown (2.5Y 5/2) clay; few, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium and moderate, very fine, subangular blocky structure; firm, plastic; few fine roots and pores; clay films on faces of most peds; strongly acid; clear, smooth boundary.

B3g—29 to 46 inches, grayish-brown (2.5Y 5/2) clay loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, fine, subangular blocky structure; firm; slightly plastic; patchy clay films along vertical faces of peds; common, fine, dark-colored concretions; few fine pores; strongly acid; clear, smooth boundary.

IIC1—46 to 56 inches, brown (10YR 4/3) light sandy clay loam; common, faint, medium, dark grayish-brown (10YR 4/2) mottles; weak, medium, subangular blocky structure; friable; few, fine, dark-colored concretions; slightly acid; gradual boundary.

IIC2—56 to 70 inches, brown (10YR 4/3) sandy loam; massive; very friable; mildly alkaline.

Forestdale soils are medium acid to very strongly acid throughout the solum, except for the surface layer in places that have been limed. The A horizon is 6 to 14 inches thick. The Ap horizon is very dark grayish brown to grayish brown. The Bt horizon is gray, olive gray, light brownish gray, and grayish brown heavy silty clay loam to clay. The B3 horizon is light brownish gray to dark grayish brown silty clay loam or clay loam. The C horizon is commonly sandy clay loam, sandy loam, or loamy sand.

The Forestdale soils in New Madrid County are browner than is within the range defined for the series. This difference does not alter the usefulness and behavior of the soils.

Forestdale soils have some similarity to Acadia, Alligator, Dundee, and Wardell soils. They formed in the same kind of material as that in which Acadia soils formed, but they are grayer. They are less clayey than the Alligator soils. Forestdale soils contain more clay than the Dundee and Wardell soils.

Fs—Forestdale silt loam. This soil is in depressions on natural levees that are in channels of former rivers or in low areas on old flood plains. The slope is 0 to 1 percent. Most areas of this soil are slightly higher than the areas of Forestdale silty clay loam. The areas are small to several hundred acres in size. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas that have a surface layer mostly of fine sandy loam or silty clay loam. Also included are small areas of Wardell soils. These areas make up less than 8 percent of the acreage.

Severe wetness is a major limitation to the use of this soil. Farming is the principal use, and soybeans is the major crop. The subsoil is strongly acid, and large amounts of lime are needed where the surface layer has been removed. Landforming is not successful because of the lack of drainage outlets. Temporary flooding from local runoff is common.

Most areas of this soil are used for row crops, but a few areas remain wooded. Adapted species of trees grow well. This soil is not well suited to grazing during wet periods. It is moderately suited to farming if excess water is removed. Capability unit IIIw-2.

Ft—Forestdale silty clay loam. This soil is in low areas on the natural levees. The slope is 0 to 1 percent. Some areas are somewhat elongated, have irregular boundaries and cover several hundred acres, but other areas are small and oval and have smooth boundaries. This soil has a profile similar to the one described as representative of the series, but it has a surface layer of silty clay loam.

Included with this soil in mapping are some areas that have a surface layer of silt loam and a small area of Alligator soils. A few sandy spots and extremely wet spots are shown on the map by special symbols.

This soil is wet. Most surface water that drains onto it must either evaporate or infiltrate the soil. During wet and rainy periods, water stands in some areas for weeks.

Some areas remain idle and are seldom used for crops. The main concern of management is removing excess water, but adequate outlets generally are not available. Soybeans are the major crop, but some fields are seldom planted. Among other uses are pasture and woodland. Some land is idle. Capability unit IIIw-2.

Gideon Series

The Gideon series consists of deep, nearly level, poorly drained soils on slightly depressed flood plains. These soils formed in loamy sediment in former braided channels of the Mississippi and Ohio Rivers. The native vegetation was cypress and mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown loam about 9 inches thick. The underlying material is olive-gray, gray, dark-gray, and very dark gray, firm clay loam and sandy clay loam about 71 inches thick. Below this is gray sandy loam and loamy sand.

Permeability is moderately slow, and the available water capacity is high. Natural fertility is high, the organic-matter content is moderately low, and runoff is slow.

Gideon soils are well suited to farming if excess water is removed. Nearly all these soils are used for row crops.

Representative profile of Gideon loam, 1,160 feet east and 50 feet south of northwest corner of sec. 22, T. 21 N., R. 11 E., about 3 miles east of Gideon.

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak, coarse, granular structure breaking to weak, fine, granular; compacted traffic pan in lower 3 inches; friable to firm; common fine roots; pockets of black humus and organic stains at lower boundary; mildly alkaline; abrupt, smooth boundary.

C1g—9 to 18 inches, olive-gray (5Y 5/2) sandy clay loam; common, medium, distinct, dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; firm; few, fine, dark-colored concretions, roots, and pores; few, black, organic stains; slightly acid; clear, wavy boundary.

C2g—18 to 45 inches, gray (5Y 5/1) sandy clay loam; few pockets or vertical cracks filled with dark-gray (10YR 4/1) clay loam; common, medium, prominent, yellowish-red (5YR 4/6) mottles; weak, medium and fine, subangular blocky structure; firm; common, fine, dark-colored concretions; few fine roots and pores; slightly acid; clear, wavy boundary.

A1b—45 to 60 inches, very dark gray (10YR 3/1) heavy clay loam; few, medium, distinct, dark-brown (7.5YR 3/2) mottles; moderate, medium, subangular blocky structure; firm; surfaces of some peds are slick and shiny; few, fine, dark-colored concretions; neutral; gradual boundary.

C3g—60 to 68 inches, dark-gray (5Y 4/1) clay loam; some mixing of very dark gray (10YR 3/1); few, medium, prominent, dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; firm; few dark-colored concretions; neutral; gradual boundary.

C4g—68 to 80 inches, olive-gray (5Y 5/2) sandy clay loam; common, coarse, faint, dark-gray (5Y 4/1) mottles, common, medium, distinct, pale-olive (5Y 6/4) and common, coarse, prominent, dark-brown (7.5YR 4/4) mottles; weak, medium, subangular blocky structure; firm; few black stains; few, fine, dark-colored concretions and soft masses; neutral; gradual boundary.

IIC5g—80 to 92 inches, gray (5Y 5/1) sandy loam; common, coarse, distinct, grayish-brown (10YR 5/2) mottles; massive; friable; neutral; gradual boundary.

IIC6g—92 to 100 inches, gray (5Y 5/1) loamy sand; common, coarse, distinct, brown (10YR 5/3) mottles; single grained; very friable; weakly stratified; neutral.

Gideon soils are slightly acid to mildly alkaline throughout. The Ap horizon is very dark grayish brown or very dark gray to dark gray. The IIC horizon is gray or olive gray to brown sandy loam to sand. Depth to the IIC horizon ranges from 48 to about 100 inches. The Ab horizon is absent in some places.

Gideon soils formed in the same kind of material in which Sikeston and Wardell soils formed. They lack a thick surface layer, which the Sikeston soils have. They are less acid than the Wardell soils, and they lack a Bt horizon.

Gd—Gideon loam. This soil is nearly level and level and is in narrow or broad areas that range from a few acres to several thousand acres in size. The slope is 0 to 1 percent. This soil has the profile described as representative of the series.

Included with this soil in mapping are spots of loamy sand and areas of sandy loam. These areas make up 5 percent of the acreage. Also included are dark-colored soils in areas 1 to 5 acres in size. Kitchen middens and artifacts in these areas are evidence of primitive dwellings. In an estimated 5 percent of the acreage the soil has a grayish-brown underlying layer and is somewhat poorly drained.

The major concern in mapping this soil is removing excess water. Landforming has been used on nearly half the acreage. It disturbs the soil profile but provides effective uniform drainage. Row irrigation is used in some fields. A firm, compacted plowpan hinders the growth of roots in areas under continual cultivation. Tillage and seedbed preparations are easily accomplished.

Nearly all of this soil is used for the row crops commonly grown in the county. The main crops are soybeans, corn, and cotton. Only a few small woodlots remain. Capability unit IIIw–1.

Ge—Gideon clay loam. This soil is in large, smooth areas that are slightly depressional. It is occasionally flooded for short periods. The slope is 0 to 1 percent. Areas of this soil are commonly 100 to several hundred acres in size. This soil has a profile similar to the one described as representative of the series, but the surface layer is clay loam.

Included with this soil are areas that contain more clay than Gideon clay loam. These areas make up nearly 10 percent of the unit. Areas that have a dark-colored surface layer more than 10 inches thick make up 5 percent. Some areas have sandy spots.

The main concern in managing this soil is removing excess water. Good surface drainage is needed for growing field crops. Landforming is used extensively to eliminate potholes and provide efficient, uniform surface drainage. Some fields are irrigated, but returns are not always profitable. This soil is subject to the formation of a plowpan if it is cultivated year after year. The surface layer is firm and moderately difficult to till and prepare for a seedbed.

Most areas of this soil are used for row crops. The major crop is soybeans. Cotton is suited if spring weather allows early planting, but corn is not quite so well suited. Capability unit IIIw–1.

Lilbourn Series

The Lilbourn series consists of deep, nearly level, somewhat poorly drained soils on natural levees (fig. 11). These soils formed in loamy alluvium that has distinct layers of different textures and a buried soil material. They are associated with areas of "sunken lands," which formed as a result of the New Madrid earthquake. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is brown and dark grayish-brown fine sandy loam about 15 inches thick. Underlying this layer is grayish-brown fine sandy loam about 22 inches thick. The next layer is grayish-brown, firm loam about 15 inches thick. The underlying material is stratified layers of dark

Figure 11.—**Dark-colored Gideon loam is in the foreground and light-colored Lilbourn fine sandy loam is in the background.**

yellowish-brown sandy loam, grayish-brown very fine sandy loam, and dark yellowish-brown sand.

Permeability and the available water capacity are moderate. The organic-matter content is low, natural fertility is medium, and runoff is slow. A perched water table limits farming operations during winter and spring.

Most of the acreage is used for row crops.

Representative profile of Lilbourn fine sandy loam, 600 feet west and 60 feet south of the northeast corner of NE¼SE¼ sec. 28, T. 25 N., R. 13 E., about 2 miles northeast of Canalou.

Ap—0 to 8 inches, brown (10YR 4/3) fine sandy loam; weak, fine granular structure; friable; many fine roots; few, fine, dark-colored concretions; slightly acid; abrupt, smooth boundary.

A12—8 to 15 inches, dark grayish-brown (10YR 4/2) fine sandy loam; common, fine, distinct, dark-brown (10YR 3/4) mottles; weak, medium, granular structure; very friable; common fine roots and pores; few, fine, dark-colored concretions; slightly acid; clear, wavy boundary.

C1—15 to 37 inches, grayish-brown (10YR 5/2) fine sandy loam; common, medium, distinct, brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) mottles and few, fine, faint, pale-brown (10YR 6/3) mottles; massive; weak, thin, bedding planes; friable; common fine roots and pores; few, fine, dark-colored concretions; medium acid; clear, wavy boundary.

IIB2—37 to 52 inches, grayish-brown (2.5YR 5/2) heavy loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; moderate, fine, subangular blocky structure; firm; common fine roots and pores; common, fine dark-colored concretions; common, patchy dark-brown clay films and flows along pores and vertical faces of peds; vertical cracks, 5 to 15 millimeters wide and 6 to 18 inches apart filled with grayish-brown fine sandy loam; very strongly acid; gradual, wavy boundary.

IIC2—52 to 57 inches, dark yellowish-brown (10YR 4/4) sandy loam; common, coarse, distinct, grayish-brown (10YR 5/2) and dark-brown (10YR 3/3) mottles; massive; very friable; few fine pores; strongly acid; clear, wavy boundary.

IIC3—57 to 64 inches, grayish-brown (2.5Y 5/2) very fine sandy loam; common, medium, distinct, dark yellowish-brown (10YR 4/4) mottles; massive; friable; common mica flakes; medium acid; clear, wavy boundary.

IIIC4—64 to 71 inches, dark yellowish-brown (10YR 4/4) sand; few, coarse, distinct, pale-brown (10YR 6/3) mottles; single grained; loose; slightly acid.

The Ap horizon is very dark grayish brown in some places. The C1 horizon ranges from dark grayish brown to light brownish gray. Depth to the underlying IIB horizon ranges from about 24 to 60 inches. This horizon is grayish-brown, light brownish-gray, or olive-gray silty clay loam, heavy silty loam, clay loam, or heavy loam about 10 to 30 inches thick. It has mottles of dark brown, brown, yellowish brown, strong brown, or reddish brown. Below the IIB horizon the texture is very fine sandy loam to sand. The A horizon and C1 horizon are medium acid to neutral, the IIB horizon is strongly acid to very strongly acid, and the IIC and IIIC horizons are strongly acid to slightly acid.

Lilbourn soils formed in the same kind of material as that in which Farrenburg soils formed, and they are in the same position on the landscape as Dundee and Wardell soils.

They are grayer than Farrenburg soils and contain more sand than Dundee and Wardell soils.

Lb—Lilbourn fine sandy loam. This soil is on low natural levees. It forms either elongated borders of large levees or small, oval, islandlike areas. The slope is 0 to 1 percent. Areas of this soil range from about 10 to 1,000 acres or more. This soil is nearly level in most places, but it has very slight undulations in some places.

Included with this soil in mapping are Gideon soils, making up 15 percent of the acreage, Wardell soils, making up 5 percent, and small areas of Dundee sandy loam. Also included are numerous sand spots of Canalou or Crevasse soils and areas where the surface layer is loamy sand.

Wetness is the major problem because of the perched water table that affects the trafficability and bearing capacity of the soil during winter and spring. In summer during the cropping season, surface wetness is not a serious problem, but some artificial drainage is needed. Landforming on some of these soils is beneficial to drainage and irrigation, and results are good. Droughtiness is a slight to moderate problem, and soil blowing can occur during the windy spring when fields lack protective cover. This soil is also subject to the formation of a plowpan. This soil is easily tilled, and it responds readily to good management. Capability unit IIw-1.

Roellen Series

The Roellen series consists of deep, nearly level, poorly drained soils on depressed flood plains and in former braided channels. These soils formed in alkaline, clayey alluvium. The native vegetation was cypress and tall grasses, but on some of the adjacent sandy natural levees, it was prairie grasses.

In a representative profile the surface layer is black and very dark gray clay about 20 inches thick. The subsoil is firm, dark-gray, olive-gray, and gray clay and silty clay 32 inches thick. The underlying material is dark-gray clay in the upper 8 inches and grayish-brown and gray sand below.

Permeability is slow, and the available water capacity is moderate. Natural fertility and the organic-matter content are high. Runoff is very slow.

Roellen soils are well suited to farming if excess water is removed. Most of these soils are cleared and are used for row crops. Some are in pasture. Only a few small woodlots remain.

Representative profile of Roellen clay, in a cultivated field, 60 feet south and about 400 feet east of the northwest corner of NE¼ sec. 4, T. 24 N., R. 15 E., about 8 miles east of Matthews.

Ap—0 to 6 inches, black (10YR 2/1) gritty light clay, very dark gray (10YR 3/1) dry; weak, fine, granular structure; friable; many fine roots; few, fine, dark-colored concretions; mildly alkaline; abrupt, smooth boundary.

A12—6 to 20 inches, very dark gray (10YR 3/1) clay, dark gray (N 4/0) dry; few, fine, distinct, grayish-brown (2.5Y 5/2) mottles; moderate, fine, subangular blocky structure; firm; few fine roots; few, fine, dark-colored concretions; mildly alkaline; clear, wavy to irregular boundary.

B21g—20 to 32 inches, dark-gray (5YR 4/1) clay; few, large, very dark gray (10YR 3/1) streaks and pockets; common, fine, faint, light olive-brown (2.5Y 5/4) mottles; weak, coarse, prismatic structure breaking to moderate, fine, subangular blocky, but weak to massive on the interior of some prisms; firm; few fine roots and dark-colored concretions; mildly alkaline; gradual, smooth boundary.

B22g—32 to 44 inches, olive-gray (5Y 5/2) silty clay; few, small, very dark gray streaks and pockets; common, fine, distinct, dark-brown (7.5YR 4/4) and a few, fine, faint, pale-olive (5Y 6/4) mottles; weak, coarse, prismatic structure breaking to moderate, fine, subangular blocky along the edges, but weak to massive on the interior of some prisms; firm; few fine roots and pores; common, fine, dark-colored concretions; few white specks; neutral; clear, smooth boundary.

B3g—44 to 52 inches, gray (5Y 5/1) silty clay; few very dark gray streaks; common, fine, distinct, light olive-brown (2.5Y 5/4) mottles; weak, fine, subangular blocky structure; firm; few fine roots and pores; mildly alkaline; clear, smooth boundary.

C1g—52 to 60 inches, dark-gray (5Y 4/1) clay; common, fine, distinct, dark-brown (7.5YR 4/4) mottles and coatings in pores; few, fine, faint, pale-yellow (5Y 7/4) mottles; few thin lenses of very dark gray; weak, medium, platy structure parting to weak, fine subangular blocky; firm; common fine pores and channels; mildly alkaline; clear, wavy boundary.

IIC2g—60 to 67 inches, grayish-brown (2.5Y 5/2) sand, few thin lenses of dark grayish brown (2.5Y 4/2); few, coarse, distinct, dark-brown (7.5YR 4/4) mottles; single grained; loose; wet; mildly alkaline; clear, smooth boundary.

IIC3g—67 to 78 inches, gray (5Y 5/1) sand; single grained; loose; wet; mildly alkaline.

The solum is 30 to about 72 inches thick. Depth to the IIC horizon is 42 to 80 inches. In some places the soils are effervescent below a depth of 20 inches or contain lime concretions. They are slightly acid to moderately alkaline throughout. The A horizon is 12 to 20 inches thick. Between depths of 10 and 40 inches, this soil is 35 to 60 percent clay, averaging about 45 percent. Shiny pressure faces and clay skins occur in some places. The IIC horizon ranges from loam to sand.

Roellen soils formed in material similar to that in which Sharkey and Cairo soils formed and are near the Gideon and Sikeston soils. Roellen soils do not have sandy loam in the lower part of the subsoil, but Cairo soils do. They have a thicker surface layer than Sharkey soils. They have a clayey subsoil, and the Gideon and Sikeston soils have a loamy subsoil.

Ro—Roellen clay. This soil is in depressional areas that were formerly old channels, shallow lakes, or bayous that have slack-water deposits. Areas of this soil are about 50 to several hundred acres in size. Many areas are narrow, meandering channels that extend for miles. The slope is 0 to 1 percent.

Included with this soil in mapping are areas that are made up of about 15 percent Cairo soils and a small amount of Sikeston soils. Also included are areas where the soils have a surface layer of clay loam. These areas make up an estimated 30 percent of the acreage. Other inclusions are large areas of soils that have a dark-colored surface layer 20 to 36 inches thick.

Providing drainage to remove excess surface water is the main concern in management. Although some surface drainage is available in all areas, there are potholes, internal wetness, and a seasonal high water table. Landforming and irrigation are not extensively used, but landforming could improve surface drainage and eliminate wet spots. The clayey surface moderately hinders tillage and seedbed preparation.

If adequately drained, this soil is well suited to all the common row crops. The major crop is soybeans and a suitable crop is rice. Capability unit IIIw-14.

Sandy Alluvial Land

Sa—Sandy alluvial land. This mapping unit consists of sandy material that is in the Mississippi River channel and occurs as sand bars and towhead deposits that adjoin the bank. It is flooded continuously for periods of several days to several months. Areas are nearly level to gently undulating and 20 to several hundred acres in size, but they vary with the fluctuation of streamflow. The slope is 0 to 4 percent.

The soil material consists of light brownish-gray and grayish-brown sand and loamy sand and strata that give evidence of recent deposition. In most places, accumulation of organic matter in the surface material is not yet evident. The material is commonly slightly effervescent.

Permeability is rapid, but movement of water through the soil is governed by the general level of water in the river. The available water capacity, natural fertility, and the organic-matter content are low.

Sandy alluvial land is not suitable for general farming uses. It is extremely droughty, but it is also wet because it is flooded for long periods. Changes or alterations of the landscape are imminent because the river shifts position, but some areas become more stable with time. Older sand bars support weeds, grasses, and willow and cottonwood trees. The more stable areas are suitable for cottonwood plantations, but seedling mortality is severe because the land is flooded. Other possible uses are hunting, recreation, and a commercial source of sand. It is generally idle and is rarely managed for any productive purpose. Capability unit Vw.

Sharkey Series

The Sharkey series consists of deep, nearly level, poorly drained soils on slack-water flats. These soils formed in thick beds of nonacid, clayey alluvium. The native vegetation was baldcypress and mixed hardwoods.

In a representative profile the surface layer is very dark gray, firm clay about 6 inches thick. The subsoil is dark-gray and gray, very firm and firm, very plastic clay about 38 inches thick. The underlying material is gray clay.

Permeability is very slow, and the available water capacity is moderate. Natural fertility is high. The organic-matter content is generally low. Runoff is very slow.

Sharkey soils are wet. The have poor aeration and properties of clay that restrict their use and management. Most areas are cleared and used for row crops, but areas covering a few hundred acres remain wooded.

Representative profile of Sharkey clay, 50 feet east and 80 feet north of the southwest corner of SE¼SE¼ sec. 23, T. 24 N., R. 15 E., near Black Bayou, 4 miles east of Henderson Mound.

Ap—0 to 6 inches, very dark gray (10YR 3/1) clay; moderate, very fine, subangular blocky structure; firm, plastic; common fine roots; slightly acid; abrupt, smooth boundary.

B21g—6 to 21 inches, dark-gray (10YR 4/1) clay; common, medium, distinct, dark-brown (7.5YR 3/2) mottles; moderate, fine, subangular blocky structure; firm, very plastic; common fine roots; neutral; clear, smooth boundary.

B22g—21 to 36 inches, gray (10YR 5/1) clay; common, medium, distinct, brown (7.5YR 4/4) mottles; weak, fine, subangular blocky structure; firm, very plastic; few fine roots; few lime concretions and lime that has accumulated as fine, soft, rounded masses; few slickensides that do not intersect; neutral; clear, smooth boundary.

B3g—36 to 44 inches, dark-gray (5Y 4/1) clay; common, fine, faint, dark-brown (10YR 3/3) mottles; weak, fine, subangular blocky structure; very firm, very plastic; many, small, shiny pressure faces; few lime concretions; few slickensides; neutral; gradual boundary.

Cg—44 to 80 inches, gray (5Y 5/1) clay; fine, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; firm, very plastic; few, fine, lime concretions; few slickensides; mildly alkaline.

The solum ranges from about 36 to 60 inches in thickness. The A horizon is very dark grayish brown or very dark gray and is 5 to 10 inches thick. Sharkey soils have a strongly acid to neutral A horizon and a medium acid to moderately alkaline Bg horizon. Generally, cracks that are 1 to 6 inches wide develop and extend from 24 to 48 inches in depth. In some profiles the soil material below a depth of 20 inches is effervescent, or it has lime concretions.

Sharkey soils formed in materials similar to those in which Alligator and Roellen soils formed and are similar in color and appearance to Gideon soils. Sharkey soils are less acid than Alligator soils. They have a thinner A horizon than Roellen soils and are more clayey throughout than Gideon soils.

Sh—Sharkey silty clay loam. This soil is in very broad, smooth, slack-water or backswamp areas that range from about a hundred to thousands of acres in size. Still, muddy water is regularly backed into these areas and covers them for long periods each year unless the soil is drained. The slope is 0 to 1 percent. This soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam.

Included with this soil in mapping are areas of soils along the boundaries that have less clay. These areas make up about 25 percent of the acreage. Also included are areas where the surface layer is mainly silty clay or clay loam and numerous spots where the surface layer is sandy loam and loamy sand. These areas make up 20 to 30 percent of the acreage. None of these included areas, even though extensive, greatly affect the use and management of the soil.

The main concern in managing this soil is removing excess water. Ditches are necessary to provide outlets for runoff, and landforming is essential in most fields if potholes, depressions, and ponded areas are to be eliminated. Only when uniform surface drainage is provided can uniform stands and growth of crops be expected. Irrigation is profitable if properly applied and well managed.

Most of the acreage is used for soybeans and cotton. Capability unit IIIw-14.

Sr—Sharkey clay. This soil is in broad, smooth, slack-water or backswamp areas. It is in large basins, depressions, former lakes, or swamps that were permanently flooded with still, stagnant water before modern drainage was established. Areas of this soil are commonly several hundred to several thousand acres in size. The slope is 0 to 1 percent. This soil has the profile described as representative of the series.

Included with this soil in mapping are some areas of a soil that has a surface layer of silty clay and a few sand spots, wet spots, or potholes. None of these areas significantly affect the use and management of this soil.

Wetness is a limitation to the use of this soil because runoff is slow, the downward movement of water is very slow, and the general overall drainage is poor. The soil is firm and plastic and has a very high shrink-swell potential; consequently, it is difficult to till, and seedbeds are difficult to prepare. In most years, cracks 1 to 6 inches wide form as the soil is depleted of available water by crops. In fields where surface water is disposed of rapidly, droughtiness is slight to moderate. Landforming helps to remove excess water. Row irrigation is difficult to manage, but sprinkler irrigation is easy to apply and more efficient than row irrigation. Irrigation is profitable only if properly applied and if used with drainage and other management practices.

Most of the acreage is used for soybeans and cotton. Rice is a suitable crop. Corn, wheat, and most deep-rooted crops, such as alfalfa and fruit trees, are poorly suited because the soil is wet and has poor aeration. Capability unit IIIw–14.

Sikeston Series

The Sikeston series consists of deep, nearly level, poorly drained soils in depressions on old flood plains. These soils occupy areas adjacent to loamy and sandy natural levees. They formed in loamy and sandy alluvium in wet and swampy areas. The native vegetation was cypress, tupelo-gum, and water-tolerant hardwoods and an understory of vines and grasses. Areas of Sikeston soils are locally called "Tupelo Gum Land."

In a representative profile (fig. 12) the surface layer is about 42 inches thick. In the upper 12 inches it is very dark gray sandy clay loam, and in the lower 30 inches it is black clay loam. The layer below the surface layer is dark grayish-brown sandy clay loam about 8 inches thick. Below that there are stratified layers of dark grayish-brown sandy loam and dark reddish-brown loamy sand.

Permeability is moderately slow, and the available water capacity is high. Natural fertility and the organic-matter content are high. Runoff is very slow.

Sikeston soils were swamps before modern drainage was established. They are well suited to farming if excess water is removed. Most of these soils are used for the common row crops.

Representative profile of Sikeston sandy clay loam, 325 feet west and 30 feet south of the northeast corner of sec. 15, T. 25 N., R. 13 E., about 3 miles southwest of the city of Sikeston.

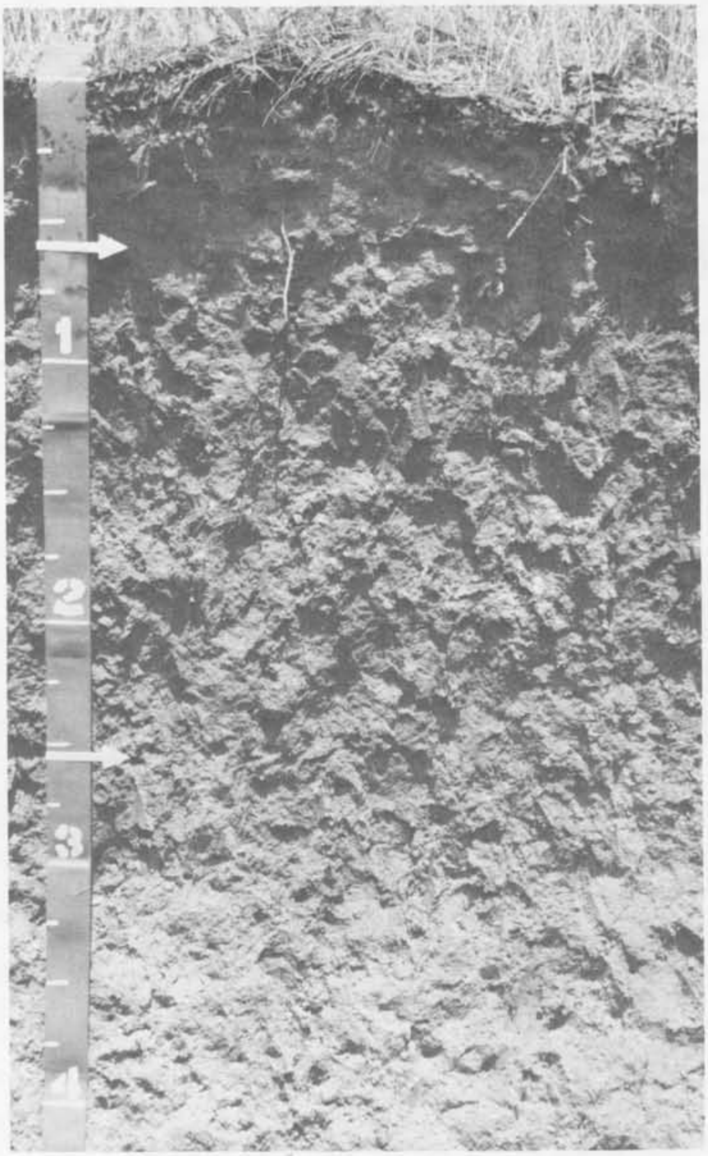


Figure 12.—**Profile of Sikeston sandy clay loam.**

Ap—0 to 12 inches, very dark gray (10YR 3/1) sandy clay loam, dark gray (10YR 4/1) dry; weak, coarse, granular structure breaking to weak, fine, granular; firm; common fine roots; compacted traffic pan in the lower 4 inches; slightly acid; abrupt, smooth boundary.

A12—12 to 17 inches, black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; few, medium, prominent, reddish-brown (5YR 4/4) mottles; weak, medium, subangular blocky structure; firm; common fine roots and pores; few dark-colored concretions; neutral; clear, smooth boundary.

A13—17 to 33 inches, black (10YR 2/1) clay loam; moderate, medium, prismatic structure breaking to moderate, medium, subangular blocky; firm; common fine roots, pores, and dark-colored iron and manganese concretions and soft dark masses; few vertical cracks, 1 to 3 inches wide, filled with very dark gray granular clay loam; neutral; gradual boundary.

A14—33 to 42 inches, black (10YR 2/1) clay loam; common, medium, distinct, olive-brown (2.5Y 4/4) and dark-brown (7.5YR 4/4) mottles; weak, medium, prismatic structure breaking to moderate, medium, subangular blocky; firm; common fine roots, pores, and dark-colored concretions; faint evidence of vertical cracks similar to those in the A13 horizon; neutral; clear, irregular boundary.

AC—42 to 50 inches, dark grayish-brown (2.5Y 4/2) sandy clay loam; common, medium, distinct mottles of olive gray (5Y 5/2) and common, medium, prominent mottles of reddish brown (5YR 4/4) and yellowish red (5YR 5/6); weak, medium, prismatic structure breaking to weak, fine, subangular blocky; few fine roots; common fine pores and dark-colored concretions; common very dark gray (10YR 3/1) organic stains; neutral; clear, smooth boundary.

IIC1g—50 to 59 inches, thinly stratified dark grayish-brown (2.5Y 4/2) sandy loam, light brownish-gray (2.5Y 6/2) very fine sandy loam, gray (5Y 5/1) silty clay loam, and very dark gray (10YR 3/1) clay loam; massive; friable and firm; few fine pores and roots; neutral; abrupt, smooth boundary.

IIC2—59 to 78 inches, dark reddish-brown (5YR 3/4) loamy sand that has strata of yellowish-brown (10YR 5/6) and grayish-brown (2.5Y 5/2) sand; single grained; loose; mildly alkaline.

The solum is 36 to 72 inches thick. This soil is slightly acid to moderately alkaline throughout. The A horizon is 24 to 48 inches thick and is very dark gray to black. The C horizon is stratified, and the individual layers range from clay loam to sand in shades of gray and brown.

Sikeston soils formed in the same kind of material that Gideon and Wardell soils formed in; in places they are near Roellen soils. Sikeston soils have a thicker A horizon than any of these soils. They are less acid than Wardell soils. They are less clayey than Roellen soils, but they have similar colors.

St—Sikeston sandy clay loam. This soil is in areas of inactive flood plains, depressions, and old channels. Runoff is very slow or nearly ponded, unless the soil is artificially drained. Areas of this soil are generally elongated and along ancient braided channels. They range from 100 to 1,000 acres in size. The slope is 0 to 1 percent.

Included with this soil in mapping are small areas of Cairo soils along the narrow drainageways and Gideon soils in the large depressions. Also included are areas of soils that have a surface layer of clay loam, loam, and sandy loam. These included soils have only a minor effect on the use and management of this soil.

Because runoff is very slow and because this soil has a high water table and is in low positions that are flooded, severe wetness is a problem. The main concern in management is providing artificial drainage. Landforming may improve runoff, except in areas where the water table is near the surface all year. This soil is productive if excess water is removed.

Plantings early in spring are risky because some areas are flooded. Soybeans is the major crop, but corn and cotton are also grown. Capability unit IIIw–1.

Tiptonville Series

The Tiptonville series consists of deep, nearly level, moderately well drained soils on natural levees. These soils formed in loamy alluvium on the higher, slightly convex places. The native vegetation was mixed hardwoods and tall grasses.

In a representative profile the surface layer is very dark grayish-brown fine sandy loam and silt loam 17 inches thick. The subsoil is friable dark yellowish-brown light silty clay loam and silt loam that is about 43 inches thick and that has a few grayish-brown mottles. The underlying material is brown silt loam that has grayish-brown mottles.

Permeability is moderate, and the available water capacity is very high. Natural fertility is high, and the organic-matter content is moderate. Runoff is slow.

Tiptonville soils are well suited to farming. Most areas are used for the common crops.

Representative profile of Tiptonville fine sandy loam, in a cultivated field, 450 feet south and 140 feet west of the northeast corner of the NW¼SE¼ sec. 20, T. 21 N., R. 13 E., about 1 mile northeast of Portageville.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) fine sandy loam, dark brown (10YR 3/3) crushed, grayish brown (10YR 5/2) dry; weak, medium, granular structure; very friable; many fine roots; slightly acid; abrupt, smooth boundary.

A12—6 to 17 inches, very dark grayish-brown (10YR 3/2) silt loam, gray (10YR 5/1) dry; weak, fine and medium, granular structure; friable; common fine roots and pores; neutral; gradual, wavy boundary.

B21t—17 to 29 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; few very dark grayish-brown stains and coatings; moderate, medium, prismatic structure breaking to moderate, medium, subangular blocky; friable; common fine roots and pores; thin patchy clay films on vertical and horizontal faces of peds; medium acid; gradual boundary.

B22t—29 to 39 inches, dark yellowish-brown (10YR 4/4) silt loam; few, fine, distinct, grayish-brown (2.5Y 5/2) mottles; weak, medium, prismatic structure breaking to weak, fine, subangular blocky; friable; few fine roots; many fine pores; patchy grayish-brown clay films on surfaces of peds and coatings on walls of pores; medium acid; gradual boundary.

B3—39 to 60 inches, dark yellowish-brown (10YR 4/4) silt loam; few, fine, distinct, grayish-brown (2.5Y 5/2) mottles; weak, fine, subangular blocky structure; friable; many fine pores and root holes; medium acid; gradual boundary.

C—60 to 79 inches, brown (10YR 4/3) silt loam; common, fine, distinct, grayish-brown (2.5Y 5/2) mottles; massive; friable; many fine pores and root holes; slightly acid.

The solum is 40 to 65 inches thick. The A horizon is 10 to 20 inches thick and is slightly acid or neutral. The B horizon is brown or dark yellowish brown and is strongly acid to slightly acid. It has few to common grayish-brown mottles in the lower part. The B horizon has a high content of very fine sand and silt particles. The C horizon is brown or grayish-brown silt loam, loam, or fine sandy loam. It is commonly slightly acid but ranges from medium acid to neutral.

Tiptonville soils are in landscape positions similar to those on which Bosket and Dubbs soils occur. Tiptonville soils have a darker colored surface layer than the Dubbs soils, and they contain less sand than Bosket soils.

Tp—Tiptonville fine sandy loam. This soil is on the high, nearly level positions of the natural levees. It occurs as small oval-shaped areas about 10 to 100 acres in size. Although small, most areas are conspicuous because they have a dark-colored surface. The slope is 0 to 2 percent.

Included with this soil in mapping are areas of a somewhat poorly drained soil that has dominantly grayish-brown colors throughout the subsoil. These areas make up about 10 percent of the acreage. Some are indicated on the map by symbols for wet spots.

There is no major problem in farming this soil. Some of the larger areas may benefit slightly from surface drainage because there are a few potholes. Most areas are small and are farmed and managed with the nearby soils. This soil is well suited to all common crops and to such deep-rooted crops as alfalfa. Capability unit I-1.

Wardell Series

The Wardell series consists of deep, poorly drained, nearly level soils on natural levees or old flood plains. The areas of these soils are above normal flooding. These soils formed in loamy alluvium that contained more than 15 percent finer or coarser sand. The native vegetation was mixed hardwoods.

In a representative profile the surface layer is very dark grayish-brown loam about 8 inches thick. The subsoil is mostly light brownish-gray, friable to firm sandy clay loam about 31 inches thick. The underlying material is layers of light gray, light brownish-gray, and dark-gray loamy sand and sandy clay loam.

The available water capacity is high. Natural fertility is medium, and the content of organic matter is low. Runoff is slow. Permeability is slow and is restricted because the material below a depth of 40 inches is stratified and clayey. Consequently there is a perched water table, and free water is in the solum during winter and spring and early in summer. Areas are above normal flooding.

Wetness is a moderate problem in using Wardell soils, but they are well suited to farming if excess water is removed. Almost all areas of these soils are cleared and are used for the common row crops.

Representative profile of Wardell loam, 150 feet north of gravel road and 45 feet west of levee in the SW¼SE¼ sec. 31, T. 25 N., R. 15 E., 3 miles north of Henderson Mound.

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak, fine, granular structure; friable; common fine roots and few dark-colored concretions; medium acid; abrupt, smooth boundary.

B1g—8 to 13 inches, light brownish-gray (2.5Y 6/2) light sandy clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine and medium, subangular blocky structure; friable; common fine roots and dark-colored concretions; few fine pores; strongly acid; clear, smooth boundary.

B21gt—13 to 28 inches, light brownish-gray (2.5Y 6/2) sandy clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/8) mottles; weak, fine, subangular blocky structure; friable; lower 3 inches is gray (10YR 6/1) sandy loam that has weak, fine, granular structure; common fine roots; common, fine, dark-colored concretions; clay films line pores and thin patchy coatings are on surfaces of peds; strongly acid; abrupt, smooth boundary.

B23gt—28 to 39 inches, light brownish-gray (2.5Y 6/2) sandy clay loam; common, fine, distinct, strong-brown (7.5YR 5/6) and few, fine, prominent, red (2.5YR 4/6) mottles; moderate, medium, subangular blocky structure; firm; few fine roots and dark-colored concretions; thin patchy clay films and bridgings between sand particles and on surfaces of peds; very strongly acid; clear, smooth boundary.

IIC1g—39 to 42 inches, light-gray (10YR 7/1) loamy sand, few olive (5Y 5/3) streaks of clay loam; massive to single grained; very friable to loose; few fine roots; strongly acid; abrupt, smooth boundary.

IIC2g—42 to 60 inches, light brownish-gray (2.5Y 6/2) or gray (10YR 6/1) sandy clay loam; common, medium, distinct, yellowish-red (5YR 5/6) and light olive-brown (2.5Y 5/4) mottles; weak, medium and fine, subangular blocky structure; friable; few fine pores and roots; medium acid; clear, smooth boundary.

IIIC3g—60 to 70 inches, stratified dark-gray (N 4/0) sandy clay loam and grayish-brown (2.5Y 5/2) loam; few, medium, distinct, brown (7.5YR 4/4) mottles; massive; friable; slightly acid.

The solum is 35 to 50 inches thick. The A horizon is very dark gray, very dark grayish brown, or dark brown and strongly acid to slightly acid. The B horizon is mainly sandy clay loam, loam, or clay loam, but subhorizons of sandy loam or light clay are not uncommon. The B horizon is gray, light brownish gray, or olive gray and very strongly acid to medium acid. The C horizon consists of stratified material ranging from clay to sand and is commonly sandier with increasing depth. It is strongly acid to mildly alkaline.

Wardell soils formed in material of the same kind as that in which Gideon and Sikeston soils formed, and they are near Dundee and Lilbourn soils. Wardell soils are more acid than Gideon and Sikeston soils, and their subsoil has clay films. They contain more sand and are slightly grayer than Dundee soils, and they are less sandy than the Lilbourn soils.

Wr—Wardell loam. This soil is in low, flat areas of natural levees and old flood plains. Areas of this soil vary in shape, and they range from small to a thousand acres or more in size. The slope is 0 to 1 percent.

Included with this soil in mapping are areas of a somewhat poorly drained soil that is similar to Wardell loam, but it has a grayish-brown subsoil. These areas make up about 20 percent of the acreage. Numerous sand spots occur in some areas where the surface layer is sandy loam and loamy sand. Also included are a few areas where the surface layer is sandy clay loam and clay loam. The included areas have little effect on the use and management of Wardell loam.

Wetness is the major problem in using this soil. Landforming is a favorable practice for eliminating potholes and providing quick, even surface drainage. Other management is needed to minimize plowpan development and to supply lime and fertilizer. This soil responds well to good management.

This soil is used almost exclusively for row crops. Capability unit IIw-1.

Use and Management of the Soils

This section discusses the use and management of soils in New Madrid County for crops, explains the system of capability grouping used by the Soil Conservation Service, and discusses the management of soils by capability units. Predicted yields of the principal crops are given. Also discussed is the management of soils for woodland and wildlife. The properties and features that affect use of the soils for recreation and engineering works are listed, mainly in tables.

Crops

Soils of New Madrid County are used mainly for cultivated crops. About 80 percent of the county is used for crops that need seasonal cultivation. Soybeans, corn, cotton, and wheat are the principal crops. Grain sorghum, sunflowers, rice, alfalfa, watermelons, and vegetables are also grown. Rye and vetch are grown for cover, pasture, and green manure, mainly on sandy soils. Less than 1 percent of the county is in permanent pasture (fig. 13).

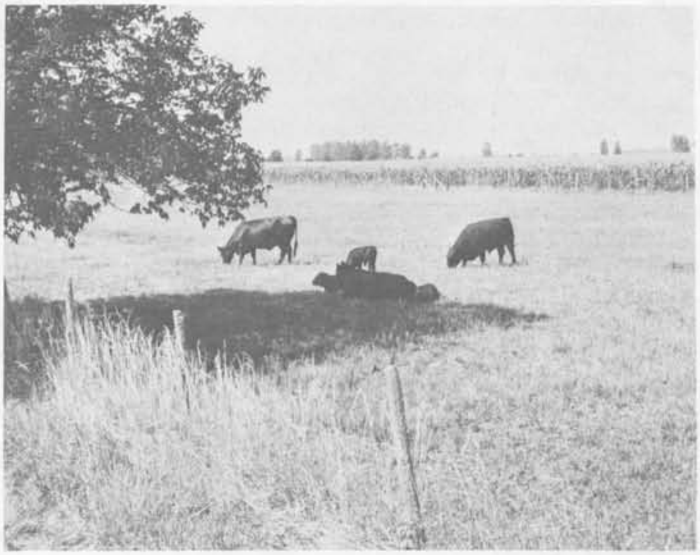


Figure 13.—Most pastures in this county are small and are near the homestead or along levees, borrow pits, and wet areas. This pasture is in an area of Wardell loam.

The basic management needs that apply to all cultivated soils in New Madrid County are maintaining a high level of fertility consistent with the needs of the crop; returning crop residue and incorporating it into the soil; and keeping tillage to a minimum to avoid the breakdown of soil structure. Other practices needed are providing drainage, controlling soil losses and sedimentation, applying supplemental water to crops, controlling pollution, and conserving moisture on droughty soils.

Drainage is provided mainly by open ditches and by landforming. Tile drainage does not work well because the soils have slow permeability and a high water table. Major outlet ditches are provided and maintained by legal drainage districts (fig. 14). Field ditches, tall ditches, and landforming are used to divert runoff. Wetness is a severe problem on Acadia, Alligator, Cairo, Forestdale, Gideon, Roellen, Sharkey, and Sikeston soils, and there is some wetness hazard on 84 percent of the county acreage.

Among the measures that help to control erosion are cover crops, stripcropping, contour farming, minimum tillage, windbreaks, diversions, terraces, waterways, crop residue, and mechanical structures. A small acreage of Bosket fine sandy loam, 1 to 5 percent slopes, and Broseley soils, 8 to 12 percent slopes, on Sikeston Ridge and other natural levees are subject

Figure 14.—Drainage ditches such as this, in an area of Gideon, Sharkey, and Sikeston soils, provide outlets for farm drainage.

to water erosion. Canalou and Crevasse soils are subject to soil blowing. Susceptibility to ditchbank erosion and, in graded fields, to sheet erosion, is less apparent, but where these kinds of erosion occur, ditch maintenance is a serious problem. Where drainage structures are used to release water from the field into major ditches, most siltation is eliminated.

Landforming eliminates potholes and insures uniform runoff, and as a result crop stands are even, yields are increased, and the surface of the field is improved for the application of irrigation water. Deep cuts permanently damage some soils because they remove the surface layer. Cooter and Crevasse soils especially are adversely affected, but nearly all soils are adversely affected for a short period both by cuts and by fills used in landforming. Building up fertility, tilth, and organic-matter content is the major concern in restoring productivity.

In most years, supplemental irrigation (fig. 15) is used to some extent. All soils, except Crevasse soils, are suited to furrow irrigation, but on Canalou soils the runs must be short. Only sprinkler irrigation can be used on Crevasse soils because of their sandy texture, rapid permeability, and low available water capacity. Supplemental irrigation is practical only if high crop yields can be expected. It is necessary that irrigated soils be provided with good drainage during the irrigation period and essential that they be otherwise well managed.

***Figure 15.*—Corn and soybeans may need supplemental irrigation for a short period every growing season. Gated pipe irrigates this corn on Gideon loam.**

Pollution abatement is aimed at controlling or maintaining the quality of soil and, closely related, the quality of the ground water and surface water. Controlling erosion is one of the main needs. Only minimum and necessary uses of agricultural chemicals should be made. Lagoons used for disposing of animal waste, sanitary landfills, and units for disposing of solid wastes should be designed so that the risk of contaminating surface water or ground water is minimized. Annual or periodic applications of commercial fertilizer should not greatly exceed the plant requirements for the immediate growing season. Ground-water contamination is potentially severe if the soil is rapidly permeable. Canalou and Crevasse soils are the only soils in New Madrid County that are rapidly permeable throughout the surface layer and subsoil.

Moisture conservation is helpful, especially on the droughty, sandy soils. Cover crops, crop residue, green manure crops, stripcropping, stubble mulching, and minimum tillage are among the measures that help to conserve moisture and protect the soils from blowing, especially the Canalou and Crevasse soils.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, forest trees, or engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed 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, defined as follows:

- Class I soils have few limitations that restrict their use.
- Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.
- Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.
- Class V soils are subject to little or no erosion but have other limitations, impractical to remove,

that limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat. (None in New Madrid County.)

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, water supply, or to esthetic purposes. (None in New Madrid County.)

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

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–4 or IIIe–6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Capability unit numbers generally are assigned locally but are a part of a statewide system. All of the units in the system are not represented by the soils of New Madrid County, and the capability unit designations in this county are not consecutive.

In the following pages the capability units in the county are described and suggestions for the use and management of the soils are given.

CAPABILITY UNIT I–1

This unit consists of nearly level, well drained and moderately well drained, loamy soils on natural levees and on the Mississippi River flood plain. The surface layer is silt loam, very fine sandy loam, and fine sandy loam.

These soils have a high and very high available water capacity. The organic-matter content is low to moderate, and the natural fertility is medium or high. Permeability is moderate, and runoff is slow. If these soils are continuously cultivated, a plow layer may form and restrict the downward movement of air, water, and roots. Unless they are protected by levees, the soils that have a surface layer of very fine sandy loam are subject to seasonal flooding, commonly late in winter or in spring before crops are planted.

Good management can easily overcome the minor limitations to use of these soils for farming. Among the management needs are maintaining organic-matter content and high fertility, using crop residue, and using minimum tillage. The use of winter cover crops and green-manure crops protects fields that are subject to soil blowing and improves and maintains tilth. All the soils in this unit are easy to till. Soil blowing is a minor problem on the fine sandy loams.

These soils are well suited to most crops commonly grown in the county. The major crops are corn, soybeans, cotton, wheat, rye, and vetch. Grain sorghum, sugar beets, vegetables, grasses, alfalfa, and fruits are suitable but not commonly grown. High yields can be expected from summer-growing annuals, cool-season annuals, and perennials.

CAPABILITY UNIT IIe–1

Bosket fine sandy loam, 1 to 5 percent slopes, is the only soil in this unit. It is a well-drained soil on natural levees.

The original surface layer has been partly removed in some sloping areas by sheet, rill, and gully erosion. This soil has a high available water capacity. The surface layer is dominantly acid in areas not limed. The organic-matter content is moderately low, and natural fertility is medium. Permeability is moderate, and runoff is medium. Erosion is the major hazard.

Cultivation across the slope and on the contour and the use of terraces, diversions, and mechanical structures shorten the slopes, slow and control runoff, and reduce soil losses. Close-growing perennial crops, such as grasses and legumes, also can be used effectively to control runoff and erosion. In some places, landforming is used to lessen the slope by cutting and filling. Among the management needs are preventing excessive losses of soil, reducing runoff and pollutants in the runoff, eliminating the siltation of ditches, and preserving the quality of soil, water, and other elements in this environment. This soil is easy to till.

This soil is suited to most crops commonly grown in the county. Corn, soybeans, and cotton are the major crops. High yields can be expected for summer-growing annuals, cool-season annuals, and perennials.

CAPABILITY UNIT IIw–1

This unit consists of nearly level, somewhat poorly drained and poorly drained, loamy soils on natural levees and the Mississippi River flood plain (fig. 16).

The surface layer is silty clay loam, silt loam, loam, and fine sandy loam. The organic-matter content is gen-

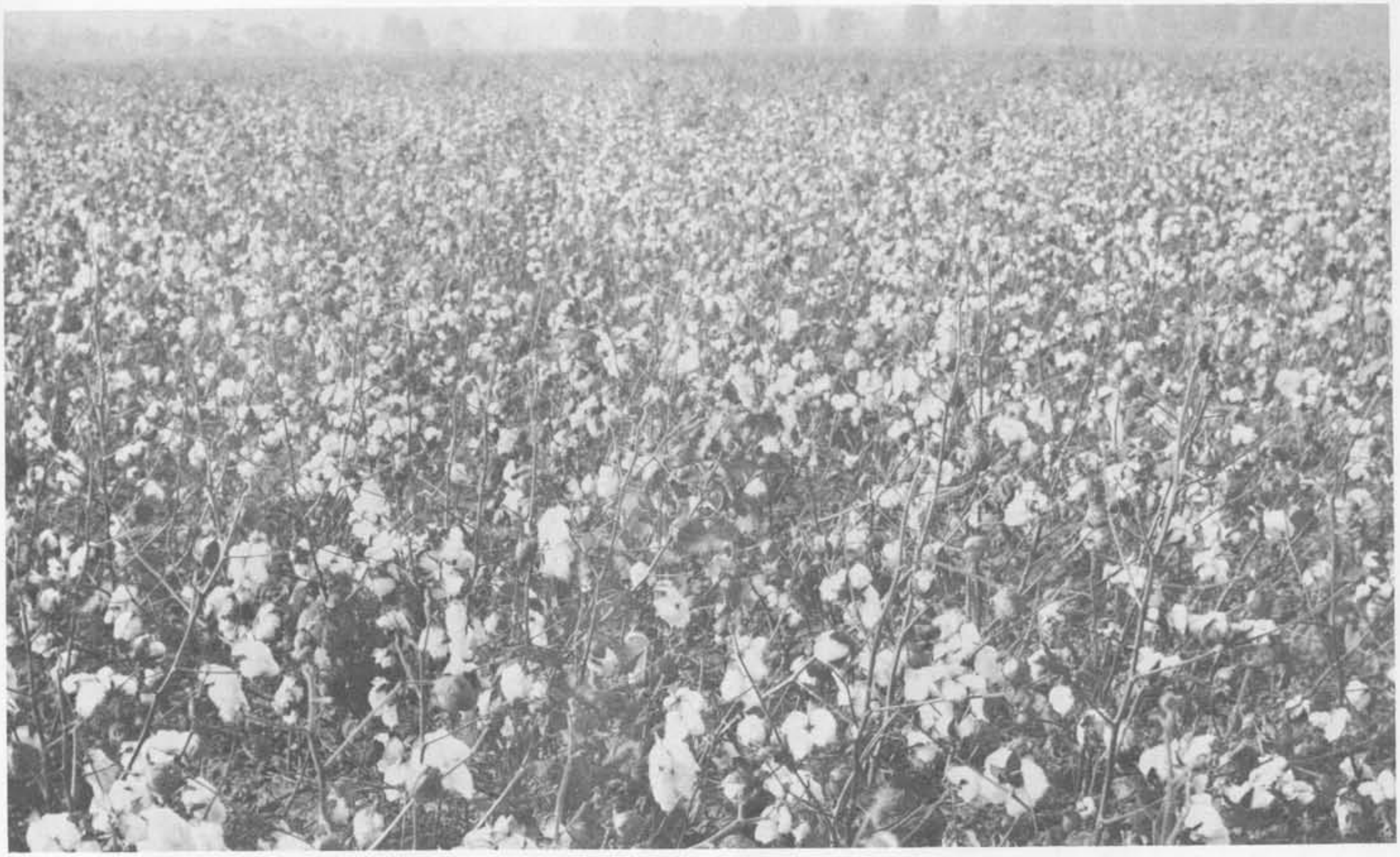


Figure 16.—**Cotton is an important crop in the county. This field yields nearly 700 pounds of lint per acre. The soil is Lilbourn fine sandy loam in capability unit IIw-1.**

erally low, and natural fertility is medium to high. Permeability is moderate to slow, the available water capacity is moderate to high, and runoff is slow.

Wetness is the major hazard caused by the moderate to slow permeability, slow runoff, and a fluctuating water table that saturates the soil for brief periods during winter and spring. Some soils have a surface layer of silt loam, and unless protected by levees they are subject to occasional flooding by the Mississippi River. Management needs include improving or maintaining organic matter and tilth. Surface drainage improved by the use of field ditches is generally adequate. Landforming is also used in some fields. Soil blowing is only a minor problem on fine sandy loams. Tillage and seedbed preparation are easy, except in areas of silty clay loam, where they are moderately difficult.

These soils are generally well suited to corn, cotton, soybeans, and small grain. If excess water is removed, high yields can be expected for summer-growing annuals, cool-season annuals, and most perennials. The growth of deep-rooted perennial crops is slightly retarded by the wetness. Some crops, such as alfalfa and orchard trees, are not water tolerant, but yields can be expected to range from moderate to high if areas are adequately drained.

CAPABILITY UNIT IIw-2

This unit consists of nearly level, moderately well drained and somewhat poorly drained soils on bottom lands. These soils formed in clayey sediment underlain by loamy and sandy materials.

These soils have a low to high available water capacity. Organic-matter content is moderate to high, and natural fertility is medium to high. Permeability is slow in the upper part of the soil but moderate to rapid below. Runoff is slow.

Wetness is the major problem in using these soils, but the soils that have a sandy subsoil are also droughty. Because the surface layer is commonly silty clay, there are some problems with tillage and seedbed preparation. Unless protected by levees, some soils are subject to flooding. Surface drainage is provided by field ditches, but landforming is not commonly used. Deep cuts that expose sand are harmful, unless they are overcut and backfilled with good soil material.

These soils are not well suited to some crops because they are wet. Soybeans is the major crop. Cool-season annuals, such as wheat, are not commonly grown because the soils are wet during winter and spring. Some summer annuals, such as corn and cotton, generally have to be planted early, often before the soils dry. Moderate yields can be expected for perennial crops.

CAPABILITY UNIT IIs-1

This unit consists of nearly level, well drained and moderately well drained soils that formed in sandy and loamy alluvium. These soils are on natural levees. They have a surface layer of loamy fine sand and fine sandy loam.

Unless limed the surface layer of loamy fine sand is commonly acid. The organic-matter content is moderately low, and the natural fertility is medium. Permeability, governed by the subsoil, is moderately rapid and moderate. The available water capacity is moderate. The hazard of soil blowing is slight.

The major limitation to the use of these soils is droughtiness, because they have limited capacity to hold and supply water to plants. Among the management needs are conserving moisture, protecting the soil from blowing, maintaining tilth and keeping the soil open and porous. Stripcropping, cover crops, and minimum tillage are also helpful. Landforming and irrigation are used to increase crop yields. Both sprinkler and furrow irrigation are feasible. Control of soil blowing and plowpan formation is a minor problem. The soil that has a surface layer of loamy fine sand is easily tilled.

These soils are suited to most crops commonly grown in the county. High yields for all crops can be expected in years when rainfall is low. Supplemental irrigation can be used to insure consistently high yields.

CAPABILITY UNIT IIIw-1

This unit consists of nearly level, poorly drained, loamy soils on flood plains and in depressions of the bottom lands. The surface layer is clay loam, sandy clay loam, or loam.

These soils are slightly acid to mildly alkaline. Organic-matter content is moderately low to high, and the natural fertility is high. Permeability is moderately slow, and the available water capacity is high. Runoff is slow to very slow.

Wetness is the major problem in using and managing these soils. It is caused by the restricted movement of air and water through the soil, slow runoff, flooding, and a high water table. A plowpan forms if the soils are frequently cultivated. Among the management needs are surface drainage and maintenance of good tilth. Tillage and seedbed preparation are easy, except for some slight problem in the areas of clay loam. Landforming eliminates potholes and provides adequate uniform drainage. Irrigation is feasible, but except for occasional dry seasons, it increases yields only marginally.

These soils are well suited to most crops if excess water is removed. The common crops are soybeans, corn, and cotton. High yields can be expected for summer-growing annuals, but spring flooding may delay planting in some areas. Only moderate yields can be expected for cool-season annuals because the soil is occasionally flooded during the growing season. Moderate to high yields can be expected for perennial crops.

CAPABILITY UNIT IIIw-2

This unit consists of nearly level to depressional, poorly drained and somewhat poorly drained soils that formed in clayey and loamy alluvium. These soils are on natural levees. The surface layer is silty clay loam and silt loam. Unless limed, the surface layer is acid. The organic-matter content is low, and natural fertility is medium. Permeability is very slow, and the available water capacity is moderate. Runoff is slow to ponded.

Severe wetness is the major problem in using and managing these soils, and surface drainage is the greater need. Although soil drainage and permeability contribute to the problem of wetness, the lack of drainage outlets in some areas has the most severe effect on the use of these soils. Water from local runoff accumulates and stands for long periods of time. Landforming and irrigation are not well suited to these soils until surface drainage is adequate. The silt loam is easily tilled, but on the silty clay loam, tillage is moderately difficult.

These soils are moderately suited to crops if excess water is removed. The major crop is soybeans. Moderate yields can be expected for both annual and perennial crops if these soils are drained.

CAPABILITY UNIT IIIw-14

This unit consists of nearly level to depressional, poorly drained soils in backswamps, bottom lands, and former stream channels.

The surface layer is acid to alkaline. The organic-matter content is low to high, and natural fertility is medium to high. Permeability and runoff are very slow to slow, and the available water capacity is moderate. Runoff is slow, flooding is a hazard, and the water table is high.

Severe wetness is the major problem in using these soils and is caused by the restricted movement of air and water through the soil. Other problems are droughtiness, high shrink-swell potential, cracking when dry, poor aeration, and adverse physical conditions. Among the management needs are providing good surface drainage, maintaining good tilth, and using tillage methods that help prepare the seedbed. Tillage is difficult on these soils. Because these soils are plastic, firm, and clayey, they can be properly cultivated only within a narrow range of moisture content. These soils are plowed in fall so that wetting, drying, freezing, and thawing in winter, as well as shrinking and swelling, can crumble clods and help in seedbed preparation. Landforming is an efficient method of providing uniform drainage. Irrigation is feasible, if an adequate drainage system is established. Both sprinkler and surface irrigation can be used.

The choice of crops is somewhat restricted. Soybeans are by far the dominant crop, but rice and grain sorghum do well. Bermudagrass, fescue, white clovers, and vetch are suitable crops. Corn is poorly suited to these soils. Where excess water is removed, yields are moderate for most summer-growing annuals, but there tend to be only moderate yields of cool season annuals and some grasses and legumes. Low yields can be expected for deep rooted perennials.

CAPABILITY UNIT IIIs-1

This unit consists of nearly level, moderately well drained and excessively drained, sandy soils on natural levees and flood plains along the Mississippi River.

Unless protected by a levee, some areas are subject to flooding. The surface layer is loamy and sandy.

These soils generally are strongly acid to neutral. The organic-matter content is low, and natural fertility is medium to low. Permeability is rapid, the available water capacity is low, and runoff is slow.

Severe droughtiness is the major limitation to the use of these soils because the soils have a limited capacity for storing water that is available for plant use. Soil blowing is a minor problem on the loamy sands and a moderate problem on the sands. Among the management needs are conserving moisture, protecting the soil from blowing, maintaining tilth, and adding humus to the soil. The soils that have a loamy or sandy surface layer are easily tilled. Irrigation is feasible, but surface irrigation is restricted to short runs. In places landforming is a benefit in irrigated areas, but deep cuts are detrimental.

The choice of crops is somewhat restricted. Wheat and other winter crops are grown extensively. Soybeans, grain sorghum, early corn, and some truck crops are successfully grown. Moderate to high yields can be expected for cool-season annuals, which are grown in fall, winter, and spring. Moderate yields can be expected for perennials and summer-growing annuals because soil moisture is deficient in most years. These crops should be planted early in the season so they can mature before the dry period late in summer. Early-maturing varieties should be considered. Crop yields can double if the soils are irrigated and well managed.

CAPABILITY UNIT IVe-1

Broseley soils, 8 to 12 percent slopes, are the only soils in this unit. They are well-drained. They are on the escarpments of the natural levees. Some areas are scarred by sheet, rill, and gully erosion. The surface layer is mainly loamy fine sand to fine sandy loam.

Unless limed, the surface layer is acid. The organic-matter content is generally low, and natural fertility is medium. Permeability is moderately rapid, available water capacity is moderate, and runoff is medium.

Erosion is the major hazard because of the slope. Diversion terraces are used in some areas to intercept runoff and reduce erosion. A few fields have been reshaped by landforming, which is expensive; slope was reduced to 3 to 5 percent, and the length of slope was greatly extended. Among the management needs is control of erosion.

These soils are not well suited to cultivation. Most areas are in pasture or are idle, and only a small acreage is used for crops. The soils are suited to grasses, alfalfa, orchards, Christmas trees, and woodland. High yields can be expected for perennials and for most annual crops if erosion is adequately controlled.

CAPABILITY UNIT IVs-1

This unit consists of nearly level to gently undulating, excessively drained, sandy soils on natural levees and on flood plains along the Mississippi River. Near the river, unless protected by levees, the soils are subject to flooding. The surface layer is sand and loamy sand. These soils have a surface layer that is medium acid to alkaline. The organic-matter content and natural fertility are low. Permeability is rapid, the available water capacity is low, and runoff is slow.

Severe droughtiness is the major limitation to the use and management of these soils. The available water is seldom sufficient for growing common row crops unless the soils are irrigated. Soil blowing is a moderate problem. Particularly in irrigated areas, skilled and timely application of fertilizer is needed if leaching is to be prevented. Tillage is difficult, because when dry, the loose sand has poor trafficability. Among the management needs are conserving moisture, protecting the soil from blowing, using cover crops and crop residue, and supplying adequate water where row crops are grown. Sprinkler irrigation can be used, but methods of applying irrigation water on the surface are not generally workable because the water is lost through the soil. The benefits from landforming are not generally equal to the cost. Areas where the topsoil has been removed are difficult to vegetate and are subject to severe soil blowing.

The choice of crops and the use of the soils in this unit are severely limited. The major crops are wheat, rye, soybeans, grain sorghum, and watermelons. The soils are suited to specialty crops, such as cantaloupe, watermelons, Irish potatoes, onions, and peanuts. Among the suitable grasses are sudangrass, bermudagrass, tall fescue, and some native grasses. These soils are poorly suited to summer-growing annuals, except in irrigated areas where moderate to high yields can be expected. Low yields can be expected for these annuals in dryfarmed areas. Moderate yields can be expected for cool-season annuals and most perennials.

CAPABILITY UNIT Vw

This unit consists of Sandy alluvial land and Borrow pits. These miscellaneous areas are subject to flooding by the Mississippi River or runoff from higher areas. The soil materials are loamy and sandy.

The organic-matter content is low or very low, and natural fertility is low to high. Permeability is moderately slow to rapid, the available water capacity ranges from low to high, and runoff is slow or ponded.

Wetness caused by frequent flooding is the main limitation. The areas are not suited to field crops because they are flooded during the cropping season. They are best suited to pasture, woodland, and wildlife habitat. Most areas are either in pasture or covered by a young stand of willow and cottonwood trees. Bermudagrass, johnsongrass, tall fescue, and dallisgrass are suitable pasture grasses for some areas. Oak, sweetgum, cottonwood, water tupelo, and baldcypress are the best suited trees. Some of the sand bars, which are unstable, have natural esthetic value.

CAPABILITY UNIT VIs-1

Crevasse loamy sand, 4 to 12 percent slopes, is the only soil in this unit. It is excessively drained and is on natural levees. The surface layer is loamy sand.

The surface layer of this soil is commonly medium acid or slightly acid. The organic-matter content and natural fertility are low. Permeability is rapid, and the soil absorbs most of the rainfall with little or no runoff. The available water capacity is low.

Severe droughtiness is the major problem in using this soil. This soil is exposed to prevailing winds, and severe soil blowing is likely unless a cover is maintained. Few to many blowouts occur in cultivated areas. Special management is needed to conserve moisture, protect the soil from blowing, and maintain a cover. Sprinkler irrigation is feasible, but surface irrigation is not. Landforming would facilitate the movement of machinery but, otherwise, would not be of much benefit. Soil conditions are such that leaching and rapid loss of soluble plant nutrients can be expected. The frequency of application and the kind and amount of fertilizer used are important factors in managing this soil for crops. Tillage is difficult because trafficability is poor when this sandy soil is dry and loose.

The choice of crops is so limited that the soil is hard to manage. The major crops are wheat, rye and vetch, trees, and some soybeans and grain sorghum. Some areas are used for pasture and others for building sites; some are quarried for sand, and some are idle.

In dryfarmed areas, where soils are best suited to perennials, low to moderate yields can be expected. Bermudagrass, rough buttonweed, (poorjo), broomsedge, and, in some places, little bluestem commonly grow in idle fields.

Most summer annuals can be grown only in irrigated areas. Broomcorn, watermelon, and some truck crops also can be grown. Even in irrigated areas, yields for the common row crops cannot be expected to be more than moderate.

In some areas Bermudagrass and tall fescue have been grown for pasture. For summer pasture or hay, native grasses, such as little bluestem, big bluestem, switchgrass, Indiangrass, and other desirable and palatable grasses can be grown if the soils are correctly managed.

Predicted yields

Yields for the principal crops grown in New Madrid County are given in table 2. These predicted yields are for crops grown under a high level of management. Yields vary from year to year depending on weather and the level of management used. In this county yields range from 20 percent less than those shown in table

TABLE 2.—*Predicted average yields per acre of principal crops*

[Figures indicate yields obtained under a high level management. Absence of a figure indicates that the crop is not commonly grown on the soil or is not suited to that soil. Borrow pits and Sandy alluvial land generally are not used for cultivated crops and are not listed]

Soil	Corn	Soybeans	Cotton (lint)	Rice	Wheat	Fescue and legumes
	Bu	*Bu*	*Lb*	*Bu*	*Bu*	*AUM* [1]
Acadia silt loam, loamy substratum	65	28	400	95	27	6.0
Alligator silty clay loam	50	32	600	120	34	9.0
Alligator clay	...	30	550	120	32	8.0
Bosket fine sandy loam, 0 to 1 percent slopes	96	40	800	...	50	9.0
Bosket fine sandy loam, 1 to 5 percent slopes	90	35	750	...	48	9.0
Bowdre silty clay	88	35	650	...	38	8.0
Broseley loamy fine sand, 0 to 2 percent slopes	80	35	600	...	40	9.0
Broseley soils, 8 to 12 percent slopes	68	25	550	...	30	8.0
Cairo clay	55	25	500	...	...	7.0
Canalou loamy sand	60	25	400	...	35	6.4
Caruthersville very fine sandy loam	110	45	825	...	48	9.0
Commerce silt loam	100	40	900	...	44	10.0
Commerce silty clay loam	90	40	850	...	42	10.0
Cooter silty clay	70	25	400	...	...	7.2
Crevasse sand, 0 to 3 percent slopes	...	...	...	...	...	4.5
Crevasse loamy sand, 0 to 4 percent slopes	...	...	...	...	20	5.0
Crevasse loamy sand, 4 to 12 percent slopes	...	...	...	...	...	4.5
Crevasse loam, overwash, 0 to 3 percent slopes	60	26	450	...	28	5.5
Dubbs silt loam	96	38	800	...	46	10.0
Dundee silt loam	92	38	735	...	42	9.5
Dundee silty clay loam	90	38	700	...	40	9.0
Farrenburg fine sandy loam	100	38	700	...	40	8.8
Forestdale silt loam	62	34	550	...	...	7.0
Forestdale silty clay loam	58	32	500	...	...	6.0
Gideon loam	95	38	750	...	38	9.0
Gideon clay loam	90	36	725	...	36	8.5
Lilbourn fine sandy loam	90	36	650	...	38	8.2
Roellen clay	65	30	500	120	28	8.0
Sharkey silty clay loam	54	35	500	120	38	5.0
Sharkey clay	...	30	450	120	34	5.0
Sikeston sandy clay loam	100	38	690	...	40	9.0
Tiptonville fine sandy loam	110	42	725	...	50	9.6
Wardell loam	90	35	735	...	40	9.0

[1] AUM is animal-unit-month, a term used to express the carrying capacity of pasture. It is the number of animal units per acre a pasture can carry each month without injury to the sod. An acre of pasture that provides 1 month of grazing for 1 cow, 1 horse, 7 sheep, or 5 hogs has a carrying capacity of 1 animal-unit-month.

2 to 20 percent more. A high level of management includes (1) following a proper cropping sequence, (2) using crop residue, (3) using minimum tillage, (4) providing adequate surface drainage, (5) applying fertilizer and lime as indicated by soil tests, (6) planting suited varieties at proper rates. (7) controlling weeds and insects, and (8) using supplemental irrigation during droughts. Landforming is needed in many fields to provide surface drainage and apply irrigation water.

The predictions are based on yields by farmers and field experiments, observations of the soil scientists who made the survey, estimates of professional agronomists, and comparisons with published yields in nearby counties and other states where these soils occur.

Woodland [2]

In 1970 about 15,500 acres, or 4 percent of the county, remained in woodland. Many of these wooded tracts are in areas outside the levee adjacent to the Mississippi River. Some smaller tracts of timber are growing where the soils are not suited to farm crops.

About 3,855,000 board feet of timber was harvested in 1969 in New Madrid County according to a statewide 1969 survey. The survey was made by the Missouri Department of Conservation and was based on estimates of sawmill owners and operators. The soils used for woodland are mainly in the Caruthersville, Commerce, Crevasse, Forestdale, Gideon, and Sharkey series, but in a few areas, trees are grown on other soils.

The soils have been placed in woodland suitability groups (*12*, *13*) in table 3. These groups help in planning for the use of the soils for wood crops. Each group is made up of soils that are suited to the same kinds of trees, that need approximately the same kind of management if the vegetation is similar, and that have about the same potential productivity.

Each woodland group is identified by a three-part symbol, such as 1o4, 2w6, or 3s9. The first part of the symbol, always a number, indicates relative potential productivity of the soils in the group: 1 is very high; 2 is high; 3 is moderately high; 4 is moderate; and 5 is low. These ratings are based on site index. Site index is the height, in feet, that the dominant trees of a given species reach in a natural, unmanaged stand in a stated number of years. For cottonwood it is the height reached in 30 years, but for other merchantable timber the height reached in 50 years. Site indexes for this survey were determined by field measurements.

The second part of the symbol for a woodland group is a small letter. This letter indicates an important

[2] FRANCIS T. HOLT, forester, Soil Conservation Service, helped prepare this section.

TABLE 3.—*Soils rated*

Woodland suitability group and map symbols	Potential productivity			Management hazards or limitations
	Kinds of trees	Site index	Average growth each year	Seedling mortality
			Bd ft per acre	
Group 1o4: Ce. Moderately well drained loamy soils; very high available water capacity; no serious restrictions for woodland use and management; very high potential productivity; suited to southern hardwoods.	Cottonwood	120	820	Slight
Group 1o5: Cm, Cn. Somewhat poorly drained loamy soils; high available water capacity; moderate wetness; very high potential productivity; best suited to southern hardwoods.	Cottonwood Sweetgum	110 98	700 ------	Slight
Group 1w6: Fs, Ft, Sh, Sr. Poorly drained soils; high content of clay in subsoil; moderate available water capacity; severe wetness; very high potential productivity; best suited to southern hardwoods.	Red oak Pin oak	101 96	580 ------	Moderate
Group 2w6: Gd, Ge. Poorly drained loamy soils; high available water capacity; severe wetness; high potential productivity; best suited to southern hardwoods.	Sweetgum Pin oak	95 95	580 ------	Moderate
Group 3s9: CsB, CsC. Excessively drained sandy soils; low available water capacity; restricted trafficability; low available plant nutrients; moderately high productivity; best suited to hardwoods but does produce southern pines.	Black oak	67	250	Severe

soil property that shows a slight to severe hazard or limitation in managing the soils of the group for wood crops. The letter *o* shows that the soils have few limitations that restrict their use for trees; *w* shows that water in or on the soil, either seasonally or year round, is the chief limitation; and *s* indicates soils that have restrictions or limitations for woodland use or management because they contain sand.

The third part of the symbol shows the degree of hazard or limitation and general suitability for using the soils for certain kinds of trees.

The numeral *1* indicates that the soils have no or only slight limitations for use and are best suited to coniferous trees.

The numeral *2* indicates that the soils have one or more moderate limitations and are best suited to coniferous trees.

The numeral *3* indicates that the soils have one or more severe limitations and are best suited to coniferous trees.

The numeral *4* indicates that the soils have no or only slight limitations and are best suited to deciduous trees.

The numeral *5* indicates that the soils have one or more moderate limitations and are best suited to deciduous trees.

The numeral *6* indicates that the soils have one or more severe limitations and are best suited to deciduous trees.

The numeral *7* indicates that the soils have no or only slight limitations and are best suited to coniferous or deciduous trees.

The numeral *8* indicates that the soils have one or more moderate limitations and are best suited to coniferous or deciduous trees.

The numeral *9* indicates that the soils have one or more severe limitations and are best suited to coniferous trees.

The hazards or limitations that affect management of soils for woodland are seedling mortality, hazard of erosion, hazard of windthrow, plant competition, and equipment limitations. They are shown for each group in table 3 and are discussed in the following paragraphs.

Seedling mortality refers to the losses of naturally occurring or planted seedlings that may be expected. Soil features that affect seedling mortality are soil texture, depth, drainage, risk of flooding, height of the water table, and degree of erosion. Mortality is *slight* if expected loss is less than 25 percent, *moderate* if between 25 and 50 percent, and *severe* if more than 50 percent.

The hazard of erosion shown in table 3 can be expected in woodland where the level of management used

for woodland use

Management hazards or limitations—Continued				Preferred trees—	
Erosion	Windthrow	Plant competition	Equipment restrictions	In existing stands	For planting
Slight	Slight	Moderate	Slight	Cottonwood	Cottonwood, green ash, sweetgum, and sycamore.
Slight	Slight	Moderate	Slight	Cottonwood and sweetgum.	Cottonwood, sweetgum, green ash, and sycamore.
Slight	Moderate	Severe	Severe	Red oak, green ash, and cypress.	Green ash, sweetgum, sycamore, and cypress.
Slight	Moderate	Severe	Severe	Sweetgum	Sweetgum, cypress, green ash, and sycamore.
Slight	Slight	Slight	Moderate	Upland oaks and shortleaf pine.	Shortleaf pine, pecan, and sycamore.

in managing and harvesting trees is average. It is *slight* if erosion control is not an important concern, *moderate* if some management is needed to reduce soil losses, and *severe* if intensive special management is needed.

The hazard of windthrow indicates the risk that trees will blow over in the high winds that generally occur. The hazard is *slight* if windthrow is of no special concern; *moderate* if roots hold the trees firmly, except when the soil is excessively wet or when the wind is strongest; and *severe* if the root zone is shallow.

Plant competition indicates the degree to which undesirable plants can be expected to invade or hinder the establishment and growth of desirable plants. *Slight* means that competition from other plants is no special concern, *moderate* means that plant competition develops but generally does not prevent an adequate stand from becoming established, and *severe* means that plant competition prevents trees from restocking naturally.

Equipment restrictions are based on limitations imposed by the degree that soil and topographic features adversely affect the general use of equipment in tending a crop of trees. Among unfavorable soil characteristics are drainage, slope, stoniness, and soil texture, but slope and stoniness do not affect woodland production in New Madrid County. The limitation is *slight* if there is little or no restriction of the type of equipment that can be used or the time of year the equipment can be used; *moderate* if the use of equipment is seasonally limited or if modified equipment or methods of harvesting are needed; *severe* if special equipment is needed or if the use of such equipment is severely restricted by one or more unfavorable soil characteristics.

Wildlife

The number of wildlife in New Madrid County has declined because the soils are now used for clean-tilled crops instead of the large forests and wetlands that once supported many kinds of wildlife. The level, open fields are broken only by ditches, roads, a few fences, levees, borrow pits, and bayous. Cottontail rabbits, mourning dove, and migrating waterfowl are plentiful in some parts of the county. Wild turkeys have been stocked and maintained with some success, but the extent of their habitat is very limited. Mink, muskrat, and raccoon live near some water areas.

White-tailed deer, wolves, foxes, swamp rabbits, bobwhite quail, and others that were once abundant are now rare. Other kinds, such as bear and bobcat, are gone.

Planning wildlife habitat for maximum use and production requires that certain areas be designated for the production or preservation of wildlife habitat. Permanent food, cover, and runways are necessary parts of a wildlife habitat. The present land use provides few, if any, permanent habitat elements. Odd areas, ditch banks, wet areas, fence rows, borrow pits, bayous, levees, and small woodlots can be used to attract and support wildlife.

In table 4 the suitability of soils in the county for development as wildlife habitat is shown. Effective depth, surface texture, natural drainage class, flooding, slope gradient, permeability, and available water capacity were considered. The existing vegetation, the present land use, the size, shape, and location of the area, and the movement of wildlife from place to place were not considered.

The terms used to show suitability are good, fair, poor, and very poor. *Good* indicates that wildlife habitat generally can be created, improved, or maintained, that few or no soil limitations affect wildlife habitat management, and that satisfactory results can be expected. *Fair* indicates that wildlife habitat generally can be created, improved, or maintained, but there are moderate soil limitations that affect wildlife habitat management. Moderately intense management and fairly frequent attention are needed to assure satisfactory results. *Poor* indicates that wildlife habitat generally can be created, improved, or maintained on these soils, but that soil limitations are severe. Wildlife habitat management is difficult and expensive, or it requires intensive effort. *Very poor* indicates that attempting to create, improve, or maintain wildlife habitat is not practical.

Most managed wildlife habitats are created, improved, or maintained by planting suitable vegetation, manipulating existing vegetation, helping the natural establishment of desired plants, or a combination of these. The eight elements of wildlife habitat and the three main classes of wildlife are discussed in the following paragraphs.

Grain and seed crops are grain or seed-producing annuals planted to produce food for wildlife. Among these crops are corn, soybeans, wheat, oats, millet, and sorghum.

Domestic grasses and legumes are domestic perennial grasses and herbaceous legumes planted to provide wildlife cover and food. Among these plants are fescue, brome, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, alfalfa, and lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses and weeds that provide food and cover, principally to upland forms of wildlife, and that are established mainly through natural processes. Among these plants are big bluestem, little bluestem, some panicums, partridge peas, beggarticks, and native lespedeza.

Hardwoods are deciduous trees, shrubs, and woody vines that produce fruit, nuts, buds, catkins, twigs, or foliage used extensively as food by wildlife. These trees are commonly established through natural processes, but they also may be planted. Among these are dogwood, sumac, sassafras, persimmon, hazelnut, shrub lespedezas, wild cherry, autumn-olive, oak, hickory, grape, plum, blackberry, blackhaw, honeysuckle, and roses.

Wetland food and cover plants are annual and perennial wild herbaceous plants in moist to wet sites. Wetland plants produce food or cover used mainly by wetland kinds of wildlife. Among these plants are smartweed, bulrush, barnyard grass, duckweed, pondweed, pickerelweed, cattail, and various sedges, but not floating or submerged aquatics.

Shallow water developments are impoundments or excavations, for controlling water, that generally are

TABLE 4.—*Suitability of soils for elements of wildlife habitat and kinds of wildlife*

Soil series and map symbols	Elements of wildlife habitat						Kinds of wildlife		
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous upland plants	Hardwoods	Wetland food and cover plants	Shallow water developments	Openland	Woodland	Wetland
Acadia: Ad	Fair: wetness.	Good	Good	Good	Good	Fair [1]	Good	Good	Good.
Alligator: Ag, At	Poor: wetness.	Fair: wetness.	Fair: wetness.	Fair: wetness.	Good to poor: surface texture.	Good	Fair	Fair	Good to fair.
Borrow pits:[2] Bp	Fair: wetness; available water capacity.	Fair: wetness.	Fair: wetness.	Good	Good	Fair: soil permeability.	Fair	Good	Fair.
Bosket: BtA, BtB	Good	Good	Good	Good	Poor: soil drainage; slope.	Poor: soil drainage; soil permeability; slope.	Good	Good	Poor.
Bowdre: Bw	Fair: surface texture.	Fair: surface texture.	Fair: surface texture.	Good	Poor: surface texture.	Fair: soil drainage; soil permeability.	Fair	Good	Poor.
Broseley: ByA, ByC	Fair: texture, slope.	Good	Good	Good	Poor: soil drainage; slope.	Very poor: soil drainage; slope.	Good	Good	Poor.
Cairo: Ca	Poor: wetness.	Fair: surface texture; wetness.	Fair: surface texture; wetness.	Fair: wetness.	Poor: surface texture.	Good	Poor	Fair	Fair.
Canalou: Cd	Poor: surface texture.	Fair: surface texture.	Good	Good	Poor: soil drainage.	Poor: soil drainage; soil permeability.	Fair	Good	Poor.
Caruthersville: Ce	Good	Good	Good	Good	Poor: soil drainage.	Poor: soil drainage.[3]	Good	Good	Poor.
Commerce: Cm, Cn	Fair: wetness.	Good	Good	Good	Fair: soil drainage.	Fair: soil drainage; soil permeability.[1]	Good	Good	Fair.
Cooter: Co	Fair: surface texture.	Fair: surface texture.	Fair: surface texture.	Good	Poor: surface texture; soil drainage.	Poor: soil drainage; soil permeability.	Fair	Fair	Poor.
Crevasse: CrA, CsB, CsC, CvA.	Poor: surface texture; soil drainage.	Poor: soil drainage.	Fair: soil drainage.	Poor: soil drainage.	Very poor: soil drainage.	Very poor: soil drainage class; soil permeability.	Poor	Poor	Very poor.
Dubbs: Db	Good	Good	Good	Good	Poor: soil drainage.	Poor: soil drainage.[3]	Good	Good	Poor.
Dundee: De, Dn	Fair: wetness.	Good	Good	Good	Fair: soil drainage.	Fair: soil drainage; soil permeability.	Good	Good	Fair.
Farrenburg: Fa	Good	Good	Good	Good	Poor: soil drainage.	Poor: soil drainage.[3]	Good	Good	Poor.

TABLE 4.—*Suitability of soils for elements of wildlife habitat and kinds of wildlife*—Continued

Soil series and map symbols	Elements of wildlife habitat: Grain and seed crops	Domestic grasses and legumes	Wild herbaceous upland plants	Hardwoods	Wetland food and cover plants	Shallow water developments	Kinds of wildlife: Openland	Woodland	Wetland
Forestdale: Fs, Ft	Poor: wetness.	Fair: wetness.	Fair: wetness.	Fair: wetness.	Good	Good	Fair	Fair	Good.
Gideon: Gd, Ge	Fair: wetness.	Fair: wetness.	Fair: wetness.	Fair: wetness.	Good	Fair: soil permeability.[1]	Fair	Fair	Fair.
Lilbourn: Lb	Fair: wetness.	Good	Good	Good	Fair: soil drainage.	Fair: soil drainage; soil permeability.	Good	Good	Fair.
Roellen: Ro	Poor: wetness.	Fair: surface texture; wetness.	Fair: surface texture; wetness.	Fair: wetness.	Poor: surface texture.	Good	Fair	Fair	Fair.
Sandy alluvial land: Sa.	Very poor: flooding.	Poor: surface texture; flooding.	Poor: flooding.	Poor: flooding; soil drainage.	Very poor: soil drainage.	Very poor: soil permeability; soil drainage.	Poor	Poor	Very poor.
Sharkey: Sh, Sr	Poor: wetness.	Fair: wetness; surface texture.	Fair: wetness; surface texture.	Fair: wetness.	Poor: surface texture.	Good	Fair	Fair	Fair.
Sikeston: St	Fair: wetness.	Fair: wetness.	Fair: wetness.	Fair: wetness.	Good	Fair: soil permeability.[1]	Fair	Fair	Fair.
Tiptonville: Tp	Good	Good	Good	Good	Poor: soil drainage.	Poor: soil drainage.[3]	Good	Good	Poor.
Wardell: Wr	Fair: wetness.	Fair: wetness.	Fair: wetness.	Fair: wetness.	Good	Good	Fair	Fair	Good.

[1] The suitability of these soils is good, if periodic pumping from a shallow well is used to maintain the level of water.
[2] Soil conditions are variable; suitability ratings reflect the primary conditions.
[3] The suitability of these soils is fair if periodic pumping from a shallow well is used to maintain the level of water.

not more than 5 feet deep. Examples are low dikes and levees; shallow dugouts, such as borrow pits along highways and levees; level ditches; and devices for controlling the water level in marshy streams or channels.

Coniferous woody plants—pine, spruce, redcedar, juniper, and other cone-bearing trees and shrubs—are not shown in table 4 because they are not native to the county and plantings are inadequate for evaluating their performance on most soils.

Openland wildlife consists of birds and mammals that generally inhabit cropland, pasture, lawns, and areas overgrown by grasses, herbs, and shrubs. For example, there are bobwhite quail, mourning dove, meadowlark, field sparrow, killdeer, redwinged blackbird, cottontail rabbit, and red fox.

Woodland wildlife consists of birds and mammals that generally inhabit areas wooded with hardwood trees and shrubs, coniferous trees and shrubs, or mixtures of such plants. Examples are woodcock, thrush, vireo, scarlet tanager, woodpeckers, turkey, squirrel, gray fox, whitetailed deer, and raccoon.

Wetland wildlife consists of birds and mammals that generally inhabit such wet areas as ponds, marshes, and swamps. Examples are duck, geese, heron, rails, kingfishers, mink, muskrat, and beaver.

Recreation

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 5 the degree and kind of limitation that affects the use of soils for camp areas, playgrounds, picnic areas, paths and trails, and golf fairways are given.

In table 5 the degrees of limitation are expressed as slight, moderate, severe, and very severe. For all of these degrees of limitation, it is assumed that a good cover of vegetation can be established and maintained. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they can easily be overcome. *Moderate* means that the limitations can be overcome or modified by planning, by design, or by special maintenance. *Severe* means

TABLE 5.—*Degree and kind of limitations for recreation uses*

Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails	Golf fairways
Acadia: Ad	Severe: local flooding; somewhat poorly drained; very slow permeability.	Severe: local flooding; seasonal high water table; somewhat poorly drained; very slow permeability.	Moderate to severe: local flooding; somewhat poorly drained; seasonal high water table.	Moderate to severe: local flooding; somewhat poorly drained; seasonal high water table.	Moderate to severe: local flooding; occasional ponding.
Alligator: Ag, At	Severe: very slow permeability; poorly drained.	Severe: very slow permeability; poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained; cracks when dry.
Borrow pits: Bp	Severe: wetness; ponding.	Severe: wetness; seasonal high water table; ponding.	Severe: wetness; seasonal high water table; ponding.	Severe: wetness; seasonal high water table; ponding.	Severe: wetness; ponding.
Bosket:					
BtA	Slight	Slight if slope is 0 to 1 percent. Moderate if slope is 1 to 5 percent.	Slight	Slight	Slight.
BtB	Slight	Slight if slope is 0 to 1 percent. Moderate if slope is 1 to 5 percent.	Slight	Slight	Slight.
Bowdre: Bw	Severe: somewhat poorly drained; seasonal high water table; clayey surface.	Severe: somewhat poorly drained; seasonal high water table; clayey surface.	Severe: clayey surface.	Severe: clayey surface.	Moderate: clayey surface.
Broseley:					
ByA	Slight	Slight	Slight	Slight	Slight.
ByC	Moderate: slope	Severe: slope	Moderate: slope	Slight	Moderate: slope.
Cairo: Ca	Severe: poorly drained; seasonal high water table; subject to flooding; very slow permeability; clayey surface.	Severe: poorly drained; seasonal high water table; subject to flooding; very slow permeability; clayey surface.	Severe: poorly drained; seasonal high water table; subject to flooding; clayey surface.	Severe: poorly drained; seasonal high water table; subject to flooding; clayey surface.	Severe: poorly drained; subject to flooding; cracks when dry.
Canalou: Cd	Moderate: seasonal high water table; loamy sand surface.	Moderate: seasonal high water table; loamy sand surface.	Moderate: seasonal high water table; loamy sand surface.	Moderate: seasonal high water table; loamy sand surface.	Moderate: loamy sand surface.
Caruthersville:[1] Ce	Severe: occasional flooding during period of use.	Moderate: occasional flooding during period of use.	Moderate: occasional flooding during period of use.	Slight	Moderate: occasional flooding during period of use.
Commerce: Cm, Cn	Moderate: somewhat poorly drained; moderately slow permeability. Severe where subject to flooding.	Moderate: somewhat poorly drained; moderately slow permeability. Severe where subject to flooding.	Moderate: somewhat poorly drained; occasional flooding where not leveed.	Moderate: somewhat poorly drained; occasional flooding where not leveed.	Slight where protected from flooding. Moderate: occasional flooding where not leveed.
Cooter: Co	Severe: occasional flooding; clayey surface.	Severe: occasional flooding; clayey surface.	Severe: clayey surface; occasional flooding.	Severe: clayey surface.	Moderate: occasional flooding; clayey surface.
Crevasse:					
CrA	Severe: flooding; sandy surface.	Severe: sandy surface.	Severe: sandy surface.	Severe: sandy surface.	Severe: sandy surface.

TABLE 5.—*Degree and kind of limitations for recreation uses*—Continued

Soil series and map symbols	Camp areas	Playgrounds	Picnic areas	Paths and trails	Golf fairways
Crevasse, Continued—					
CsB	Moderate: loamy sand surface.	Moderate: loamy sand surface.	Moderate: loamy sand surface.	Moderate: loamy sand surface.	Moderate: loamy sand surface.
CsC	Severe: sandy; subject to soil blowing.	Severe: slope; sandy; subject to soil blowing.	Severe: sandy; subject to soil blowing.	Moderate: loamy sand surface.	Moderate: loamy sand surface.
CvA	Severe: flooding	Moderate: flooding	Moderate: flooding.	Moderate: flooding.	Moderate: flooding.
Dubbs: Db	Slight	Slight	Slight	Slight	Slight.
Dundee: De, Dn	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained; moderately slow permeability.	Moderate: somewhat poorly drained.	Moderate: somewhat poorly drained.	Slight.
Farrenburg: Fa	Slight	Slight	Slight	Slight	Slight.
Forestdale: Fs, Ft	Severe: poorly drained; seasonal high water table; very slow permeability; ponding.	Severe: poorly drained; seasonal high water table; very slow permeability; ponding.	Severe: poorly drained; seasonal high water table; ponding.	Severe: poorly drained; seasonal high water table; ponding.	Severe: poorly drained; ponding.
Gideon: Gd, Ge	Severe: poorly drained; occasional flooding; seasonal high water table.	Severe: poorly drained; occasional flooding; seasonal high water table.	Severe: poorly drained; occasional flooding.	Severe: poorly drained; occasional flooding.	Severe: poorly drained.
Lilbourn: Lb	Moderate: somewhat poorly drained; seasonal high water table.	Moderate: somewhat poorly drained; seasonal high water table.	Moderate: somewhat poorly drained; seasonal high water table.	Moderate: somewhat poorly drained; seasonal high water table.	Slight.
Roellen: Ro	Severe: poorly drained; seasonal high water table; occasional flooding; clayey surface.	Severe: poorly drained; seasonal high water table; occasional flooding; clayey surface.	Severe: poorly drained; seasonal high water table; clayey surface.	Severe: poorly drained; seasonal high water table; clayey surface.	Severe: poorly drained; occasional ponding; cracks when dry.
Sandy alluvial land: Sa.	Very severe: high water table; flooding; sandy.	Very severe: high water table; flooding; sandy.	Very severe: high water table; flooding; sandy.	Severe: high water table; flooding; sandy; some areas are islands.	Severe: flooding; sandy; some areas are islands.
Sharkey: Sh, Sr	Severe: poorly drained; seasonal high water table; very slow permeability.	Severe: poorly drained; seasonal high water table; very slow permeability.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained; cracks when dry.
Sikeston: St	Severe: poorly drained; seasonal high water table; occasional flooding during season of use.	Severe: poorly drained; seasonal high water table; occasional flooding during season of use.	Severe: poorly drained; seasonal high water table; occasional flooding during season of use.	Severe: poorly drained.	Severe: poorly drained.
Tiptonville: Tp	Slight	Slight	Slight	Slight	Slight.
Wardell: Wr	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.

[1] Degree of limitation is slight for all uses if protected from flooding by levee.

that costly soil reclamation, special design, intense maintenance, or a combination of these, is required. *Very severe* means that the limitations cannot be overcome or are too impractical for reclamation.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, and a surface free of rocks and coarse fragments and are not subject to flooding during periods of heavy use; their surface is firm after rain but not dusty when dry.

Playgrounds are areas used intensively for baseball, football, badminton, and other organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops. They have good drainage and are not subject to flooding during periods of heavy use. Their surface is firm after rain but not dusty when dry. If grading and leveling are required, depth to rock is important.

Picnic areas are attractive natural or landscaped tracts that carry heavy foot traffic. Most of the vehicular traffic is confined to access roads. The best soils are firm when wet but not dusty when dry, are not subject to flooding during the season of use, and do not have slopes or stones that can greatly increase the cost of leveling or of building access roads.

Paths and trails are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Golf fairways are subject to heavy foot traffic. The best soils for this use are firm when wet but not dusty when dry, and they are free of flooding during the period of use. The soils should be well suited to grass.

Engineering Uses of the Soils [3]

This section is useful to planning commissions, town and city managers, land developers, engineers, contractors, farmers, and others who need information about soils used as structural material or as foundations on which structures are built.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are depth to the water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

[3] KENNETH M. MORGAN, agricultural engineer, Soil Conservation Service, helped prepare this section.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
4. Correlate performance of structures already built with properties of the kinds of soil on which they are built to help predict performance of structures on the same or similar kinds of soil in other locations.
5. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
6. Develop preliminary estimates for construction in a particular area.

Most of the information in this section is presented in tables. Table 6 shows estimated soil properties significant in engineering. Table 7 gives interpretations for various engineering uses. Table 8 shows the engineering laboratory tests on soil samples.

This information, along with the soil map and data in other parts of this publication, can be used to make interpretations in addition to those given in tabels 6 and 7, and it also can be used to make other useful maps.

This information, however, does not eliminate the need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths of more than 6 feet. Also, inspection of sites, especially the small ones, is needed because many mapped areas of one soil can include small areas of other kinds of soil that have strongly contrasting properties and different suitability or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists. The Glossary defines many of these terms.

Classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*2*) used by SCS engineers, the Department of Defense, and others, and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

In the Unified system, soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL-ML.

The AASHTO system classifies soils according to properties that affect their use in highway construction

TABLE 6.—*Soil properties significant*

[Absence of data indicates that no estimate was made or the soil is too variable to

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Dominant USDA texture	Classification	
				Unified	AASHTO
	Ft	*In*			
Acadia: Ad	1–2	0–7	Silt loam	CL–ML or ML	A–4
		7–28	Silty clay and clay	CH, CL	A–7
		28–39	Clay loam	CL	A–6, A–7
		39–60	Sandy loam	SM, ML	A–4
Alligator:					
Ag	0–1	0–10	Silty clay loam	CL, CH	A–7
		10–49	Clay	CH	A–7
		49–79	Clay and silty clay	CH	A–7
At	0–1	0–49	Clay	CH	A–7
		49–79	Clay and silty clay	CH	A–7
Borrow pits: Bp. Too variable to be estimated.					
Bosket: BtA, BtB	>5	0–25	Fine sandy loam	SM	A–4
		25–58	Clay loam and sandy clay loam.	SC	A–6
		58–78	Fine sandy loam and sand.	SM	A–4, A–2
Bowdre: Bw	1–2	0–14	Silty clay	MH, CH	A–7
		14–78	Very fine sandy loam and silt loam.	ML or CL–ML	A–4
Broseley: ByA, ByC	>5	0–37	Loamy fine sand	SM	A–4 or A–2
		37–63	Fine sandy loam	SM, SC	A–4, A–6
		63–75	Loamy fine sand	SM	A–2 or A–4
Cairo: Ca	0–1	0–27	Clay	CH	A–7
		27–60	Loamy sand and sandy loam.	SM	A–2
Canalou: Cd	2–3	0–20	Loamy sand	SM	A–2
		20–48	Sandy loam	SM, SC	A–2, A–4
		48–63	Sand	SM	A–2
Caruthersville: Ce	2–3	0–55	Very fine sandy loam	CL–ML or ML	A–4
		55–70	Loamy fine sand	SM	A–2 or A–4
Commerce: Cm, Cn	1–3	0–60	Silty clay loam and silt loam.	CL, ML	A–4, A–6, A–7
Cooter: Co	2–3	0–15	Silty clay	CH, CL	A–7
		15–60	Loamy sand and sand	SM	A–2
Crevasse:					
CrA	>3.5	0–60	Sand	SP–SM	A–3
CsB, CsC	>3.5	0–10	Loamy sand	SM	A–2
		10–60	Sand	SP–SM	A–3
CvA	>3.5	0–12	Loam	ML, CL–ML	A–4
		12–60	Sand	SP–SM	A–3

See footnote at end of table.

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be estimated. The symbol > means greater than; the symbol < means less than]

Percentage less than 3 inches passing sieve—			Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—	
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
			Pct		Inches per hour	Inches per inch of soil	pH			
100	100	90–100	10–30	[1]NP–7	0.6–2.0	0.20–0.22	5.6–7.3	Low	Moderate	Moderate.
100	100	90–100	45–65	25–40	<0.06	0.09–0.11	4.5–5.5	High	High	High.
100	95–100	80–90	30–50	15–35	0.2–0.6	0.15–0.17	5.1–5.5	Moderate	High	High.
100	95–100	45–60	<20	NP–3	0.2–6.0	0.11–0.13	6.1–6.5	Very low	Low	Low to moderate.
100	100	90–100	40–55	20–35	0.2–0.6	0.19–0.21	6.6–7.3	High	High	Low.
100	100	95–100	71–85	40–64	<0.06	0.08–0.13	4.5–6.0	Very high	High	Moderate to high.
100	100	95–100	80–94	55–64	<0.06	0.08–0.10	6.6–7.8	Very high	High	Low.
100	100	95–100	71–85	40–64	<0.06	0.08–0.13	4.5–6.0	Very high	High	Moderate to high.
100	100	95–100	80–94	55–64	<0.06	0.08–0.10	6.6–7.8	Very high	High	Low.
100	95–100	40–50	<20	NP–3	2.0–6.0	0.16–0.18	6.1–7.3	Very low	Low	Moderate.
100	100	36–45	25–35	10–15	0.6–2.0	0.16–0.18	5.1–6.0	Low	Moderate	Moderate.
100	90–100	30–40	<20	NP–3	2.0–6.0	0.11–0.13	6.1–6.5	Very low	Low	Moderate.
100	95–100	90–95	50–65	18–35	0.06–0.2	0.12–0.14	6.6–7.8	High	High	Low.
100	100	85–95	<20	NP–5	0.6–2.0	0.17–0.19	7.9–8.4	Low	Moderate	Low.
100	90–95	30–40	<20	NP–3	6.0–20	0.10–0.12	5.6–6.5	Very low	Low	Low to moderate.
100	90–95	36–50	<30	NP–12	2.0–6.0	0.14–0.16	5.1–6.0	Very low	Low	Moderate to high.
100	70–80	30–40	<20	NP–3	6.0–20	0.08–0.11	6.1–6.5	Very low	Low	Moderate to high.
100	95–100	80–85	55–65	30–40	<0.06	0.11–0.13	6.6–7.3	High	High	Low.
100	95–100	15–25	----	NP	6.0–20	0.08–0.10	7.4–7.8	Very low	Low	Low.
100	65–85	15–25	<15	NP	6.0–20	0.08–0.10	4.5–6.0	Very low	Low	Moderate to high.
100	85–95	30–40	<30	NP–10	6.0–20	0.12–0.15	5.1–6.0	Low	Low	Moderate.
100	70–85	10–25	<15	NP	6.0–20	0.08–0.10	6.6–7.3	Very low	Low	Low to moderate.
100	95–100	85–95	<20	NP–5	0.6–2.0	0.19–0.22	7.4–8.4	Low	Low	Low.
100	95–100	30–40	<20	NP–3	6.0–20	0.09–0.11	7.0–8.4	Low	Low	Low.
100	100	90–100	30–45	5–20	0.2–0.6	0.17–0.22	6.6–8.4	Low to moderate.	Moderate to high.	Low.
100	90–100	80–90	45–65	30–40	0.06–0.2	0.12–0.14	6.1–7.3	High	High	Low.
100	70–85	15–25	<15	NP–3	6.0–20	0.06–0.08	7.4–7.8	Very low	Low	Low.
100	70–100	5–10	----	NP	6.0–20	0.05–0.08	6.6–7.3	Very low	Low	Low.
100	80–100	12–30	----	NP	6.0–20	0.10–0.12	5.1–6.5	Very low	Low	Moderate.
100	70–100	5–10	----	NP	6.0–20	0.06–0.08	5.1–6.5	Very low	Low	Moderate.
100	90–100	50–75	<25	NP–7	0.6–2.0	0.20–0.22	5.6–7.8	Low	Moderate	Moderate to low.
100	70–100	5–10	----	NP	6.0–20	0.05–0.08	5.6–7.8	Very low	Low	Moderate to low.

TABLE 6.—*Soil properties significant*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Dominant USDA texture	Classification	
				Unified	AASHTO
	Ft	*In*			
Dubbs: Db	>5	0–11	Silt loam	ML	A–4
		11–38	Silty clay loam	CL	A–6, A–7
		38–66	Silt loam and loam	ML, CL	A–4, A–6
		66–76	Sand	SP–SM	A–3
Dundee:					
De	1–2	0–8	Silt loam	ML	A–4
		8–77	Silty clay loam	CL	A–6, A–7
Dn	1–2	0–77	Silty clay loam	CL	A–6, A–7
Farrenburg: Fa	2–3	0–33	Fine sandy loam	SM, ML	A–4
		33–46	Clay loam	CL	A–6, A–7
		46–73	Sand and loamy sand	SP–SM, SM	A–2
Forestdale:					
Fs	0–1	0–8	Silt loam	CL–ML, CL	A–6 or A–4
		8–29	Clay	CH	A–7
		29–46	Clay loam	CL	A–6, A–7
		46–70	Light sandy clay loam and sandy loam.	SC–SM, SM, ML, CL–ML	A–4
Ft	0–1	0–11	Silty clay loam	CL, CH	A–6 or A–7
		11–29	Clay	CH, CL	A–6 or A–7
		29–46	Clay loam	CL	A–6, A–7
		46–70	Light sandy clay loam and sandy loam.	SC–SM, SM, ML, CL–ML	A–4
Gideon: Gd, Ge	0–1	0–9	Loam and clay loam	CL	A–6
		9–45	Sandy clay loam	CL, SC	A–6, A–7
		45–68	Heavy clay loam	CL	A–6, A–7
		68–80	Sandy clay loam	SC, SM, CL	A–6, A–4
Lilbourn: Lb	0–1.5	0–37	Fine sandy loam	SM, ML	A–4
		37–52	Heavy loam	CL	A–6 or A–7
		52–64	Sandy loam and very fine sandy loam.	SM, ML, SM–SC	A–4
		64–71	Sand	SM	A–2
Roellen: Ro	0–1	0–60	Clay, silty clay	CH	A–7
		60–78	Sand	SP–SM	A–2
Sandy alluvial land: Sa. Too variable to be estimated.					
Sharkey:					
Sh	0–1	0–8	Silty clay loam	CL	A–6, A–7
		8–80	Clay	CH	A–7
Sr	0–1	0–80	Clay	CH	A–7
Sikeston: St	0–1	0–12	Sandy clay loam	CL	A–6
		12–42	Clay loam	CL	A–6
		42–50	Sandy clay loam	CL	A–6
		50–78	Stratified sandy loam, sand, and loamy sand.	SC–SM, SM	A–4, A–2
Tiptonville: Tp	2–3	0–6	Fine sandy loam	SM	A–4
		6–79	Silt loam and silty clay loam.	ML, CL	A–4, A–6
Wardell: Wr	0–1.5	0–70	Loam and sandy clay loam.	CL	A–6

[1] NP means nonplastic.

in engineering—Continued

Percentage less than 3 inches passing sieve—			Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Corrosivity to—	
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
			Pct		*Inches per hour*	*Inches per inch of soil*	*pH*			
100	100	80–95	30–40	4–8	0.6–2.0	0.20–0.22	5.1–6.0	Low	Low	Moderate.
100	100	85–100	35–45	20–25	0.6–2.0	0.18–0.20	5.6–6.0	Moderate	High	Moderate to high.
100	100	80–95	30–40	5–15	0.6–2.0	0.17–0.22	4.5–5.5	Low	Moderate	Moderate to high.
95–100	95–100	5–10	......	NP	6.0–20	0.05–0.07	5.6–6.0	Very low	Low	Moderate.
100	95–100	75–85	10–25	NP–4	0.6–2.0	0.20–0.22	6.1–6.5	Low	Moderate	Low.
100	100	85–95	35–45	15–25	0.2–0.6	0.18–0.20	4.5–7.8	Moderate	High	Low to high.
100	100	85–95	35–45	15–25	0.2–0.6	0.18–0.21	4.5–7.8	Moderate	High	Low to high.
100	80–95	45–55	<15	NP–3	2.0–6.0	0.15–0.17	4.5–5.5	Very low	Low	High.
100	90–100	70–85	30–45	10–25	0.6–2.0	0.14–0.16	4.5–5.0	Moderate	High	High.
100	70–85	10–20	<15	NP–3	6.0–20	0.06–0.08	5.6–6.5	Very low	Very low	Moderate.
100	95–100	90–100	10–30	5–15	0.6–2.0	0.20–0.22	5.6–7.3	Low	Moderate	Low to moderate.
100	95–100	90–100	55–65	30–40	<0.06	0.09–0.11	5.1–5.5	High	High	Moderate.
100	95–100	80–90	30–50	15–35	0.2–0.6	0.15–0.17	5.1–5.5	Moderate	High	Moderate.
100	95–100	45–60	<25	NP–5	0.6–6.0	0.11–0.15	6.1–7.8	Very low or low.	Low	Low.
100	95–100	90–100	30–55	15–25	0.2–0.6	0.19–0.21	5.6–7.3	Moderate	Moderate to high.	Moderate.
100	95–100	90–100	35–65	30–40	<0.06	0.09–0.11	5.1–5.5	High	High	Moderate.
100	95–100	80–90	30–50	15–35	0.2–0.6	0.15–0.17	5.1–5.5	Moderate	High	Moderate.
100	95–100	45–60	<25	NP–5	0.6–6.0	0.11–0.15	6.1–7.8	Low or very low.	Moderate	Low.
100	85–90	60–65	30–35	10–15	0.6–2.0	0.20–0.22	7.4–7.8	Low	High	Low.
100	80–95	45–60	35–45	20–30	0.6–2.0	0.16–0.18	6.1–6.5	Moderate	High	Low.
100	85–95	60–80	35–45	20–30	0.2–0.6	0.14–0.16	6.6–7.3	Moderate	High	Low.
100	85–90	40–55	<30	NP–15	0.6–2.0	0.15–0.17	6.6–7.3	Moderate to low.	High	Low.
100	95–100	45–55	<15	NP–3	2.0–6.0	0.15–0.17	5.6–6.5	Very low	Low	Moderate.
100	95–100	85–90	35–50	15–25	0.6–2.0	0.17–0.19	4.5–5.0	Moderate	Moderate	High.
100	85–95	40–90	<20	NP–5	2.0–6.0	0.11–0.19	5.1–6.0	Very low	Moderate	Moderate.
100	95–100	10–20	......	NP	6.0–20	0.05–0.07	5.6–6.5	Very low	Moderate	Moderate.
100	95–100	75–100	60–65	35–40	0.06–0.2	0.08–0.13	6.1–8.4	High	High	Low.
100	90–100	5–10	......	NP	6.0–20	0.05–0.07	7.4–7.8	Very low	High	Low.
100	100	95–100	30–50	15–30	0.2–0.6	0.17–0.20	5.1–7.3	High	High	Moderate to low.
100	100	95–100	70–85	40–50	<0.06	0.08–0.10	5.5–7.8	Very high	High	Low to moderate.
100	100	95–100	70–85	40–50	<0.06	0.08–0.10	6.1–7.8	Very high	High	Low to moderate.
100	85–95	50–55	35–40	20–25	0.2–0.6	0.16–0.18	6.1–6.5	Moderate	High	Low.
100	90–95	55–60	35–40	20–25	0.2–0.6	0.15–0.17	6.6–7.3	Moderate	High	Low.
100	85–95	50–55	35–40	20–25	0.2–0.6	0.15–0.17	6.6–7.3	Moderate	High	Low.
100	80–90	15–40	<25	NP–7	2.0–6.0	0.05–0.13	6.6–7.8	Low	High	Low.
100	95–100	40–50	<25	NP–3	2.0–6.0	0.16–0.18	6.1–6.5	Very low	Low	Moderate.
100	95–100	90–100	30–40	5–20	0.6–2.0	0.18–0.24	5.6–7.3	Low to moderate.	Moderate to high.	Low to moderate.
100	85–90	50–70	30–40	10–25	0.6–0.2	0.16–0.18	4.5–6.5	Moderate	High	Moderate to high.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Roads and streets	Sanitary landfill [3] (area type)
Acadia: Ad	Severe: very slow permeability; depth to seasonal high water table; local flooding.	Moderate: depth to permeable material.	Severe: somewhat poorly drained; seasonal high water table; local flooding.	Severe: seasonal high water table; high shrink-swell potential; local flooding.	Severe: somewhat poorly drained; high shrink-swell potential.	Severe: seasonal high water table; local flooding.[4]
Alligator: Ag, At	Severe: very slow permeability; slow percolation rate; depth to water table; flooding.	Slight. Severe where subject to flooding by the Mississippi River.	Severe: poorly drained; seasonal high water table; clayey.	Severe: poorly drained; seasonal high water table; local flooding; high shrink-swell potential.	Severe: poorly drained; possible flooding; high shrink-swell potential.	Severe: seasonal high water table; soil drainage; clayey; possible flooding.[5]
Borrow pits: Bp. No interpretations made; properties too variable.						
Bosket: BtA, BtB	Slight to moderate; moderate permeability.	Moderate: moderate permeability.	Slight	Slight	Slight to moderate; low strength.	Slight
Bowdre: Bw	Severe: slow permeability in upper part; depth to seasonal high water table; flooding in some areas.	Severe: depth to seasonal high water table; moderate permeability in lower part; flooding in some areas.	Severe: somewhat poorly drained; seasonal high water table; clayey.	Severe: seasonal high water table; high shrink-swell potential in upper horizons; flooding in some areas.	Severe: high shrink-swell potential in upper horizons; flooding in some areas.	Severe: seasonal high water table; clayey.
Broseley: ByA, ByC	Slight if slope is 0 to 2 percent. Moderate if slope is 8 to 12 percent.	Severe: moderately rapid permeability; 8 to 12 percent slopes.	Slight if slope is 0 to 2 percent. Moderate if slope is 8 to 12 percent.	Slight if slope is 0 to 2 percent. Moderate if slope is 8 to 12 percent.	Moderate: low strength; 8 to 12 percent slopes.	Severe: moderately rapid permeability.
Cairo: Ca	Severe: flooding; very slow permeability in upper horizons; rapid permeability in lower horizons; depth to water table.	Severe: depth to water table; rapid permeability below depth of 27 inches.	Severe: poorly drained; seasonal high water table; clayey; flooding.	Severe: poorly drained; seasonal high water table; flooding; high shrink-swell potential in upper horizons.	Severe: poorly drained; flooding; high shrink-swell potential in upper horizons.	Severe: seasonal high water table; poorly drained; flooding.

See footnotes at end of table.

engineering properties

Suitability as a source of—			Soil features affecting—			
Daily cover for landfill	Road fill	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation [3]
Fair: consistence; mixed loamy and clayey material.	Poor: high shrink-swell potential; somewhat poorly drained.	Fair: loamy; thin layer.	Very slow permeability.	Medium strength and compressibility; fair compaction characteristics.	Very slow permeability; poor access to outlets; seasonal high water table; slow runoff; wet.	Moderate available water capacity; moderate intake rate; very slow permeability in subsoil.
Poor: clayey; wetness.	Poor: high shrink-swell potential; poorly drained.	Poor: clayey; poorly drained.	Very slow permeability.	Low strength; high compressibility; high shrink-swell potential.	Very slow permeability; clayey; seasonal high water table; slow runoff; wet.	Moderate available water capacity; very slow intake rate; subject to severe cracking.
Good	Fair: low strength.	Good	Moderate permeability; nearly level to gently sloping.	Medium to high susceptibility to piping.	Moderate permeability; water table below depth of 5 feet; slow to medium runoff.	High available water capacity; moderately rapid intake rate.
Poor to depth of 14 inches: clayey. Good below depth of 14 inches.	Poor to depth of 14 inches: high shrink-swell potential. Fair below depth of 14 inches: somewhat poorly drained.	Poor: clayey	Slow permeability in upper horizons; moderate permeability in lower horizons.	Low strength; high compressibility; poor compaction characteristics and high shrink-swell potential in upper horizons; high susceptibility to piping and poor compaction characteristics in the lower horizons.	Slow permeability in the upper horizons; seasonal high water table; slow runoff.	High available water capacity; slow intake rate; moderate permeability below depth of 14 inches.
Fair: sandy	Fair: low strength.	Poor: sandy	Moderately rapid permeability; slope.	High susceptibility to piping; easily erodible.	Moderately rapid permeability; water table below depth of 5 feet; slow to medium runoff.	Moderate available water capacity; rapid intake rate; nearly level to steep; moderately rapid permeability in subsoil; highly erodible where steep.
Poor: clayey; wet.	Poor: high shrink-swell potential in upper 27 inches; poorly drained.	Poor: clayey; poorly drained.	Very slow permeability in upper horizons; rapid permeability in lower horizons.	Low strength; high compressibility; poor compaction characteristics and high shrink-swell potential in upper horizons; high susceptibility to piping in the lower horizons.	Very slow permeability in the upper horizons; depth to sand about 32 inches; seasonal high water table; slow runoff; unstable material in lower horizons; wet.	Moderate available water capacity; very slow intake rate; rapid permeability below depth of 27 inches.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Roads and streets	Sanitary landfill [2] (area type)
Canalou: Cd	Severe: depth to seasonal high water table.	Severe: seasonal high water table; rapid permeability.	Severe: seasonal high water table; unstable cutbanks.	Severe: seasonal high water table.	Slight	Severe: rapid permeability; seasonal high water table.
Caruthersville: Ce	Severe: flooding; depth to seasonal high water table.	Severe: subject to flooding; seasonal high water table.	Severe: seasonal high water table; flooding; unstable cutbanks.	Severe: flooding.	Severe where subject to flooding. Moderate where protected from flooding: low strength.	Severe: seasonal high water table; flooding.
Commerce: Cm, Cn	Severe: moderately slow permeability; depth to seasonal high water table; flooding.	Severe: subject to flooding; seasonal high water table.	Severe: somewhat poorly drained; seasonal high water table; flooding.	Severe where subject to flooding. Moderate where protected from flooding: wet; low strength.	Severe where subject to flooding. Moderate where protected from flooding: wet; low strength; moderate shrink-swell potential.	Severe: seasonal high water table; flooding.
Cooter: Co	Severe: depth to seasonal high water table; flooding.	Severe: seasonal high water table; excess seepage; rapid permeability below depth of 15 inches.	Severe: seasonal high water table; unstable cutbanks.	Severe: seasonal high water table; local flooding; high shrink-swell potential to depth of 15 inches.	Severe: high shrink-swell potential in upper horizons.	Severe: seasonal high water table; seepage.
Crevasse: CrA, CsB, CsC, CvA.	Slight where protected from flooding.[6] Severe where subject to flooding.	Severe: rapid permeability; some areas subject to flooding.	Severe: sandy	Slight where protected from flooding. Severe where subject to flooding.	Slight where protected from flooding. Severe where subject to flooding.	Severe: rapid permeability; some areas subject to flooding.
Dubbs: Db	Moderate: moderate permeability.	Moderate: moderate permeability.	Slight	Moderate: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Slight

See footnotes at end of table.

engineering properties—Continued

Suitability as a source of—			Soil features affecting—			
Daily cover for landfill	Road fill	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation [3]
Fair to good: layers of sandy and loamy textures.	Good	Poor: sandy	Rapid permeability; excess seepage.	High susceptibility to piping; erodible.	Rapid permeability; sandy; water table at a depth of 2 to 3 feet; slow runoff; unstable material for ditchbanks.	Low available water capacity; rapid intake rate.
Good	Fair: low strength.	Good	Moderate permeability; excess seepage; subject to flooding unless protected by levee.	High susceptibility to piping; low strength; compressible.	Moderate permeability; water table below depth of 2 feet; slow runoff; subject to flooding.	Very high available water capacity; moderate intake rate; subject to flooding.
Fair to good: high clay content in some layers.	Fair: low strength; moderate shrink-swell potential; wet.	Fair to good: layers of high clay content.	Moderately slow permeability; subject to flooding unless protected by levee.	Medium to low strength; medium to high susceptibility to piping; fair compaction characteristics.	Moderately slow permeability; water table at a depth of 1 to 3 feet; slow runoff; flooding.	High available water capacity; moderate to moderately slow intake rate; some areas subject to flooding.
Poor: clayey	Poor to depth of 15 inches: high shrink-swell potential. Good below depth of 15 inches.	Poor: clayey	Slow permeability in upper horizons; rapid permeability in lower horizons; subject to flooding unless protected by levee; excess seepage.	Low strength; high compressibility in places; poor compaction characteristics in places; high shrink-swell potential in upper horizons; high susceptibility to piping in the lower horizons.	Slow permeability in the surface horizons; depth to sand about 15 inches; seasonal high water table; slow runoff; cutbanks subject to caving.	Low available water capacity; slow intake rate; rapid permeability below depth of 15 inches.
Fair to poor: sandy.	Good	Poor: sandy	Rapid permeability.	Rapid permeability of compacted soil; highly erodible; piping; noncompressible.	Rapid permeability; sandy throughout; water table below a depth of 35 feet; unstable material; flooding in some areas.	Low available water capacity; rapid intake rate; rapid permeability.
Fair: mainly silty clay loam.	Fair: low strength; moderate shrink-swell potential.	Fair: thin layer.	Moderate permeability.	Medium to low strength; medium susceptibility to piping; fair compaction characteristics.	Moderate permeability; water table below depth of 5 feet; slow runoff.	High available water capacity; moderate intake rate.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Roads and streets	Sanitary landfill [2] (area type)
Dundee: De, Dn	Severe: moderately slow permeability; depth to seasonal high water table.	Severe: seasonal high water table.	Severe: somewhat poorly drained; seasonal high water table.	Moderate: somewhat poorly drained; seasonal high water table; moderate shrink-swell potential; low strength.	Moderate: somewhat poorly drained; low strength; moderate shrink-swell potential.	Moderate: seasonal high water table; somewhat poorly drained.
Farrenburg: Fa	Severe: perched water table.	Severe: seasonal high water table; moderate permeability.	Severe: seasonal high water table; unstable cutbanks.	Moderate: seasonal high water table.	Moderate: moderate shrink-swell potential.	Moderate: seasonal high water table.
Forestdale: Fs, Ft	Severe: very slow permeability; depth to water table; ponding.	Slight to moderate: depth to permeable material; seasonal high water table.	Severe: poorly drained; ponding.	Severe: poorly drained; ponding; high shrink-swell potential; low strength.	Severe: poorly drained; high shrink-swell potential.	Severe: poorly drained; ponding.[4]
Gideon: Gd, Ge	Severe: moderately slow permeability; depth to water table.	Severe: depth to water table.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained; moderate shrink-swell potential.	Severe: poorly drained.
Lilbourn: Lb	Severe: depth to seasonal water table.	Severe: seasonal high water table; moderate permeability; thickness of material; excess seepage.	Severe: seasonal high water table; unstable cutbanks.	Severe: seasonal high water table.	Moderate: somewhat poorly drained.	Severe: seasonal high water table.

See footnotes at end of table.

engineering properties—Continued

Suitability as a source of—			Soil features affecting—			
Daily cover for landfill	Road fill	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation [3]
Fair: silty clay loam.	Fair: low strength; moderate shrink-swell potential; somewhat poorly drained.	Fair: thin layer.	Moderately slow permeability.	Medium to low strength; fair compaction characteristics.	Moderately slow permeability; seasonal high water table; slow runoff.	High available water capacity; moderate to moderately slow intake rate.
Good	Fair: low strength; moderate shrink-swell potential.	Good	Moderately rapid permeability in upper horizons; moderately permeable subsoil.	Low compressibility and high susceptibility to piping in the upper horizons; medium to low strength in subsoil; moderate permeability and medium susceptibility to piping in the lower horizons.	Moderate permeability; water table below depth of 2 feet; slow runoff.	Moderate available water capacity; moderately rapid intake rate; moderate permeability in subsoil.
Poor: clayey; wetness.	Poor: high shrink-swell potential; poorly drained.	Fair: thin layer; high clay content.	Very slow permeability.	Medium to low strength; medium to high compressibility, fair compaction characteristics, high shrink-swell potential in subsoil; moderate permeability, medium to high susceptibility to piping in the lower horizons.	Very slow permeability; seasonal high water table; slow runoff to ponded; poor outlet access in most areas.	Moderate available water capacity; moderate to moderately slow intake rate; very slow permeability in subsoil.
Fair: wetness high clay content.	Poor: poorly drained.	Fair: thin layer; high clay content.	Moderately slow permeability.	Medium strength; fair compaction characteristics.	Moderately slow permeability; seasonal high water table; slow runoff.	High available water capacity; moderate intake rate; wet.
Good	Fair: somewhat poorly drained.	Good	Moderately rapid permeability below depth of 4 feet.	High susceptibility to piping in the upper horizons; low strength, fair compaction characteristics, and moderate shrink-swell potential in the subsoil; high susceptibility to piping and fair compaction characteristics in the lower horizons.	Moderate permeability; seasonal high water table; slow runoff; unstable cutbanks.	Moderate available water capacity; moderately rapid intake rate.

TABLE 7.—*Interpretations of*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Roads and streets	Sanitary landfill [2] (area type)
Roellen: Ro	Severe: slow permeability; depth to water table; ponding; percolation rate.	Slight	Severe: seasonal high water table; clayey.	Severe: seasonal high water table; high shrink-swell potential.	Severe: poorly drained; ponding; high shrink-swell potential.	Severe: seasonal high water table.
Sandy alluvial land: Sa. No interpretations made; properties too variable.						
Sharkey: Sh, Sr	Severe: very slow permeability; depth to water table; flooding in some areas.	Slight where protected from flooding. Severe where subject to flooding.	Severe: seasonal high water table; clayey.	Severe: seasonal high water table; flooding in some areas; very high shrink-swell potential.	Severe: poorly drained; flooding in some areas; very high shrink-swell potential.	Severe: seasonal high water table; flooding in some areas.[3]
Sikeston: St	Severe: moderately slow permeability; depth to water table.	Severe: depth to permeable material; excess seepage; seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; local flooding.	Severe: poorly drained.	Severe: seasonal high water table.
Tiptonville: Tp	Severe: seasonal high water table.	Moderate: seasonal high water table; moderate permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table; moderate shrink-swell potential.	Moderate: low strength; moderate shrink-swell potential.	Slight to moderate: seasonal high water table.
Wardell: Wr	Severe: slow permeability; depth to water table.	Severe: depth to permeable material; poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: poorly drained.	Severe: seasonal high water table.

[1] Dwellings in New Madrid County commonly have no basement. The degree of limitation to use for basements is severe for all soils, except the Bosket, Broseley, Dubbs, and Tiptonville soils.

[2] For trench-type sanitary landfills, which are not shown in this table, the degree of limitation for most soils is severe because of excessive permeability, seasonal high water table, wetness, or soil texture.

[3] Most soils that are continuously cultivated are subject to severe plowpan development that restricts the effective rooting depth to about 1 foot. The soils are likely to need surface drainage, except that the Crevasse soils are level to nearly level in most places.

engineering properties—Continued

Suitability as a source of—			Soil features affecting—			
Daily cover for landfill	Road fill	Topsoil	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation [3]
Poor: clayey; wetness.	Poor: high shrink-swell potential; poorly drained.	Poor: clayey; poorly drained.	Slow permeability.	Low shear strength; high compressibility; poor compaction characteristics; high shrink-swell potential; slow permeability below depth of 5 feet.	Slow permeability; seasonal high water table; very slow runoff; clayey; wet.	Moderate available water capacity; very slow intake rate; subject to severe cracking.
Poor: clayey; wetness.	Poor: poorly drained; very high shrink-swell potential.	Poor: clayey; poorly drained.	Very slow permeability.	Low shear strength; high compressibility; poor compaction characteristics; very high shrink-swell potential.	Very slow permeability; clayey throughout; seasonal high water table; slow or very slow runoff; wet.	Moderate available water capacity; very slow intake rate; subject to severe cracking.
Fair: wetness; high clay content.	Poor: poorly drained.	Poor: thin layer; high clay content.	Moderately slow permeability.	Medium shear strength; fair compaction characteristics; moderately slow permeability; high susceptibility to piping below depth of 4 feet.	Moderately slow permeability; seasonal high water table; slow to very slow runoff; wet.	High available water capacity; moderately slow intake rate.
Good	Fair: moderate shrink-swell potential; low strength.	Good	Moderate permeability.	Medium to high susceptibility to piping; fair compaction characteristics.	Moderate permeability; water table below depth of 2 feet; slow to moderate runoff.	Very high available water capacity; moderately rapid intake rate.
Poor: wetness; high clay content.	Poor: poorly drained.	Poor: thin layer; poorly drained.	Slow permeability.	Medium strength; fair compaction characteristics.	Slow permeability; seasonal high water table; slow runoff.	High available water capacity; moderate intake rate.

[4] The degree of limitation to the use of these soils for landfill is severe, but these soils retard leachates enough that they can be used for area-type sanitary landfills.
[5] These soils may be used for area- or trench-type sanitary landfills, but the wetness is a limitation that affects workability and trafficability in the immediate area.
[6] Because the rate of soil permeability is rapid, the ground water may be polluted.

TABLE 8.

[Tests made by the Missouri

Soil name and location	Parent material	Missouri State Highway Commission laboratory number 71159—	Depth from surface	Classification	
				AASHTO	Unified
			In		
Canalou sandy loam: approximately 100 feet west and 50 feet south of NE corner of sec. 22, T. 25 N., R. 14 E. (Modal)	Loamy alluvium and sandy material.	18	20–40	A–2–4–(0)	SM
		19	48–63	A–2–4–(0)	SM
Gideon loam: 80 feet west of field road and 50 feet south of county road ditch, NE¼NW¼ sec. 22, T. 21 N., R. 11 E. (Modal)	Loamy alluvium	20	18–45	A–6–(9)	CL
Lilbourn fine sandy loam: 600 feet west and 60 feet south of NE corner NE¼SE¼ sec. 28, T. 25 N., R. 13 E. (Modal)	Loamy alluvium	21	15–37	A–4–(3)	SM
		22	37–52	A–7–6–(13)	CL

[1] NP means nonplastic.

and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). In group A–7 are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As an additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 8; the estimated classification, without group index numbers, is given in table 6 for all soils mapped in the survey area.

Soil properties significant in engineering

Several estimated soil properties significant in engineering are given in table 6. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 6.

Depth to seasonal high water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used are defined in the Glossary of this soil survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic. If the moisture content is further increased, the material changes from a plastic to a liquid. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic; and the liquid limit, from a plastic to a liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 6, but in table 8 the data on liquid limit and plasticity index are based on the results of soil tests.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crops.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms to describe soil reaction are explained in the Glossary.

—*Test data*

State Highway Commission]

Percentage passing sieve—			Percentage smaller than—			Liquid limit	Plasticity index
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm		
						Pct	
100	92	34	27	12	9	......	[1] NP
100	98	17	9	4	2	......	NP
100	88	53	50	31	28	38	24
100	99	49	37	12	9	......	NP
100	98	87	75	30	25	44	20

Shrink-swell potential is the relative change in volume of soil material to be expected with changes in moisture content; that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils causes much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to the maintenance of structures built in, on, or with material having this rating.

Corrosivity pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Corrosivity for concrete is influenced mainly by the content of sodium or magnesium sulfate but also by soil texture and acidity. Installations of uncoated steel that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations of the soils

The estimated interpretations in table 7 are based on the engineering properties of soils shown in table 6, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of New Madrid County. In table 7, summarized limitations or ratings of suitability of the soils are given for all listed purposes other than for irrigation, ponds, and reservoirs, drainage of cropland and pasture, embankments, and terraces and diversions. For these particular uses, table 7 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil limitations are expressed as slight, moderate, and severe. *Slight* means soil properties generally are favorable for the given use or that the limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation and special designs are needed.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the column headings in table 7.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material between depths of 18 inches and 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope affects layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage to a depth of less than 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor; its sides, or embankments, are of soil material compacted to medium density, and the pond is protected from flooding. Properties that affect the pond floor are permeability, organic matter, and slope, and if the floor needs to be leveled, depth to bedrock is important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified Soil Classification and the amount of stones, if any, which influence the ease of excavation and compaction of the embankment material.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet, for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding or absence of a high water table.

Dwellings are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The soil limitations that affect the use of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Roads and streets have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet.

Soil properties that most affect design and construction of roads and streets are load-supporting capacity, stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material and the shrink-swell potential show the traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Sanitary landfill (area type) is a method of disposing of refuse. Two soil properties that affect suitability for landfill are the hazard of polluting ground water and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable. Every site should be investigated before it is selected for this use.

Road fill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage. It also reflects the relative ease of excavating the material at borrow areas.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as in preparing a seedbed; natural fertility of the material, or response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments affect suitability, and also considered in the ratings is damage that can result at the area from which topsoil is taken.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to permeability and to depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage and piping and that has favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Drainage is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that affect the movement of water; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream flooding, water erosion, or soil blowing; soil texture; content of stones; accumulation of salts and alkali; depth of root zone; rate of water intake at the surface; permeability below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Test data

Table 8 gives engineering test data for some of the major soil series in the county. The engineering classifications are based on data obtained by mechanical analyses and by tests to determine liquid limit and plastic limit. The mechanical analyses were made by combined sieve and hydrometer methods.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as has been explained for table 6.

Formation and Classification of Soils

This section tells how the factors of soil formation have affected the development of soils in New Madrid County and explains the system of soil classification currently used. Table 9 shows the classification of each soil series into higher categories.

Factors of Soil Formation

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor. Many of the processes of soil formation are unknown, but some of the more apparent ones are parent material, climate, living organisms, relief, and time.

TABLE 9.—*Classification of the soil series*

Soil series	Family	Subgroup	Order
Acadia[1]	Fine, montmorillonitic, thermic	Aeric Ochraqualfs	Alfisols.
Alligator	Very fine, montmorillonitic, acid, thermic	Vertic Haplaquepts	Inceptisols.
Borrow pits		Haplaquents and Psamments	Entisols.
Bosket	Fine-loamy, mixed, thermic	Mollic Hapludalfs	Alfisols.
Bowdre	Clayey over loamy, montmorillonitic, thermic	Fluvaquentic Hapludolls	Mollisols.
Broseley	Loamy, mixed, thermic	Arenic Hapludalfs	Alfisols.
Cairo	Clayey over sandy or sandy-skeletal, montmorillonitic, thermic.	Vertic Hapludolls (Fluvaquentic)	Mollisols.
Canalou	Coarse-loamy, mixed, thermic	Aquic Dystric Eutrochrepts	Inceptisols.
Caruthersville	Coarse-silty, mixed (calcareous), thermic	Aquic Udifluvents	Entisols.
Commerce[1]	Fine-silty, mixed, nonacid, thermic	Aeric Fluvaquents	Entisols.
Cooter	Clayey over sandy or sandy-skeletal, montmorillonitic, thermic.	Fluvaquentic Hapludolls	Mollisols.
Crevasse	Mixed, thermic	Typic Udipsamments	Entisols.
Dubbs	Fine-silty, mixed, thermic	Typic Hapludalfs	Alfisols.
Dundee	Fine-silty, mixed, thermic	Aeric Ochraqualfs	Alfisols.
Farrenburg	Fine-loamy, mixed, thermic	Glossaquic Hapludalfs	Alfisols.
Forestdale[1]	Fine, montmorillonitic, thermic	Typic Ochraqualfs	Alfisols.
Gideon	Fine-loamy, mixed, nonacid, thermic	Mollic Fluvaquents	Entisols.
Lilbourn	Coarse-loamy, mixed, nonacid, thermic	Aeric Haplaquents	Entisols.
Roellen	Fine, montmorillonitic, thermic	Vertic Haplaquolls	Mollisols.
Sandy alluvial land		Psammaquents	Entisols.
Sharkey	Very fine, montmorillonitic, nonacid, thermic	Vertic Haplaquepts	Inceptisols.
Sikeston	Fine-loamy, mixed, thermic	Cumulic Haplaquolls	Mollisols.
Tiptonville	Fine-silty, mixed, thermic	Typic Argiudolls	Mollisols.
Wardell	Fine-loamy, mixed, thermic	Mollic Ochraqualfs	Alfisols.

[1] The following soils in New Madrid County are taxadjuncts to the series for which they are named: Acadia soils are redder in the upper part of the B horizon and are more loamy in the C horizon than is within the range defined for the Acadia series. Commerce soils have more stratification in the upper part of the profile than is within the range defined for the Commerce series. Forestdale soils are browner than is within the range defined for the Forestdale series. These differences do not alter use or behavior of the soils.

The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation, the living organisms on and in the soil, the relief, or lay of the land, and the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effect of climate and plant and animal life is conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in a few places, determines it almost entirely. Finally, time is needed for changing the parent material into a soil that has differentiation of soil horizons.

Parent material

Parent material is the unconsolidated mass in which a soil forms. The characteristics of the parent material affect the texture and the mineralogy of the soils that form in it (4). Soil drainage and color also are affected by the kind of parent material.

All the soils in New Madrid County formed in alluvium that was sorted by a river as it overflowed the channel or entered a deltaic plain. When it lost velocity, the river began to deposit the sorted soil materials. Sand was deposited first, and Canalou, Crevasse, and similar soils, as well as Sandy alluvial land, formed in this material. Sediments finer than sand were deposited as the flood water continued to flow. Most of the loamy soils formed in the finer sediments. Where water stood in shallow lakes or swamps, clay settled and accumulated. In these areas Alligator, Bowdre, Cairo, Cooter, Forestdale, Roellen, and Sharkey soils formed.

This sorting and deposition of sediments was greatly affected by stream meandering and channel migration. In some soils, Cairo and Cooter soils, for example, the stream abandonment of some channels was dramatic and sudden and the change in texture from sand to clay was abrupt. Other soils show a similar pattern at greater depths.

In some places the texture is mixed. An example is the sand flows in such soils as Sharkey silty clay loam, which are a result of the New Madrid Earthquake.

Climate

The climate in New Madrid County has been generally constant and stable during the brief period of geologic time in which these soils have been forming. Deposits of alluvium in the Holocene Epoch have been uniform and consistent with a humid, warm, continental climate. But in the substratum or below the solum, there is a definite unconformity. Additional information on present climate is given under the heading "Environmental Factors Affecting Soil Use."

A sudden warming occurred late in the Pleistocene Epoch (*5, 6*). The thickness of recently deposited silt and clay is generally less than 10 feet in New Madrid County, but it is much less in some areas. Depth to sandy material is commonly less than 5 feet in soils of the Acadia, Cairo, Caruthersville, Cooter, Farrenburg, Forestdale, Lilbourn, and Wardell series.

Atmospheric composition, which controls the absorption of solar energy (*3*), apparently changed and then altered the climate of the earth. It may have provided a cause for the sudden warming of temperature and the melting of glaciers that affected the rise in sea level. The abrupt change in alluvium from sand to silt and clay could have resulted from slower water velocity that resulted from the rise in sea level.

Living organisms

Plant and animal life has made significant contributions to soil formation. Plants add organic matter and nitrogen to the soil. Soil reaction is influenced by plant residue. Products of plant decomposition are active forces in the oxidation-reduction reactions which alter the iron and manganese minerals in the soil parent material. The bulk density of the soil is also changed by rapidly developing plants.

Three major plant communities—swamp, prairie, and forest—have contributed to the development of soils in New Madrid County. In the depressions, the soils had a high water table and were ponded or swampy. Runoff was very slow. In these areas, baldcypress, water tupelo, sweetgum, and some grasses, canes, and rushes grew, and their residue accumulated in the shallow water. Where the water level was seasonal, not much organic matter accumulated. In these areas Alligator and Sharkey soils formed. Where the water level was more constant, the decomposition of humus was retarded and organic matter accumulated. Soils that formed where organic-matter content is high are those of the Cairo, Cooter, Roellen, and Sikeston series.

Mixed hardwoods grew in most other parts of the county. Soils that formed in these areas of deciduous forests are low in organic-matter content. Among these are soils of the Acadia, Dubbs, Dundee, Forestdale, and Wardell series.

A small part of the county was once a natural prairie. Tall native grasses flourished on Matthews Prairie, the "Big Opening," and in several other small fields in openings in the natural forest canopy. Prairie grasses leave large quantities of humus in the soil. Tiptonville fine sandy loam is an example of soils that formed in such areas. Some of the Bosket, Canalou, and Crevasse soils also supported grasses.

Animals in the soil convert raw plant residue into humus, mix soil materials, and dig tunnels that help air and water move through the soil. Among these animals are burrowing rodents, earthworms, and such insects as beetles and grubworms. Crayfish are common in some poorly drained soils. Some bacteria convert atmospheric nitrogen to soil nitrogen.

By cutting the trees, draining swamps, improving drainage, landforming, controlling floods, irrigating, introducing new crops, cultivating crops, and adding fertilizer, lime, and other chemicals, man has changed the natural soil. Two of the most obvious results of man's activities are the reduction of organic matter in the soil and deterioration of natural tilth.

Relief

Relief is the elevations or inequalities of a land surface considered collectively. These inequalities reflect the entrenchment of the drainage pattern into the land surface as well as all other forces that contribute to shaping of the surface. Because New Madrid County is within the southern part of the Mississippi River Valley, the topography on flood plains is greatly affected by the forces and patterns of deposition. Most of the physical features of the county result from deposition, but the New Madrid Earthquake of late 1811 and 1812 has also had some impact.

The relief ranges from the nearly level natural levees to depressions of slack-water clay. Differences in elevation are commonly less than 2 feet, but on a few terrace escarpments and sand ridges and along the streambanks, the differences are 30 feet or more. The highest elevation is 325 feet above sea level at Sikeston, and the lowest is 250 feet near the southwest corner of the county, a difference of 65 feet. The distance between the two points is about 38 miles. Much of the change in elevation occurs at an abrupt escarpment that leads from the Sikeston Ridge to the Morehouse Lowland. The land commonly slopes downward toward the south at the rate of about 1 foot per mile.

Sikeston Ridge is the surface of a former flood plain, probably of the Ohio River (*7*). The Mississippi River carved out the Morehouse Lowland west of the ridge and later joined the Ohio River for further entrenchment east of the ridge. Sikeston Ridge marks a former base level of erosion, but there was a rather sudden rejuvenation of the region when a new erosion cycle formed the lowlands.

A succession of severe disturbances known collectively as the New Madrid Earthquake began on December 16, 1811, and lasted more than a year (*9*). Phenomena characteristic of the quakes included fissures, faults, landslides, uplifts, depressions, and sand blows. At the height of the disturbances the ground rose and fell and earth waves, like swells of the sea, passed across the surface.

Some of the soil properties that can be attributed to the earthquake and its aftereffects are most noticeable on the sunken lands. The poorly drained Gideon, Roellen, and Sikeston soils are closely associated with areas that were depressed during the earthquake. The high organic-matter content of the Roellen and Sikeston soils reflects the depressed, stagnant, swampy condition of that time. Some areas of Sharkey soils are also related to sunken lands, especially on the flood plain along the Little River. Other soils generally associated with sunken land are those of the Farrenburg and Lilbourn series. Some Dundee soils in this area have an overwash of fine sandy loam, averaging about 10 inches thick. Sand blows were common in some areas when they were first cleared, and although the years of cultivation and landforming have helped to mix soil textures, there are still some sand spots.

Time

Soils in New Madrid County are geologically young. Although the geology of the entire county is of the Holocene Epoch, there are age differences among the soils. The length of time required for the weathering of fresh materials and for a soil profile to form is not known, but limited evidence suggests that in some places soils can develop to maturity within a few hundred years or possibly less (*8*). In general, moisture and temperature and animal and plant life have been favorable for accelerated biochemical activity, but the soils in the county seem to be only slightly to moderately developed because they have been in place for only a short time.

The sequence of soil formation in alluvium, as time passes, includes the accumulation of organic matter; destruction of bedding planes; leaching of carbonates, if present; altering of reaction; development of stable peds; translocation of silicate clays; and the formation of distinct horizons. Each of these processes occurs at all times, but one process may be dominant during the early stages of soil formation, and another may become dominant later.

The age of new deposits, such as those in which the Caruthersville soils formed, ranges from a few years to several decades. The soils have some accumulation of organic matter, but they retain some depositional bedding planes as well as free calcium and alkalinity. They have weak and newly formed peds only in the upper 10 inches. In all factors except for age, the Dubbs soils on natural levees that border former stream channels are comparable to Caruthersville soils. Dubbs soils lack bedding planes in the solum, but they have a distinct accumulation of organic matter in the surface layer and are acid; they have moderate subangular blocky structure and have clay films in the subsoil. The distinct horizons suggest a significant altering of parent material. The formation of an argillic horizon in sandy material takes only about 500 years (*4*), as in the Broseley soils. More time than that may be needed for distinct horizons to develop in medium-textured material, such as that in which the Dubbs soils formed.

The clayey soils of the backwater swamps also have differences that can be attributed to the influence of time. Examples are the Alligator soils that generally are in the older backswamps along abandoned river channels and Sharkey soils that are in the younger backswamps along the more recently abandoned channels. That the leaching of bases has progressed further in Alligator soils than Sharkey soils can be inferred from the more acid reaction of the Alligator soils.

Time is necessary for the processes of soil formation to act on parent materials. The length of time that sediments have been in place varies enough in the soils of New Madrid County to show the effect of age. The actual time measured in years is not known, but the relative age, measured by degree of weathering, is known and is recorded as a property of the soil profile.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should search the latest literature available (*16, 19*).

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, can be grouped. In table 9, the soil series of New Madrid County are placed in several categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties that differentiate these soil orders are those that tend to give broad climatic groupings of soils. Three exceptions are the Entisols, Histosols, and Vertisols, which occur in different kinds of climate. Each order's name is a word of three or four syllables ending in *sol* (Moll-i-sol). The four soil orders in the county are Entisols, Inceptisols, Mollisols, and Alfisols.

Entisols are light-colored soils that do not have natural genetic horizons or that have only weakly expressed beginnings of such horizons. These soils do not show soil mixing that is caused by shrinking and swelling.

Inceptisols are soils that are young but not of the Holocene Epoch. They have started forming definite horizons, but extreme weathering has not occurred.

Mollisols formed under grass and have a thick, dark-colored surface layer containing colloids dominated by bivalent cations. The soil material in these soils has not been mixed by shrinking and swelling.

Alfisols are mineral soils that contain horizons of clay accumulation. Unlike the Mollisols, they lack a thick, dark-colored surface layer that contains colloids dominated by bivalent cations, but the base status of the lower horizons is not extremely low.

SUBORDER.—Each order has been divided into suborders, primarily on the basis of the characteristics that produce classes of the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging or soil differences resulting from the climate or plants. The names of suborders have two syllables. The last syllable indicates the order. An example is *Udoll* (*Ud*, meaning humid climate, and *oll*, from Mollisol).

GREAT GROUPS.—Suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that contain a pan that interferes with the growth of roots or movement of air and water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is *Argiudoll* (*Arg*, meaning clay accumulation, *ud* for humid climate, and *oll*, from Mollisol).

SUBGROUP.—Great groups are divided into subgroups, one representing the central (typic) segment of the group, and others called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are formed by placing one or more adjectives before the great group. An example is Typic Argiudolls (a typical Argiudoll).

FAMILY.—Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. An example is the fine-silty, mixed thermic family of Typic Argiudolls.

SERIES.—The series is a group of soils that have major horizons that except for texture of the surface layer are similar in important characteristics and in arrangement in the profile.

Environmental Factors Affecting Soil Use

Before 1786, the only inhabitants of the area that is now New Madrid County were Indians. The Mississippians had a fortified ceremonial center about 3 miles southwest of the present town of New Madrid, and later the Deleware Indians lived in the vicinity. Artifacts left by these Indians, particularly the Mississippians, indicate that farming was a major enterprise. The charred remains of corn have been uncovered from their living sites.

Clearing the woodland that originally had covered almost all of what is now New Madrid County began long before the first European settlers arrived. The clearing progressed slowly, but by 1900 most of the county had been cleared. At present, about 96 percent of the county has been cleared.

The early farming was done on Sikeston Ridge and other natural levees, but farming spread to the lowlands when those areas were drained and protected from flooding. In 1796 there were 608 cattle and 96 horses in the county, and 17,435 bushels of corn were grown. Most of the land had been drained by 1920. At present the soils are used mainly for field crops.

The acreage of corn, the first staple crop grown in the county, decreased from 120,000 acres in 1920 to about 60,000 acres in 1950. Since 1950 it has fluctuated but has remained near 60,000 acres. Although grown in the county for more than a hundred years, cotton did not become the principal crop until about 1920. The acreage in cotton increased to about 100,000 acres in 1940 and reached a peak of 120,000 acres by 1950. It has since declined to 70,000 acres.

The acreage in soybeans, an important crop during World War II, amounted to less than 10,000 acres in 1940 but had increased to more than 100,000 acres by 1950. At present, soybeans are grown on more than 200,000 acres.

The number of livestock has been decreasing. The number of beef and dairy cattle decreased from 16,000 in 1940 to about 9,000 in the 1960's. The raising of cattle has increased slightly in the last few years. Hogs have decreased in number from 53,000 in 1940 to less than 8,000 in the 1960's.

New Madrid dates back to 1789. Its population in 1796 was 499. The settlement did not grow much until 1804 when Louisiana became part of the United States. At that time, the population was 1,350. The growth of the area was greatly retarded by the New Madrid Earthquake. Many families left, taking only the belongings they could carry with them. Point Pleasant was settled in 1815, Portageville in 1851, and Sikeston in 1860. By 1900 the population of the county had increased to about 11,000 and continued to increase until 1940 when it reached a peak of nearly 40,000. It has since declined to about 23,000, the present population.

For the early residents, the Mississippi River was the main source of transportation. Later, two historically important roads were constructed. They were the El Camino Real, or King's Road, to St. Louis and a road that extended from Point Pleasant to Malden Prairie. The part of this road that crossed the Little River lowlands between Boekerton and Gideon became known as the Pole Road. These roads were important in the settlement of this area. The first railroad was built in 1893-94.

Currently the county is served by two railroads and several highways, including Interstates 55 and 57 and U.S. Highways 60, 61, and 62.

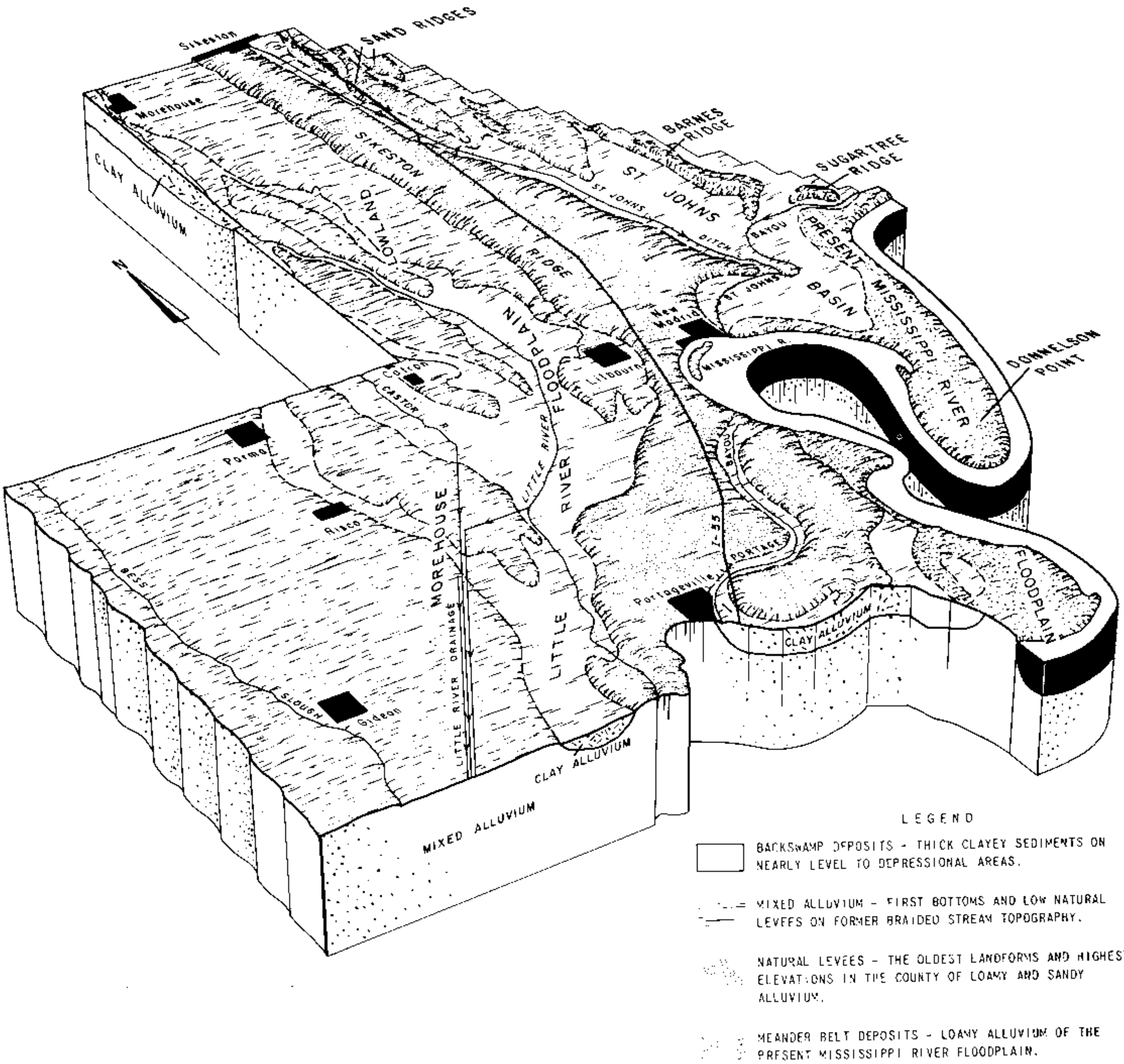

Figure 17.—**Physiography, relief, drainage, and surface features of New Madrid County.**

Physiography, Landforms, and Drainage

New Madrid County is on a nearly level alluvial plain (fig. 17), except for a few terrace escarpments and sand ridges. It has landforms and deposits characteristic of the southern Mississippi River Valley: backswamps, braided stream patterns, a recent meander belt, natural levees, and other formations (*17*). Sikeston Ridge, which dissects the county in a north-south direction, is the oldest landform. Barnes Ridge, Sugartree Ridge, and sand ridges are also old and are natural levees that are remnants of the former Ohio River flood plain. The Morehouse Lowland was once covered by the Mississippi River. Former braided stream channels now make up sloughs, swales, and drainageways. Thick deposits of clay are in backswamp areas, such as the Little River flood plain and St. Johns Basin.

The Mississippi Valley embayment is a broad structural trough between the Appalachian uplift on the east and the Ozark highlands on the west (*7*). The trough was filled by material deposited by a receding sea in pre-Pleistocene times, and the present valley was cut from the Gulf Coastal Plain. Toward the base of the alluvium, there is generally a gravel bed that consists of coarse chert *(10)*. Overlying the gravel bed is a thick layer of pervious sand and a thin top stratum of silt and clay. The early deposits were made by a stream flow of greater magnitude than that of the present Mississippi River. This is shown by the deep entrenchment, the subsequent thick alluviation, the raised river terraces, and stream meanders that are too small for the size of the valley.

The alluvium is about 200 feet thick in New Madrid County. One or more great streams initiated by the uplift of the Appalachian region and later augmented by the glacial melting carved the great valley and laid down the alluvial fills. The major valley entrenchment and some of the early deposits may have been made by the Teays River that once flowed from the eastern part of the United States to a northern embayment of the old Gulf of Mexico *(11)*. This river was later buried by glacial deposits. Most of the recent alluvium was deposited during and after the glaciation period as the sea level was rising. The terraces or natural levees were later formed by lower sea levels or by intermittent uplifts toward the north.

The alluvial deposits in New Madrid are in four general classes: backswamp deposits, mixed alluvium, natural levees, and meander belt deposits. Backswamps are those former channels or depressions where thick beds of clayey sediment accumulated. Mixed alluvium generally is made up of loamy deposits. These deposits are near braided stream channels. Natural levees are remnants of former flood plains made up of loamy and sandy alluvium. Meander belt deposits are stratified loamy deposits within about 2 miles of the present Mississippi River channel.

Some of the major courses providing natural drainage are Bess Slough, Black Bayou, Castor River, Little River, Portage Bayou, St. Johns Bayou, and St. Johns Ditch. Until artificial drainage was begun, drainage patterns were poorly established. Large areas were ponded for long periods, and as much as 10 percent of the county was always ponded. About 40 percent of the county was ponded or wet, except for a short period during the dry season.

Artificial drainage was started in 1899 with the dredging and straightening of Little River and its tributaries. Organized efforts have since provided drainage for nearly all parts of the county and have resulted in hundreds of miles of ditches.

Water Supply

Ground water is one of the abundant natural resources of New Madrid County. The three principal water-bearing strata are the alluvium, the Wilcox Group, and the McNairy (Ripley) Formation.

The alluvium is a surface formation 150 to more than 200 feet thick. Driven wells within a depth of 50 feet have been widely used for domestic water supplies. Most wells that yield as much as 4,000 gallons per minute or more are 150 to 200 feet in depth and extend to the basal gravel. Water from the alluvium is moderately hard and used mainly for irrigation.

The sand part of the Wilcox Group, which underlies the alluvium, is also a source of water supply. Yields are much lower than either the alluvium or the McNairy (Ripley) Formation. The quality of water is generally somewhat better than that of the alluvium.

The McNairy Formation is beneath the Wilcox Group

TABLE 10.—*Temperature*

[All data from Sikeston, elevation 325 feet;

Month	Temperature				
	Average daily maximum	Average daily minimum	Daily average	Record high	Record low
	°F	°F	°F	°F	°F
January	46.2	26.9	36.6	80	−15
February	49.4	28.9	39.1	78	−23
March	58.2	36.0	47.1	89	−4
April	70.1	46.7	58.4	91	24
May	79.2	56.3	67.7	98	31
June	88.6	65.7	77.2	109	43
July	91.9	68.5	80.2	111	47
August	91.0	67.1	79.1	111	41
September	84.8	58.9	71.8	104	29
October	74.6	47.3	61.0	99	19
November	58.7	35.4	47.1	87	0
December	47.8	29.0	38.4	76	−8
Year	70.0	47.2	58.6	111	−23

[1] Based on an average monthly temperature of 65° F. These data show relative heating requirements for dwellings.
[2] Less than one-half day.

and produces very soft water that is low in iron content. Most of the wells flow at ground level. The water-bearing part of this formation consists of sand, and under favorable conditions it yields 200 to 500 gallons per minute.

Surface storage is not an important source of water in the county because of the abundant ground water, but 1,050 acres of water are impounded in the county. This includes both natural impoundments and man-made lakes and ponds. About 40 miles of the county is along the Mississippi River.

Climate [4]

The main features of the climate in New Madrid County are comparatively mild winters and warm summers and an average precipitation that is greater in fall and winter than in the rest of the year. In 30 years, according to records, the total annual precipitation has ranged from 33 to 79 inches. Because of the large amount of precipitation in fall and winter, ditches are necessary to maintain extensive surface drainage. During summer, when crops are growing, precipitation usually does not meet crop demands for water, and irrigation is needed.

Table 10 gives temperature and precipitation data, and table 11 gives the probability of low temperatures in spring and fall. All data are based on records that are kept at the weather station in Sikeston.

New Madrid County is subject to large changes in temperature from season to season. The day-to-day fluctuations in temperature are largest in fall and winter and comparatively small in summer. In 4 or 5 winters out of 6, temperatures do not fall as low as 0°F. On more than half the days in July and August temperatures of 90°F or higher can be expected. In about half the summers a temperature of 100° or higher can be expected on at least 1 day.

The column headed "Average heating degree days" in table 10 provides a comparative number, or average, for calculating relative heating requirements for dwellings. The number of heating degree days for a given day is equal to a base temperature of 65°F, less the mean temperature for that day. As the heating degree day value increases, the amount of fuel needed to heat a given building also increases.

[4] By JAMES D. MCQUIGG, Professor of Atmospheric Science, College of Agriculture, University of Missouri, Columbia.

Natural Vegetation

Most of New Madrid County was once natural forest. At least 40 kinds of trees of three forest types are native to New Madrid County (*15*). The oak-hickory forest type covered the natural levees where the soils are of the Acadia, Bosket, Broseley, Dubbs, Dundee, Forestdale, and other series. These soils are acid. The oak-gum-cypress forest type covered the low wet areas of swamp where the soils are of the Cairo, Cooter, Gideon, Roellen, Sharkey, and Sikeston series. The elm-ash-cottonwood forest type covered the rest of the county.

Native prairie vegetation no longer grows in the county, but grass once grew on about 1 percent of the soils. Among these soils were those of the Tiptonville, Bosket, Canalou, and Crevasse series. Currently only about 3 percent of the county is forested and in native vegetation.

and precipitation data

based on records for the period 1931–60]

Average heating degree days [1]	Precipitation: Rainfall: Average	Precipitation: Rainfall: Maximum in 24-hour period	Precipitation: Snow and sleet: Average	Precipitation: Snow and sleet: Record	Average number of days that have—: Precipitation of 0.10 inch or more	Average number of days that have—: Temperature: 90° F or above	Average number of days that have—: Temperature: 32° F or below	Average number of days that have—: Temperature: 0° F or below
Number	*In*	*In*	*In*	*In*				
880	4.70	3.90	2.3	19.0	7	0	22	1
722	3.88	4.06	2.7	11.0	6	0	19	(2)
570	4.99	5.45	1.9	22.0	8	0	11	(2)
225	4.37	5.29	(3)	1.0	7	(2)	1	0
43	4.51	4.96	0		8	3	(2)	0
0	4.19	6.98	0		7	14	0	0
0	3.06	6.00	0		5	21	0	0
0	2.89	3.86	0		5	19	0	0
33	3.76	5.82	0		5	10	0	0
189	2.98	5.50	(3)	(3)	5	1	1	0
537	4.17	5.40	.2	4.0	6	0	13	0
825	3.69	3.55	1.1	6.8	7	0	20	(2)
4,024	47.19	6.98	8.2	22.0	76	68	87	1

[3] Trace, an amount too small to measure.

TABLE 11.—*Probability of low temperatures in spring and fall*

[Based on records from Sikeston]

Probability	Dates for given probability and temperatures				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than	March 12	March 18	March 23	April 8	April 22
2 years in 10 later than	March 4	March 10	March 17	April 1	April 15
5 years in 10 later than	February 15	February 25	March 9	March 22	April 5
Fall:					
1 year in 10 earlier than	November 23	November 16	October 31	October 22	October 17
2 years in 10 earlier than	November 26	November 22	November 14	October 28	October 22
5 years in 10 earlier than	December 11	December 3	November 17	November 8	October 30

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that the growth of most crop plants is low from this cause.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

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 clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found 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 and brittle; little affected by moistening.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has been allowed to drain away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Natural levee. A low ridge that parallels a river. It is formed by the alluvium that is deposited when a river spreads over its banks and the water suddenly loses its power to transport sediment.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Plowpan. A compacted layer formed in the soil immediately below the plowed layer.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.5 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that 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.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes 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 other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which plants (specifically sunflower) wilt so much that they do not recover when placed in a dark, humid atmosphere.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit, read the introduction to the section it is in for general information about its management.

Map symbol	Mapping unit	Described on page	Capability unit	
			Symbol	Page
Ad	Acadia silt loam, loamy substratum	10	IIIw-2	35
Ag	Alligator silty clay loam	11	IIIw-14	35
At	Alligator clay	11	IIIw-14	35
Bp	Borrow pits	12	Vw	36
BtA	Bosket fine sandy loam, 0 to 1 percent slopes	13	I-1	33
BtB	Bosket fine sandy loam, 1 to 5 percent slopes	13	IIe-1	33
Bw	Bowdre silty clay	14	IIw-2	34
ByA	Broseley loamy fine sand, 0 to 2 percent slopes	15	IIs-1	34
ByC	Broseley soils, 8 to 12 percent slopes	15	IVe-1	36
Ca	Cairo clay	16	IIIw-14	35
Cd	Canalou loamy sand	17	IIIs-1	35
Ce	Caruthersville very fine sandy loam	17	I-1	33
Cm	Commerce silt loam	18	IIw-1	33
Cn	Commerce silty clay loam	18	IIw-1	33
Co	Cooter silty clay	19	IIw-2	34
CrA	Crevasse sand, 0 to 3 percent slopes	19	IVs-1	36
CsB	Crevasse loamy sand, 0 to 4 percent slopes	19	IVs-1	36
CsC	Crevasse loamy sand, 4 to 12 percent slopes	20	VIs-1	36
CvA	Crevasse loam, overwash, 0 to 3 percent slopes	20	IIIs-1	35
Db	Dubbs silt loam	21	I-1	33
De	Dundee silt loam	21	IIw-1	33
Dn	Dundee silty clay loam	22	IIw-1	33
Fa	Farrenburg fine sandy loam	22	IIs-1	34
Fs	Forestdale silt loam	23	IIIw-2	35
Ft	Forestdale silty clay loam	23	IIIw-2	35
Gd	Gideon loam	24	IIIw-1	35
Ge	Gideon clay loam	24	IIIw-1	35
Lb	Lilbourn fine sandy loam	26	IIw-1	33
Ro	Roellen clay	26	IIIw-14	35
Sa	Sandy alluvial land	27	Vw	36
Sh	Sharkey silty clay loam	27	IIIw-14	35
Sr	Sharkey clay	28	IIIw-14	35
St	Sikeston sandy clay loam	29	IIIw-1	35
Tp	Tiptonville fine sandy loam	29	I-1	33
Wr	Wardell loam	30	IIw-1	33

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