

# SOIL SURVEY

## Dent County, Missouri



UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
AND FOREST SERVICE  
In cooperation with  
MISSOURI AGRICULTURAL EXPERIMENT STATION

Issued March 1971

Major fieldwork for this soil survey was done in the period 1958-63. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1963. This survey was made cooperatively by the Soil Conservation Service, the U.S. Forest Service, and the Missouri Agricultural Experiment Station; it is part of the technical assistance furnished to the Dent County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or can be purchased on individual order, from the Cartographic Division, Soil Conservation Service, USDA, Washington, D.C. 20250.

## HOW TO USE THIS SOIL SURVEY

**T**HIS SOIL SURVEY of Dent County contains information that can be applied in managing farms, wildlife habitat, and woodland; in selecting sites for roads, ponds, buildings, or other structures; and in judging the suitability of tracts of land for farming, forestry, industry, or recreation.

### Locating Soils

All of the soils of Dent County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. 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 in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, woodland group, wildlife group, or any other group in which the soil has been placed.

Interpretations not included in the text can be developed by using the soil map and 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 limita-

tion 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 in the soil descriptions and in the discussions of the capability units, woodland suitability groups, and wildlife suitability groups.

*Foresters and others* can refer to the section "Use of Soils for Wood Crops," where the soils of the county are grouped according to their suitability for trees.

*Game managers, sportsmen, and others concerned with wildlife* will find information about soils and wildlife in the section "Use of Soils for Wildlife."

*Community planners and others concerned with recreational development* can read about the soil properties that affect the choice of parks, picnic areas, and other recreational areas in the section "Recreational Uses of Soils."

*Engineers and builders* will find under "Engineering Uses of Soils" tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

*Scientists and others* can read about how the soils were formed and how they are classified in the section "Formation, Morphology, and Classification of Soils."

*Newcomers in Dent County* may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information about the county.

### Cover Picture

View of the Clarksville-Baxter association typical of the landscape in Dent County. The Clarksville and Baxter soils are on the steep slopes in the background, and the Viraton and Elsay soils are in the valleys.

U.S. GOVERNMENT PRINTING OFFICE: 1971

## Contents

	Page		Page
<b>How this survey was made</b> .....	1	<b>Use and management of soils—Continued</b>	
<b>General soil map</b> .....	2	Use of soils for wildlife.....	35
1. Nixa-Clarksville-Lebanon-Hobson association.....	2	Elements of wildlife habitat and classes of wildlife.....	35
2. Clarksville-Coulstone association.....	4	Wildlife suitability groups.....	36
3. Clarksville-Baxter association.....	5	Management for openland, wetland, and woodland wildlife and for fish.....	38
<b>Descriptions of the soils</b> .....	6	Engineering uses of soils.....	38
Ashton series.....	7	Engineering classification systems.....	39
Atkins series.....	8	Engineering test data.....	39
Bado series.....	8	Engineering properties of the soils.....	50
Baxter series.....	9	Engineering interpretations of the soils.....	50
Clarksville series.....	9	Recreational uses of soils.....	51
Coulstone series.....	11	<b>Formation, morphology, and classification of soils</b> .....	54
Elkins series.....	12	Factors of soil formation.....	54
Elsah series.....	13	Parent material.....	54
Gladden series.....	14	Climate.....	55
Hobson series.....	14	Plants and animals.....	55
Lebanon series.....	15	Relief.....	55
Moniteau series.....	17	Time.....	55
Nixa series.....	18	Morphology and composition of soils.....	56
Pope series.....	19	Classification of soils.....	56
Razort series.....	20	<b>Chemical and physical analysis of soils</b> .....	57
Riverwash.....	21	Field and laboratory methods.....	57
Rock land.....	21	<b>General nature of the county</b> .....	58
Sandy alluvial land.....	21	Geology, physiography, and drainage.....	58
Sharon series.....	21	Climate.....	62
Viraton series.....	22	Settlement and population.....	64
Viraton silt loam, red subsoil variants.....	23	Water supply.....	64
Westerville series.....	23	Transportation, industry, and markets.....	65
<b>Use and management of soils</b> .....	24	Farming statistics.....	65
Capability grouping.....	24	<b>Literature cited</b> .....	66
Management by capability units.....	25	<b>Glossary</b> .....	67
Predicted yields.....	28	<b>Guide to mapping units</b> .....	Following 68
Use of soils for wood crops.....	30		
Forest types.....	30		
Woodland suitability groups.....	30		



# SOIL SURVEY OF DENT COUNTY, MISSOURI

BY FREDERICK L. GILBERT, SOIL CONSERVATION SERVICE

SOILS SURVEYED BY JOHN P. FRANCKA, FREDERICK L. GILBERT, ALLAN H. JEFFREY, DEAN E. MORGAN, GEORGE D. ROBERTSON, JOHN W. VAN DINE, RALPH WORK, AND JAMES E. YARBOROUGH, SOIL CONSERVATION SERVICE, AND CHARLES D. CHRISTOPH, EDWIN W. NEUMANN, AND SHERMAN A. RADTKE, U.S. FOREST SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, IN COOPERATION WITH THE MISSOURI AGRICULTURAL EXPERIMENTAL STATION

**D**ENT COUNTY, in the south-central part of Missouri, covers a total area of 756 square miles, or 483,840 acres (fig. 1). Part of the land in the county is in public ownership. In 1969 the Clark National Forest consisted of 65,529 acres that were managed on a multiple-use basis by the U.S. Forest Service. Salem, the county seat, had a population of 3,870 in 1960. In the same year the county had a population of 10,445.

Farming is the principal enterprise in Dent County. In 1964 slightly more than half the acreage was in farms. The principal field crops are corn, barley, and grain sorghum, though alfalfa and other legumes and grasses are grown for hay or pasture. The main kinds of livestock are cattle, hogs, and sheep.

Most of the soils are hilly and gently sloping to strongly sloping. Flooding is a hazard on the small acreage of soils of the bottom land.

## *How This Survey Was Made*

Soil scientists made this survey to learn what kinds of soils are in Dent County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many 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.

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 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 other geographic feature near the place where a soil of that series was first observed and mapped. Lebanon and Clarksville, for example, are the names of two soil series. 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, Clarksville cherty silt loam, 2 to 9 percent slopes, is one of several phases within the Clarksville series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries

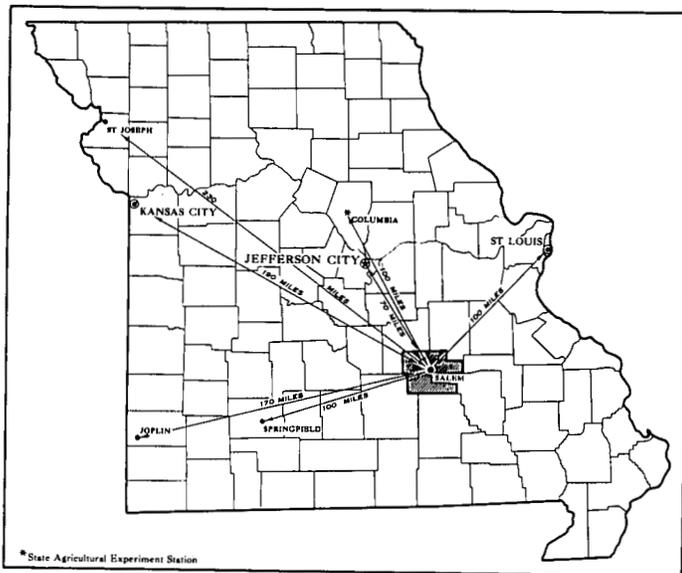


Figure 1.—Location of Dent County in Missouri.

of the individual soils on aerial photographs. These photographs show woodland, buildings, field borders, trees, and other details that greatly 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 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.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of Dent County: soil complexes and undifferentiated groups.

A soil complex consists of two or more soils so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern of and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Nixa-Clarksville cherty loams, 2 to 5 percent slopes, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the survey, there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Lebanon and Hobson silt loams, 2 to 5 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so 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 land types instead of soils and are given descriptive names. Riverwash and Sandy alluvial land are land types in Dent 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 soils 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 soils. 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 a way that it is readily useful to different groups of users, among them farmers, managers of woodland, engineers, and homeowners.

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, and then adjust the groups according to the results of their studies and con-

sultation. 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 in this survey shows the soil associations in Dent County (fig. 2). A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is also useful in determining the value of the associations for a watershed, for growing wood products, for wildlife habitat, for engineering work, for recreational areas, and for community development. A general soil map, however, is not suitable for planning the management of a farm or field, or choosing the site for a building or other structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The three soil associations in Dent County are described in the following pages.

### 1. Nixa-Clarksville-Lebanon-Hobson Association

*Gently sloping to moderately steep, somewhat excessively drained to moderately well drained soils that have a fragipan, a cherty subsoil, or both*

This association consists of gently sloping to moderately steep soils on uplands and soils on bottom lands along small tributary streams. The association is in the western and central parts of the county in an area that is about 20 miles across. It is mostly open farmland, though trees grow in small areas. A few small areas are steep and stony. This association covers about 47 percent of the county.

Dominant in the association are the sloping to moderately steep Nixa and Clarksville soils and the gently sloping Lebanon and Hobson soils (fig. 3). The Nixa and Clarksville soils make up about 40 percent of the association; the Lebanon and Hobson soils, 43 percent; and minor soils, the remaining 17 percent.

The sloping to moderately steep Nixa and Clarksville soils are adjacent to the broad ridgetops in most places. These two kinds of soils are closely intermingled. Nixa soils are moderately well drained. They generally have a dark grayish-brown cherty loam surface layer about 9 inches thick. A cherty fragipan occurs at a depth of 17 inches. The fragipan is light-brown cherty silt loam that extends to a depth of 33 inches.

The Clarksville soils are somewhat excessively drained. They generally have a dark grayish-brown cherty silt loam surface layer. Their subsoil is very cherty loam that

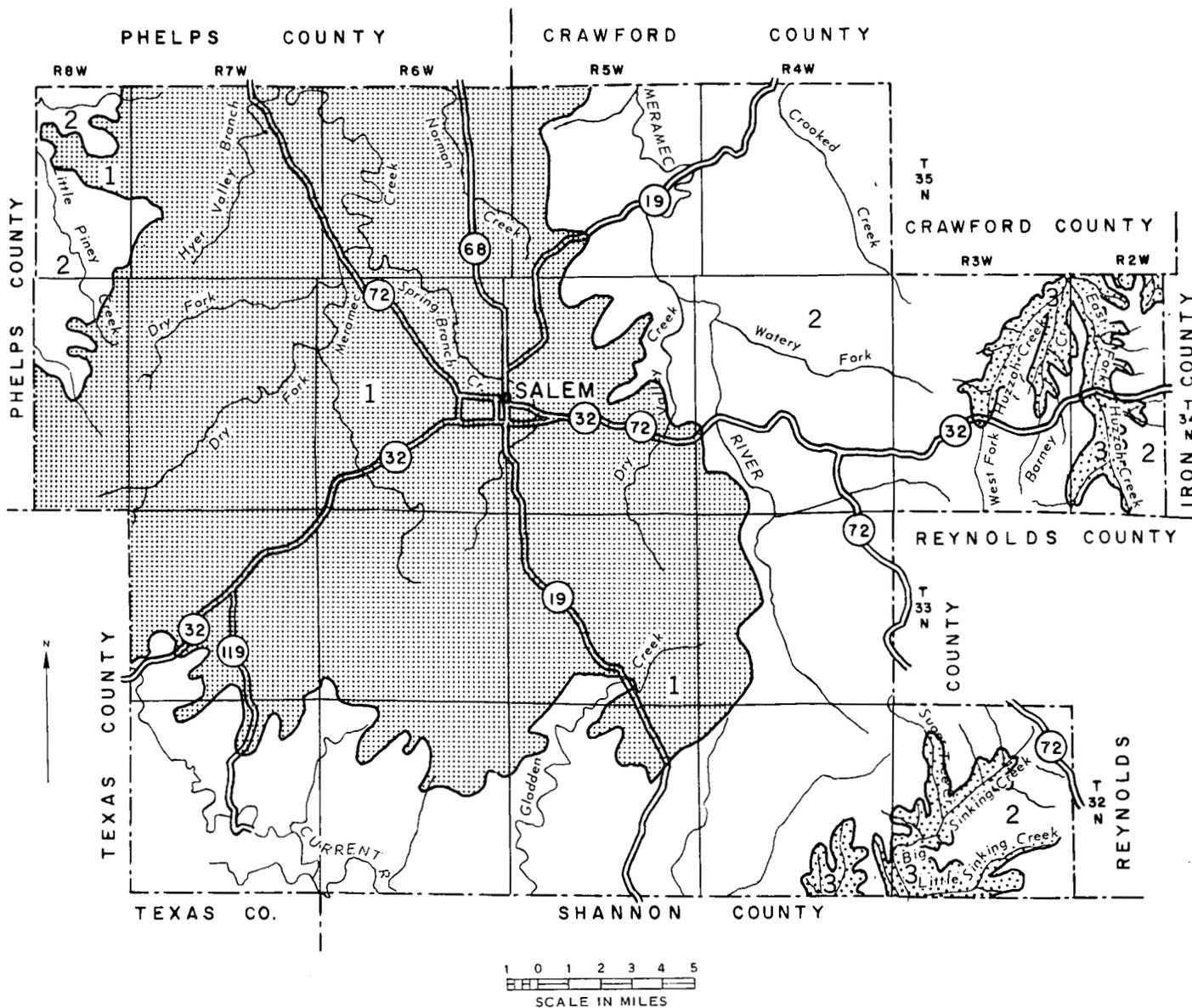


Figure 2.—General Soil Map, Dent County, Missouri.

1. Nixa-Clarksville-Lebanon-Hobson association: Gently sloping to moderately steep, somewhat excessively drained to moderately well drained soils that have a fragipan, a cherty subsoil, or both.
2. Clarksville-Coulstone association: Steep, somewhat excessively drained soils that are cherty throughout.
3. Clarksville-Baxter association: Steep, somewhat excessively drained and well-drained soils that have a cherty surface layer and a cherty or clayey subsoil.

is about 80 percent chert and is reddish yellow and strong brown in equal parts. The subsoil is underlain by yellowish-red very cherty silty clay loam.

The gently sloping Lebanon and Hobson soils are also closely intermingled, mainly on the broad ridgetops (fig. 4). These soils are moderately well drained. They have a silt loam to loam surface layer about 8 inches thick. In the Lebanon soils a cherty fragipan occurs at a depth of 18 to 30 inches. Throughout the profile in some places are small amounts of chert and sandstone fragments. A

thick sandy loam fragipan in the Hobson soils distinguishes these soils from the Lebanon soils.

Also in this association are the steep Clarksville soils in small areas along the streams and the level Sharon and Westerville soils on bottom lands along the many streams in the county. Other soils in the association are the level Moniteau and Bado soils, in small areas on the broad ridgetops, and other minor soils that occur in small acreages throughout the association.

This association is the most important part of the

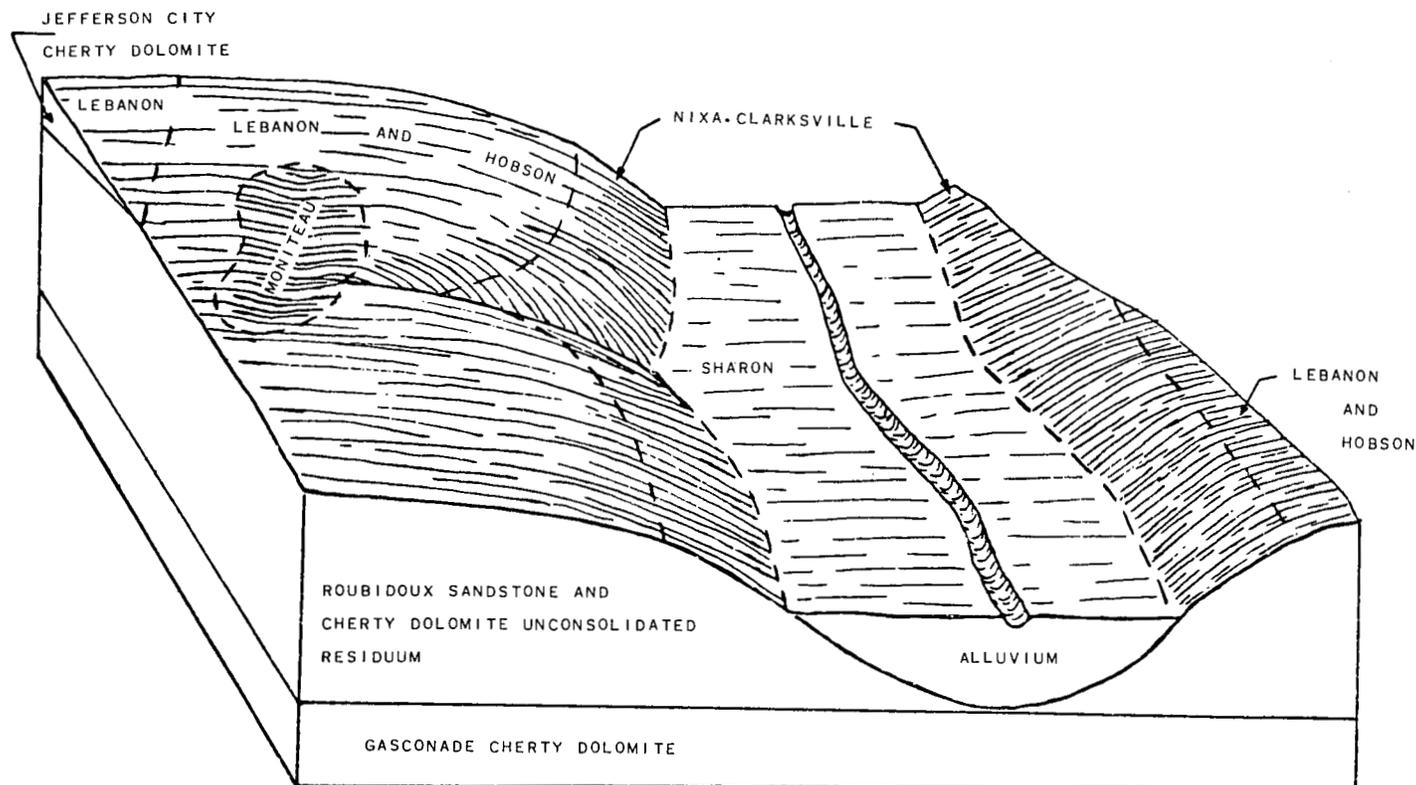


Figure 3.—Major soils in association 1 showing relationships of these soils and the underlying material.

county for farming. Because the raising of livestock is the most common enterprise, most of the acreage is in hay and pasture. Cultivated crops, such as corn and small grain, are grown in a few small areas, mainly on the level soils on bottom lands. The soils in this association are not used for crops to a large extent. Intensive management should not be practiced, mainly because crop growth is limited by droughtiness, low fertility, and sheet erosion.

## 2. Clarksville-Coulstone Association

*Steep, somewhat excessively drained soils that are cherty throughout*

Most of this soil association is made up of cherty soils on narrow ridgetops, steep side slopes, and narrow bottom lands, all of which are covered by timber (fig. 5). Farms, however, are generally scattered throughout the association. This association occurs in a large area that extends around the southern and eastern parts of the county in a band 6 to 12 miles wide. A smaller area is in the northwestern part of the county. This soil association covers about 50 percent of the county.

Clarksville soils make up about 69 percent of the association; Coulstone soils, about 23 percent; and minor soils, the remaining 8 percent.

Clarksville soils are steep and in most places are on ridgetops and side slopes (fig. 6). In these soils the sur-

face layer is about 13 inches thick and consists of cherty silt loam. The subsoil, about 7 inches thick, is reddish-yellow and strong-brown very cherty loam. The next layer is yellowish-red very cherty silty clay loam. From 40 to 90 percent of the soil profile consists of pieces of chert that range from  $\frac{1}{4}$  inch to 6 inches or more in size.

Coulstone soils are on positions similar to those of the Clarksville. The surface layer is 4 inches thick and consists of dark-gray or dark grayish-brown very cherty loam. The subsurface layer, a very cherty, brown loam, overlies the yellowish-brown cherty sandy loam upper part of the subsoil. The lower part of the subsoil is very pale brown cherty sandy loam over sandstone fragments.

The rest of the association consists of the gently sloping Nixa, the level Lebanon and Hobson, the steep Baxter, and the level Elsay and Gladden soils. The Nixa soils and the Lebanon and Hobson soils are on the ridgetops, Baxter soils are on the lower slopes, and Elsay and Gladden soils are on the bottom lands. Small acreages of other soils occur throughout the association.

Woodland is dominant in this association, though the small, cleared fields, mainly in hay or pasture, are on the small strips in bottom lands and on ridgetops. Larger fields occupy the valleys along the major streams. Steepness, stoniness, and droughtiness are the main limitations. Because these limitations are severe, timber production is the best use.



Figure 4.—View of landscape in soil association 1. Lebanon and Hobson silt loams are on the gently sloping parts, and the Nixa-Clarksville cherty loams are on the slopes along the drainageways.



Figure 5.—Typical view of a ridgetop in soil association 2, showing mixed hardwoods and shortleaf pine on Clarksville cherty silt loam, 2 to 9 percent slopes.

### 3. Clarksville-Baxter Association

*Steep, somewhat excessively drained and well-drained soils that have a cherty surface layer and a cherty or clayey subsoil*

This association consists of steep, somewhat excessively drained and well-drained, cherty soils on uplands and nearly level soils in alluvium on the stream bottoms. The steep valley slopes are timbered, and the bottom lands are cleared. This association is in the two areas in the eastern part of the county. One area is in the valley of Huzzah Creek, and the other area is in the valley of Sinking Creek and its tributaries. The association covers only about 3 percent of Dent County.

Clarksville soils make up about 67 percent of the association; the Baxter soils, 28 percent; and minor soils, the remaining 5 percent.

The steep Clarksville and Baxter soils are closely intermingled above narrow valleys (see fig. 6). These soils have a surface layer that ranges from cherty loam to cherty silt loam. The upper part of the subsoil in the Baxter soils is yellowish-red silty clay, of which less than

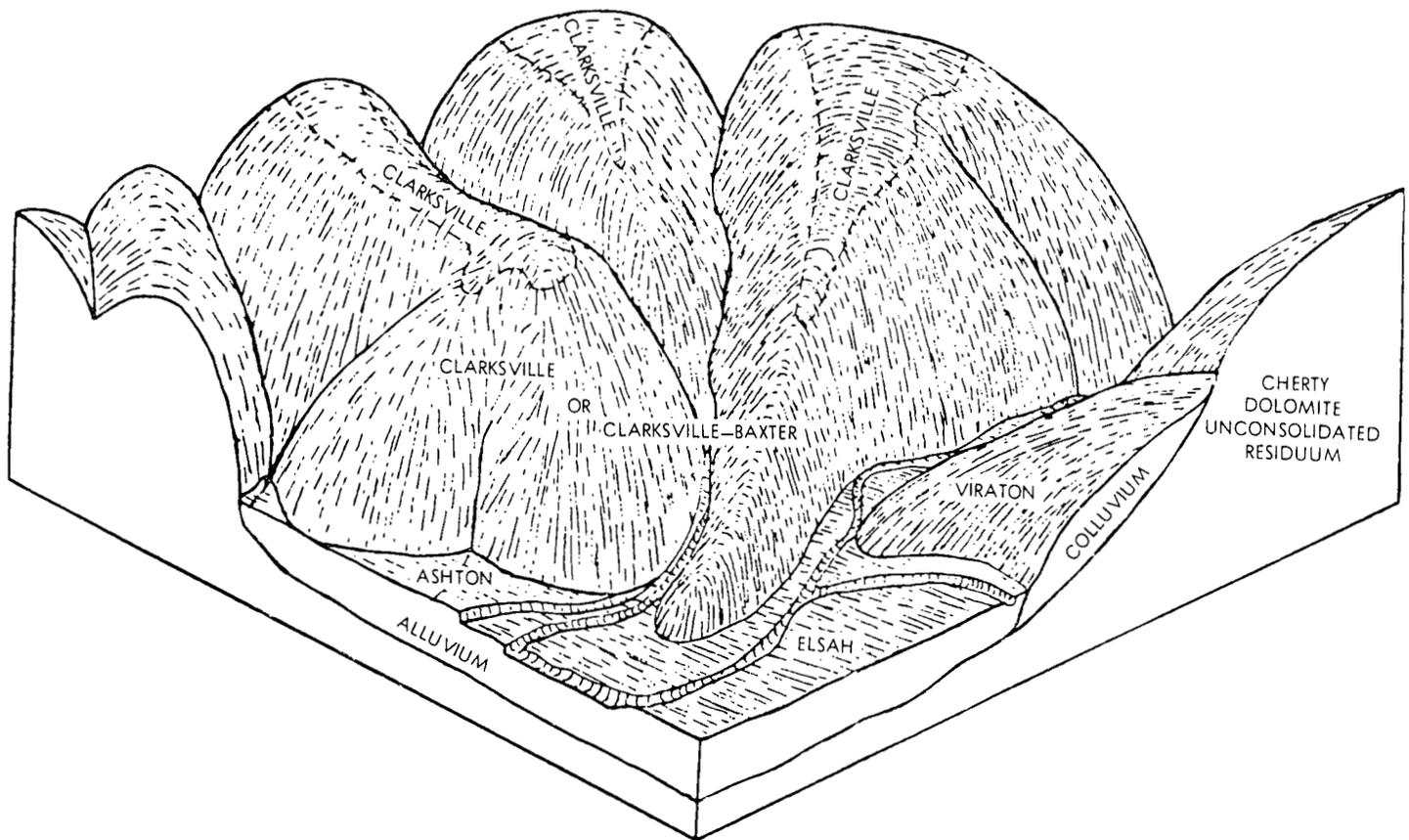


Figure 6.—Major soils in soil associations 2 and 3 showing relationship of these soils and underlying material.

10 percent is chert. The lower part is red clay that is 10 to 30 percent chert. The subsoil of the Clarksville soils is very cherty loam mixed with chert that makes up about 80 percent of the volume. The reddish color in the subsoil of the Baxter soils and the high chert content in the subsoil of the Clarksville soils are the main differences between these soils. In both kinds of soils the fragments of chert range from less than  $\frac{1}{4}$  inch to 6 inches or more in size.

Minor soils in this association are the Lebanon, Nixa, Viraton, and Elsay. Lebanon soils are level and sloping, and Nixa and Viraton soils are sloping to moderately steep.

About half of this association remains in timber, and the rest is used for row crops, hay, and pasture. The timber grows on the steep soils that are high on the hillsides, and the cleared land is on the lower slopes and the valley floor. Steepness, stoniness, and droughtiness are the main limitations to use.

### Descriptions of the Soils

In this section the soil series and the mapping units in each series are described. The acreage and proportionate extent of each mapping unit are given in table 1.

The procedure is first to describe the soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. The description of a soil series mentions features that apply to all the soils in a series. Differences among the soils of one series are pointed out in the description of the individual soils or are indicated in the soil name. As mentioned in the section, "How This Survey Was Made," not all mapping units are members of a soil series. Riverwash, for example, is a miscellaneous land type that does not belong to a soil series. It is listed, nevertheless, in alphabetic order along with the soil series.

A profile typical for each series is described in two ways. Many will prefer to read the short description in narrative form. It is the second paragraph in the series description. The technical profile is mainly for soil scientists and others who want detailed information about the soils. Unless otherwise indicated, the colors given in the technical profile are for the soils when moist. Some of the terms used to describe the soils are defined in the Glossary at the back of this soil survey. Others are defined in the "Soil Survey Manual" (10).<sup>1</sup>

<sup>1</sup> Italic numbers in parentheses refer to Literature Cited, p. 66.

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

Soil	Acre	Percent	Soil	Acre	Percent
Ashton silt loam, 0 to 2 percent slopes.....	125	( <sup>1</sup> )	Lebanon and Hobson silt loams, 5 to 9 percent slopes, eroded.....	22, 145	4. 6
Ashton silt loam, 2 to 5 percent slopes.....	285	0. 1	Lebanon and Hobson silt loams, 9 to 14 percent slopes.....	2, 387	. 5
Ashton silt loam, 5 to 9 percent slopes.....	71	( <sup>1</sup> )	Lebanon and Hobson silt loams, 9 to 14 percent slopes, eroded.....	2, 748	. 6
Atkins loam.....	2, 530	. 5	Moniteau silt loam, 0 to 2 percent slopes.....	475	. 1
Bado silt loam, 2 to 5 percent slopes.....	641	. 1	Moniteau silt loam, 2 to 5 percent slopes.....	1, 011	. 2
Clarksville cherty silt loam, 2 to 9 percent slopes.....	9, 882	2. 0	Nixa-Clarksville cherty loams, 2 to 5 percent slopes.....	10, 894	2. 2
Clarksville cherty silt loam, 9 to 14 percent slopes.....	2, 656	. 5	Nixa-Clarksville cherty loams, 5 to 9 percent slopes.....	64, 283	13. 3
Clarksville cherty silt loam, 14 to 30 percent slopes.....	31, 868	6. 6	Nixa-Clarksville cherty loams, 9 to 14 percent slopes.....	27, 964	5. 8
Clarksville cherty silt loam, 30 to 50 percent slopes.....	52, 634	10. 9	Nixa-Clarksville cherty loams, 14 to 19 percent slopes.....	4, 153	. 8
Clarksville-Baxter cherty silt loams, 12 to 30 percent slopes.....	2, 323	. 5	Pope sandy loam.....	2, 549	. 5
Clarksville-Baxter cherty silt loams, 30 to 50 percent slopes.....	10, 924	2. 2	Razort loam, 1 to 3 percent slopes.....	91	( <sup>1</sup> )
Coulstone and Clarksville cherty soils, 2 to 9 percent slopes.....	17, 874	3. 7	Razort cherty loam, 1 to 3 percent slopes.....	826	. 2
Coulstone and Clarksville cherty soils, 9 to 14 percent slopes.....	9, 255	1. 9	Riverwash.....	2, 913	. 6
Coulstone and Clarksville cherty soils, 14 to 30 percent slopes.....	38, 187	7. 9	Rock land.....	3, 963	. 8
Coulstone and Clarksville cherty soils, 30 to 50 percent slopes.....	24, 376	5. 0	Sandy alluvial land.....	708	. 1
Elkins silt loam.....	316	. 1	Sharon silt loam.....	13, 319	2. 8
Elsah cherty loam.....	7, 344	1. 5	Viraton cherty silt loam, 5 to 9 percent slopes.....	1, 342	. 3
Elsah very cherty loam.....	14, 885	3. 1	Viraton cherty silt loam, 5 to 9 percent slopes, eroded.....	403	. 1
Gladden loam.....	5, 141	1. 1	Viraton cherty silt loam, 9 to 14 percent slopes.....	1, 279	. 3
Lebanon silt loam, 2 to 5 percent slopes.....	307	. 1	Viraton cherty silt loam, 14 to 19 percent slopes.....	731	. 1
Lebanon silt loam, 5 to 9 percent slopes.....	361	. 1	Viraton silt loam, red subsoil variant, 3 to 9 percent slopes.....	896	. 2
Lebanon cherty silt loam, 2 to 9 percent slopes.....	4, 018	. 8	Viraton silt loam, red subsoil variant, 9 to 16 percent slopes.....	394	. 1
Lebanon and Hobson silt loams, 2 to 5 percent slopes.....	41, 434	8. 6	Westerville silt loam.....	7, 315	1. 5
Lebanon and Hobson silt loams, 2 to 5 percent slopes, eroded.....	2, 701	. 5	Mines and dumps.....	49	( <sup>1</sup> )
Lebanon and Hobson silt loams, 5 to 9 percent slopes.....	29, 941	6. 2	Water.....	923	. 2
			Total.....	483, 840	100. 0

<sup>1</sup> Less than 0.05 percent.

## Ashton Series

The Ashton series consists of nearly level to sloping, well-drained soils. These soils developed in alluvium on the stream terraces above the bottom lands in the highly dissected parts of the county.

In a typical profile the surface layer is dark-brown silt loam about 8 inches thick. The subsoil extends to a depth of at least 36 inches. The upper part is dark-brown silt loam, and the lower part is dark-brown or dark yellowish-brown silty clay loam. A few, faint, yellowish-brown mottles are in the lower part.

Available moisture capacity is high. Permeability is moderate. Natural fertility is moderately high. These soils are strongly acid to medium acid.

Ashton soils are used mainly for row crops, pasture, and hay. Timber is grown in some areas.

Typical profile of Ashton silt loam, 0 to 2 percent slopes (SW $\frac{1}{4}$ SE $\frac{1}{4}$ , section 17, T. 32 N., R. 3 W.):

A1—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; loose when moist; medium acid (pH 6.0); clear boundary.

B1—8 to 13 inches, dark-brown (7.5YR 4/4) silt loam; weak, fine, granular structure; very friable; medium acid (pH 5.7); clear boundary.

B21t—13 to 24 inches, dark-brown (7.5YR 4/4) silty clay loam; weak, fine, subangular blocky structure; friable; strongly acid (pH 5.4); gradual boundary.

B22t—24 to 29 inches, dark-brown (7.5YR 4/4) silty clay loam; weak, medium, subangular blocky structure; friable; strongly acid (pH 5.2); gradual boundary.

B3—29 to 50 inches, dark yellowish-brown (10YR 4/4) silty clay loam; few, fine, faint, yellowish-brown (10YR 5/4) mottles; massive (structureless); friable; strongly acid (pH 5.1).

In undisturbed areas, the A1 horizon is 7 to 10 inches thick and dark brown (7.5YR 3/2 to 10YR 4/3). The B1 horizon ranges from dark brown (7.5YR 4/4) to reddish brown (5YR 4/4). In some areas the Ashton soils are slightly more acid and contain more sand than the soil described as typical for the series.

Ashton soils are below the steep Clarksville and Baxter soils of the uplands and above the Elsah soils of the bottom lands. Ashton soils occur on low terraces with the Razort soils.

**Ashton silt loam, 0 to 2 percent slopes (AsA).**—This soil occupies stream terraces below the steep Clarksville and Baxter soils on uplands and above the Elsah soils on bottom lands. The profile of this soil is the one described as typical for the series.

Included with this soil in mapping, on low terraces, were a few small areas of the Razort soils.

This Ashton soil is well drained, has good tilth, has favorable depth, and is well suited to cultivated crops. Limitations to cultivation are only slight. All crops common in the county can be grown if enough fertilizer is added, if all crop residue is left on the surface or mixed into the soil, and if minimum tillage is applied. Row crops, clover, alfalfa, grasses, and trees are suitable crops. (Capability unit I-1; woodland suitability group 6; wild-life suitability group 3)

**Ashton silt loam, 2 to 5 percent slopes (AsB).**—This soil is on terraces below the steep Clarksville and Baxter soils and above the Elsay soils on the flood plain. In some places the profile of this soil has a thinner surface layer and a slightly sandier subsoil than the profile described as typical for the series. Included with this soil in mapping were a few moderately eroded areas.

This Ashton soil is well suited to row crops, grasses, and most legumes and trees. It also is well suited to plants that furnish food and cover for wildlife. Because the soil is susceptible to erosion, practices that reduce soil losses are needed. (Capability unit IIe-1; woodland suitability group 6; wildlife suitability group 3)

**Ashton silt loam, 5 to 9 percent slopes (AsC).**—This soil normally is between Ashton silt loam, 0 to 2 percent slopes, or Ashton silt loam, 2 to 5 percent slopes, and the Elsay soils on the bottom lands. It is also on terraces between the steep Clarksville and Baxter soils on uplands and the Elsay soils on the bottom lands. The profile of this soil is similar to the one described as typical for the series but has a slightly thinner surface layer and a sandier subsoil.

Included in mapping were a few moderately eroded areas. In these areas the surface layer is 1 to 6 inches thick and has been partly mixed with the subsoil.

This Ashton soil is suited to row crops, grasses, and legumes, and trees. It also is suited to plants that provide food and cover for wildlife. Because erosion is the main obstacle, practices are needed that reduce soil losses. (Capability unit IIIe-1; woodland suitability group 6; wildlife suitability group 3)

## Atkins Series

The Atkins series consists of level, poorly drained soils that formed in alluvial sediments washed from uplands underlain by sandstone and cherty dolomite. These soils occur on bottom lands along streams and are level and slightly depressional.

In a typical profile the surface layer is dark-brown loam about 5 inches thick. The underlying material extends to a depth of 60 inches and consists of white and light-gray loam. The upper part of this layer is mottled with brownish yellow, and the lower part is mottled with strong brown.

Natural fertility is low, but available moisture capacity is high. These soils are very strongly acid. Permeability is moderately slow to slow. These soils commonly flood during most years.

Most of the acreage of Atkins soils is used for pasture, hay, and row crops. A few areas are idle.

Typical profile of Atkins loam (SE $\frac{1}{4}$ SE $\frac{1}{4}$ , section 20, T. 34 N., R. 7 W.):

Ap—0 to 5 inches, dark-brown (10YR 4/3) loam; weak, very fine, granular structure; slightly sticky when wet; very strongly acid (pH 4.7); abrupt, smooth boundary.

C1—5 to 19 inches, white (10YR 8/2) loam; many, medium, distinct mottles of brownish yellow (10YR 6/8); weak, medium, subangular blocky structure; firm, hard; very strongly acid (pH 4.8); gradual, wavy boundary.

C2—19 to 25 inches, light-gray (10YR 7/2) loam with pockets of clay loam; many, medium, distinct mottles of brownish yellow (10YR 6/8); massive (structureless); friable, hard; very strongly acid (pH 5.0); clear, wavy boundary.

C3—25 to 60 inches, light-gray (10YR 7/2) loam; many, medium, distinct mottles of strong brown (7.5YR 5/8); massive (structureless); firm, very hard; very strongly acid (pH 4.9).

On the surface in many areas are large amounts of black concretions that are sometimes called buck shot. Areas of the Atkins soils are locally called buck shot land.

The A and C horizons are loam or silt loam. In most areas the C horizon is mottled with various shades of brown and yellow. The material underlying these soils is stratified sand in some places, but the upper 30 inches is normally loam or silt loam. Atkins soils are very strongly acid to medium acid.

Atkins soils occur closely with the better drained Westerville and Sharon soils.

**Atkins loam (At).**—This soil occurs on bottom lands and is nearly level and slightly depressional. Slopes are less than 1 percent.

Included with this soil in mapping were areas of Westerville and Sharon soils. In most places these included areas occupy mounds.

This soil is used for pasture, hay, and row crops. Because wetness is the main limitation to sustained crop growth, drainage is needed if this soil is cultivated. Required in addition to drainage in intensively cropped areas are practices that leave all crop residue on the fields and later mix it into the soil, that add lime and fertilizer, and that provide minimum tillage. (Capability unit IIIw-1; woodland suitability group 7; wildlife suitability group 2)

## Bado Series

The Bado series consists of nearly level, poorly drained soils that formed in loess over cherty dolomite residuum. These soils occur on broad ridges in the gently rolling parts of the county. The native vegetation was mixed hardwoods, mainly blackjack and post oaks.

In a typical profile the surface layer is dark-brown silt loam about 4 inches thick. The subsurface layer is silt loam about 8 inches thick. It is light yellowish brown in the upper part and yellowish brown mottled with gray in the lower part. The next layer is gray silty clay loam about 5 inches thick. The subsoil, about 12 inches thick, is dark gray and very dark gray clay mottled with yellowish red. Beneath this is a fragipan consisting of dark grayish-brown, very hard and brittle silt loam about 19 inches thick. It is underlain by mottled gray, pale-brown, yellowish-brown, and strong-brown silty clay loam.

Bado soils are moderately well suited to pasture, hay, row crops, small grains, and trees.

Typical profile of Bado silt loam, 2 to 5 percent slopes (SE $\frac{1}{4}$ SE $\frac{1}{4}$ , section 8, T. 34 N., R. 7 W.):

A1—0 to 4 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; many, fine,

black concretions; very strongly acid (pH 4.65); clear, smooth boundary.

- A21—4 to 8 inches, light yellowish-brown (10YR 6/4) silt loam; few, fine, faint, light brownish-gray (10YR 6/2) mottles; weak, fine, angular structure; very friable; very strongly acid (pH 4.65); clear, smooth boundary.
- A22—8 to 12 inches, yellowish-brown (10YR 5/4) silt loam with light-gray (10YR 7/2) coatings and common, fine, faint mottles; weak, fine, subangular blocky structure; very friable; very strongly acid (pH 4.8); clear, wavy boundary.
- A&Bt—12 to 17 inches, gray (10YR 5/1) silty clay loam; light-gray (10YR 7/2) silt coatings on the peds; few yellowish-brown (10YR 5/4) stains; strong, fine, subangular blocky structure; very firm; very strongly acid (pH 4.7); clear, wavy boundary.
- B21t—17 to 21 inches, dark-gray (10YR 4/1) clay; common, fine, distinct, yellowish-red (5YR 5/8) mottles; moderate, medium, subangular blocky structure; very firm; very strongly acid (pH 4.5); clear, irregular boundary.
- B22t—21 to 29 inches, very dark gray (10YR 3/1) clay; common, medium, distinct, yellowish-red (5YR 5/8) mottles; strong, coarse, subangular blocky structure; very firm; very strongly acid (pH 4.5); clear, irregular boundary.
- IIA'xb—29 to 48 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, faint, brownish-yellow (10YR 6/6) mottles; very thick platy structure; very hard and brittle; light-gray (10YR 7/1) coatings and very dark gray (10YR 3/1) clay seams that follow old root channels; very strongly acid (pH 4.7); clear, irregular boundary.
- IIB2tb—48 to 66 inches, mottled gray (10YR 6/1), pale-brown (10YR 6/3), yellowish-brown (10YR 5/4), and strong-brown (7.5YR 5/6) silty clay loam; weak, fine, subangular blocky structure; firm; very strongly acid (pH 4.7).

In undisturbed areas, the A1 horizon is about 4 to 8 inches thick and ranges from dark brown (10YR 4/3) to grayish brown (10YR 5/2). The main variations are in the B horizon. It is silty clay in some places and has moderate structure in many places. Depth to the fragipan ranges from 25 to 36 inches.

Bado soils are commonly associated with the Hobson, Moniteau, and Lebanon soils. Unlike the Moniteau soils, the Bado soils have a fragipan within 36 inches of the surface.

**Bado silt loam, 2 to 5 percent slopes (BaB).**—This soil occupies broad ridges in the uplands in the gently rolling parts of the county. It is wet during spring and fall but is droughty during periods of low rainfall.

This soil is moderately well suited to pasture and hay mixtures, such as redtop, fescue, Ladino clover, and other water-tolerant grasses. It is moderately well suited to row crops, small grains, and trees.

On this soil practices that control erosion and reduce soil losses are needed. Because natural fertility is low, a topdressing, especially of nitrogen, is needed on pasture. Grazing should be controlled during periods of wetness so as to avoid compacting the surface layer. (Capability unit IIIe-5; woodland suitability group 4; wildlife suitability group 8)

## Baxter Series

The Baxter series consists of steep, well-drained soils. These soils normally occupy the lower part of side slopes below the Clarksville soils. In a few areas Baxter soils are at the heads of drainageways in the kind of position that is commonly occupied by Clarksville soils. The Bax-

ter soils also occur at low elevations in the eastern part of the county.

In a typical profile the surface layer is very dark grayish-brown cherty silt loam about an inch thick. The subsurface layer, about 9 inches thick, is pale-brown cherty silt loam. The subsoil is yellowish-red silty clay in the upper part and red clay in the lower part. Partly decomposed cherty dolomite makes up about 30 percent of the lower part of the subsoil.

Baxter soils are moderately permeable and have low available moisture capacity and low natural fertility. These soils are medium acid to very strongly acid. Because they are steep, sheet erosion is likely in cleared areas. The steep slope and the large amount of stones on the surface restrict the use of most farm machinery.

Most of the acreage of Baxter soils is in timber, but a few areas have been cleared for pasture. Droughtiness is the main concern where this soil is pastured.

In this county the Baxter soils are mapped only in complexes with the Clarksville soils.

Typical profile of a Baxter cherty silt loam (SE $\frac{1}{4}$ SW $\frac{1}{4}$ , section 34, R. 4 W., T. 32 N.):

- A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) cherty silt loam; weak to moderate, very fine, granular structure; very friable; estimated 25 percent fine chert; medium acid (pH 6.0); abrupt, smooth boundary.
- A2—1 to 10 inches, pale-brown (10YR 6/3) cherty silt loam; weak, very fine, subangular blocky structure; very friable; estimated 20 percent fine chert; medium acid (pH 5.6); clear, smooth boundary.
- B21t—10 to 17 inches, yellowish-red (5YR 5/6) silty clay; moderate, fine, subangular blocky structure; friable; estimated less than 10 percent chert; very strongly acid (pH 5.0); clear, wavy boundary.
- B22t—17 to 34 inches, red (2.5YR 5/8) clay; moderate to strong, fine to medium, subangular blocky structure; firm; estimated less than 10 percent chert; clear, wavy boundary.
- B23t—34 to 60 inches +, red (2.5YR 4/8) clay; strong, medium, subangular blocky structure; firm; estimated 30 percent partly decomposed cherty dolomite; very strongly acid (pH 5.0).

In some areas the combined thickness of the A1 and A2 horizons is 15 inches. In most undisturbed areas the A1 horizon is 1 to 4 inches thick and ranges from very dark grayish brown (10YR 3/2) to brown (10YR 5/3). The A2 horizon becomes thicker and grayer as the soil grades to the Clarksville soils. In a few areas the B horizon is yellowish red (5YR 5/8) or reddish yellow (5YR 6/8) and ranges from clay to silty clay loam. Content of chert in the B horizon ranges from 10 to 40 percent.

The Baxter soils are intermingled with Clarksville soils but are easily distinguished from them by the color of the subsoil. Baxter soils have a yellowish-red and red subsoil, but the Clarksville soils have a somewhat yellower color in the subsoil. The Baxter soils contain less chert, especially in the subsoil, than the Clarksville soils.

## Clarksville Series

The Clarksville series consists of nearly level to steep, somewhat excessively drained soils that formed in residuum from cherty dolomite. These soils normally occupy steep side slopes and narrow ridges in the highly dissected parts of Dent County.

In a typical profile the surface layer is dark grayish-brown cherty silt loam about 1 inch thick. The subsurface layer is about 12 inches thick and consists of very pale

brown cherty silt loam. The upper part of the subsoil is very cherty loam that is colored reddish yellow and strong brown in equal amounts. The lower part is yellowish-red very cherty silty clay loam. Below a depth of 36 inches is underlying material consisting of yellowish-red very cherty silty clay loam.

Clarksville soils have moderately rapid permeability and are low in available moisture capacity and natural fertility. These soils are strongly acid to very strongly acid. Steep, cultivated areas of these soils are subject to sheet erosion.

Most of the acreage of Clarksville soils is in timber, but a few areas have been cleared for pasture. The rest of the acreage is idle. Droughtiness is the main hazard where the soils are pastured. Also, the use of most farm machinery is restricted where these soils are steep and have many stones on the surface.

Typical profile of Clarksville cherty silt loam, 14 to 30 percent slopes (along State Route 19 in a road cut, NW $\frac{1}{4}$ NE $\frac{1}{4}$ , section 18, T. 35 N., R. 4 W.):

- A1—0 to 1 inch, dark grayish-brown (10YR 4/2) cherty silt loam; weak, very fine, granular structure; loose when dry or moist; 87 percent angular chert; very strongly acid (pH 4.8); abrupt, smooth boundary.
- A2—1 to 13 inches, very pale brown (10YR 7/3) very cherty silt loam; weak, very fine, granular structure; soft, loose; 67 percent angular chert; very strongly acid (pH 4.6); clear, irregular boundary.
- B2t—13 to 20 inches, reddish-yellow (7.5YR 6/6) and strong-brown (7.5YR 5/6), in equal parts, very cherty loam; weak, very fine, subangular blocky structure; slightly hard, very friable; 81 percent angular chert; very strongly acid (pH 4.7); clear, irregular boundary.
- B3—20 to 36 inches, yellowish-red (5YR 4/6) very cherty silty clay loam; weak, medium, subangular blocky structure; 72 percent angular chert; very strongly acid (pH 4.9); gradual, smooth boundary.
- C—36 to 72 inches, yellowish-red (5YR 4/6) very cherty silty clay loam; structureless; friable; 60 percent angular chert; common pockets of mottled yellowish-red (5YR 4/6) and strong-brown (7.5YR 5/6) silty clay loam that is less than 20 percent chert; very strongly acid (pH 4.9).

The light-colored chert fragments range from less than  $\frac{1}{4}$  inch to 6 inches in size. The volume of chert increases with increasing depth. Estimated chert content ranges from 15 to 87 percent in the A horizon and from 50 to 90 percent in the B horizon. In some places the A1 and A2 horizons combined are as much as 20 inches thick, but combined thickness is less in areas where these soils have been eroded.

The B horizon ranges from loam to silty clay loam in texture and from strong brown (7.5YR 5/6) to light yellowish brown (10YR 6/4) in color. In scattered areas the B horizon is yellowish red and resembles the upper part of the B horizon in Baxter soils. Depth to bedrock ranges from about 6 to as much as 100 feet.

The Clarksville soils occur with the Nixa soils on broad ridgetops. Clarksville soils are more cherty than the Nixa soils but lack a compact, cherty fragipan and have a very pale brown instead of brown surface layer. Clarksville soils also occur with the Baxter soils, which have a less cherty, pale-brown subsurface layer. The Clarksville soils are finer textured throughout the profile than the Coulstone soils.

**Clarksville cherty silt loam, 2 to 9 percent slopes (CcC).**—This soil occurs on the narrow ridgetops above Clarksville cherty silt loam, 30 to 50 percent slopes, and the Clarksville-Baxter cherty silt loams. The surface layer of this soil is slightly thicker and the chert content is slightly less than in the profile described as typical for

the series. In some spots a moderately hard cherty fragipan is within 36 inches of the surface.

Because this soil is droughty and has a large amount of chert on the surface, it is not suited to the cultivated crops commonly grown in the county. It has some value as pasture but is better suited to trees. It is also suited to plants that furnish food and cover for wildlife. (Capability unit IVs-6; woodland suitability group 1; wildlife suitability group 10)

**Clarksville cherty silt loam, 9 to 14 percent slopes (CcD).**—This soil generally occupies short slopes at the heads of drainageways and on moderately steep spur ridges. The surface layer of this soil is slightly thicker than that in the profile described as typical for the series.

Included with this soil in mapping were a few small areas of Baxter cherty silt loam.

This Clarksville soil is suited to trees and to plants that furnish food and cover for wildlife. It is not suited to tilled crops and is poorly suited to pasture. Droughtiness is the main limitation to farming. (Capability unit VIs-6; woodland suitability group 1; wildlife suitability group 10)

**Clarksville cherty silt loam, 14 to 30 percent slopes (CcF).**—This soil is on long side slopes in the highly dissected part of the county. It has the profile described as typical for the series.

Included with this soil in mapping were a few areas of stony soils that have outcrops of rock in spots. The surface layer in these stony areas is thin, dark-colored silty clay or silty clay loam. The subsurface layer is clay that ranges from olive to red in color. The included areas are used and managed in about the same way as this soil but are not so well suited to trees as this soil. Also included were a few small areas of Baxter cherty silt loam.

Because of droughtiness, steepness, and the large amount of chert on the surface, this Clarksville soil is not suited to tilled crops and is poorly suited to pasture. Trees are a better use. This soil is also suited to plants that furnish food and cover for wildlife. (Capability unit VIIs-6; woodland suitability group 1; wildlife suitability group 10)

**Clarksville cherty silt loam, 30 to 50 percent slopes (CcG).**—This soil occurs on long side slopes in the highly dissected part of the county. The surface layer of this soil is not so thick as the one in the profile described as typical for the series.

Included with this soil in mapping were a few stony areas where bedrock crops out in spots. In these areas the surface layer consists of thin, dark-colored silty clay or silty clay loam. The subsurface layer is clay that ranges from red to olive in color. The included areas are used and managed in about the same way as this soil but are not so well suited to trees. Also included were a few small areas of Baxter cherty silt loam.

Because this Clarksville soil is droughty, is steep, and has a large amount of chert on the surface, it is not suited to annual crops and is poorly suited to pasture. Better uses are for trees and plants that furnish food and cover for wildlife. (Capability unit VIIs-6; woodland suitability group 1; wildlife suitability group 10)

**Clarksville-Baxter cherty silt loams, 12 to 30 percent slopes (Cff).**—Most areas of this mapping unit consist of Clarksville cherty silt loam and Baxter cherty silt loam

that are too intermingled to be mapped separately. In a few mapped areas the Baxter soil does not occur. Of the total acreage, about 50 percent is Clarksville cherty silt loam, about 30 percent is Baxter cherty silt loam, and the rest is other soils. The Clarksville and Baxter soils have profiles similar to the ones described as typical for their respective series.

Normally the Clarksville soil is on the upper parts of the slopes, and the Baxter soil is on the lower. The Baxter soil is easily distinguished by its redder, less cherty subsoil. The subsoil of Clarksville soil is more yellow.

Most of the acreage of these soils is forested, but a few areas have been cleared and are used for unimproved pasture. Some areas are idle. Because of the high content of chert in the surface layer, these soils are poorly suited to tilled crops or pasture. They are well suited to trees. (Capability unit VII<sub>s</sub>-6; woodland suitability group 1; wildlife suitability group 10)

**Clarksville-Baxter cherty silt loams, 30 to 50 percent slopes (CfG).**—Most areas of this mapping unit consist of Clarksville cherty silt loam and Baxter cherty silt loam that are too intermingled to be mapped separately. In a few areas the Baxter soil does not occur. Of the total acreage, about 50 percent is Clarksville cherty silt loam, about 30 percent is Baxter cherty silt loam, and the rest is other soils. The Clarksville and Baxter soils have profiles similar to the ones described for their respective series.

In most places, the Clarksville soil is on the upper part of long, very steep slopes and the Baxter soil is on the lower part. The Baxter soil is easily distinguished by its redder color and less cherty subsoil. The Clarksville soil is more yellow.

Most areas of this mapping unit are forested, but a few areas have been cleared and are used for unimproved pasture. The rest is idle. These soils are better suited to trees than to tilled crops or pasture. Because of the steep slope and the large amount of chert on the surface, operation of equipment is difficult. These soils are well suited to plants that furnish food and cover for wildlife. (Capability unit VII<sub>s</sub>-6; woodland suitability group 1; wildlife suitability group 10)

## Coulstone Series

The Coulstone series consists of nearly level to steep, somewhat excessively drained soils. These soils formed in material weathered from sandstone. They are commonly on steep side slopes and narrow ridges in the highly dissected parts of Dent County.

In a typical profile the surface layer is dark-gray very cherty loam about 1 inch thick. The subsurface layer is about 17 inches thick. It is dark grayish-brown very cherty loam in the upper part, brown cherty loam in the middle, and brown very cherty loam in the lower part. The subsoil, to a depth of 37 inches, is yellowish-brown and very pale brown cherty sandy loam. Sandstone fragments make up 85 percent of the layer between depths of 37 and 52 inches. This layer is underlain by mottled red, yellowish-red, and light yellowish-brown silty clay.

Coulstone soils have moderate to rapid permeability and are low in available moisture capacity and natural

fertility. These soils are strongly acid to extremely acid. Because slope is steep, sheet erosion is likely in cultivated areas.

Most of the acreage of Coulstone soils remains in trees, but a few areas have been cleared for pasture. The rest is idle. Droughtiness is the main obstacle to growth of pasture plants on these soils. The steep slope and large amount of stones on the surface restrict the use of most farm machinery.

Typical profile of a Coulstone very cherty loam (on the middle of the east boundary of SW $\frac{1}{4}$ SW $\frac{1}{4}$ , section 3, T. 32 N., R. 3 W.):

- A1—0 to 1 inch, dark-gray (10YR 4/1) very cherty loam; weak, fine to medium, granular structure; friable; extremely acid (pH 4.0); clear boundary.
- A21—1 to 4 inches, dark grayish-brown (10YR 4/2) very cherty loam; weak, fine to medium, granular structure; friable and nonsticky; extremely acid (pH 4.4); clear boundary.
- A22—4 to 11 inches, brown (10YR 5/3) cherty loam; weak, fine to medium, granular structure; friable and nonsticky; strongly acid (pH 5.1); gradual boundary.
- A23—11 to 18 inches, brown (10YR 5/3) very cherty loam; structureless; friable; very strongly acid (pH 4.8); clear boundary.
- B11—18 to 26 inches, yellowish-brown (10YR 5/4) cherty sandy loam; structureless; friable; fine mottles of reddish brown (5YR 4/4) and yellowish red (5YR 4/6) that appear to be clay films lining tubular pores on sand particles; very strongly acid (pH 4.7); clear boundary.
- B12—26 to 37 inches, very pale brown (10YR 7/4) cherty sandy loam; weak, medium and coarse, subangular blocky structure; firm; reddish-brown (5YR 4/4) clay films nearly continuous on pedes and lining pores; very strongly acid (pH 4.8); clear boundary.
- B21—37 to 52 inches, about 85 percent of horizon is sandstone fragments that are yellowish red (5YR 4/8) in the interior and red (2.5YR 4/8) on the exterior; fragments up to 18 inches in diameter; partly decomposed sandstone fragments have sandy clay loam texture; between rock fragments is reddish-brown (5YR 5/4) clay loam with pH of 4.6; a pocket about 8 inches in diameter is yellowish-red (5YR 4/6) clay; pore surfaces in the clay pocket lined with reddish-brown (5YR 5/4) clay films; clear boundary.
- B22—52 to 58 inches, mottled red (2.5YR 4/8), yellowish-red (5YR 4/8), and light yellowish-brown (10YR 6/4) very cherty silty clay; chert fragments are more angular and smaller than the sandstone fragments in the B21 and B23 horizons.
- B23—58 to 62 inches +, color and texture similar to those of B21 horizon.

Thickness of the solum is more than 5 feet. In some places the total regolith is more than 40 feet thick. Both angular chert fragments and rounded sandstone boulders are scattered throughout the profile.

The A1 horizon ranges from silt loam to sandy loam and is cherty in all places. The A2 horizons are loam, sandy clay loam, or sandy loam in places. In most areas the B horizons are more than 50 percent coarse fragments, but in others they are about 90 percent sandstone in the form of broken float rock. The B horizons range from 10YR to 2.5YR in hue, 4 to 7 in value, and 4 to 8 in chroma. The B1 horizons range from cherty sandy loam to loam. The B2 horizons range from clay loam to sandy clay, but in places are silty clay.

Coulstone soils lack the compact cherty fragipan but are more cherty than the Nixa soils. They have sandier A2 horizons than the Clarksville soils.

**Coulstone and Clarksville cherty soils, 2 to 9 percent slopes (CkC).**—This mapping unit is made up of Coulstone

and Clarksville cherty soils that are intermingled on the landscape. These soils are on ridgetops in the highly dissected parts of the county. They also occur on shoulders of broader ridges between gently sloping Nixa soils on the broad ridgetops and moderately steep to steep Coulstone and Clarksville soils on the side slopes. Each kind of soil has a profile similar to the one described as typical for its respective series. The Coulstone soils make up about 60 percent of the acreage; the Clarksville soils, about 25 percent; and other soils about 15 percent.

Included in mapping were a few areas that contain less chert than the soils described as typical for the Coulstone and Clarksville series. Also included in most areas were some spots that have a cherty fragipan.

Because these soils are droughty and have pieces of chert on the surface, they are poorly suited to common crops that require annual tillage. They have limited value as pasture. Because water intake is rapid, erosion is not a major hazard. These soils are well suited to trees and to plants that furnish food and cover for wildlife. (Capability unit IVs-6; woodland suitability group 1; wildlife suitability group 10)

**Coulstone and Clarksville cherty soils, 9 to 14 percent slopes (CkD).**—This mapping unit consists of Coulstone and Clarksville soils that are intermingled on the landscape. Each kind of soil has a profile similar to that described as typical for its respective series. The Coulstone soils make up about 60 percent of the acreage; the Clarksville soils, about 25 percent; and other soils, 15 percent. These soils normally are in small areas at the heads of drainageways and on moderately steep spur ridges.

Included with these soils in mapping were a few spots that have a cherty fragipan at a depth of about 36 inches.

Use of these soils is limited mainly by droughtiness. These soils are not suited to tilled crops and are poorly suited to pasture. Better uses are for trees and plants that furnish food and cover for wildlife. (Capability unit VIs-6; woodland suitability group 1; wildlife suitability group 10)

**Coulstone and Clarksville cherty soils, 14 to 30 percent slopes (CkF).**—In this unit the Coulstone and Clarksville soils are too intermingled to be mapped separately. The Coulstone cherty soils make up about 60 percent of the total acreage; the Clarksville cherty soils, about 25 percent; and other soils, the rest. These soils commonly occupy long side slopes in the highly dissected parts of the county. Each kind of soil has a profile similar to that described as typical for its series, except that in some places the surface layer is cherty silt loam and the subsoil is loam or fine sandy loam. In most areas a few spots have a cherty fragipan.

Included with these soils in mapping were a few stony areas where bedrock crops out in spots. These areas have a thin, dark silty clay or silty clay loam surface layer. These included areas are small and are used and managed in about the same way as the Coulstone and Clarksville soils, but the included areas are not so well suited to trees. Also included were a few small areas of Baxter cherty silt loam.

Because these soils are droughty, they are not suited to tilled crops or pasture. They are better suited to trees

and to plants that provide food and cover for wildlife. (Capability unit VIIs-6; woodland suitability group 1; wildlife suitability group 10)

**Coulstone and Clarksville cherty soils, 30 to 50 percent slopes (CkG).**—This unit consists of Coulstone and Clarksville soils that are intermingled on the landscape. Each kind of soil has a profile similar to the one described as typical for its respective series. The Coulstone cherty soils make up about 55 percent of the acreage; the Clarksville soils, about 25 percent; and other soils, 20 percent.

Included with these soils are stony areas in which bedrock crops out in spots and the clay subsoil ranges from olive to red in color. These areas have a thin, dark-colored silty clay or silty clay loam surface layer. Because of their small size, these areas are used and managed in about the same way as these Coulstone and Clarksville soils, but they are not so well suited to trees. Also included were a few small areas of Baxter cherty silt loam.

Because the soils are steep and have a cherty surface layer, they are not suited to tilled crops or pasture. They are better suited to trees and to plants that provide food and cover for wildlife. (Capability unit VIIs-6; woodland suitability group 1; wildlife suitability group 10)

## Elkins Series

The Elkins series is made up of poorly drained, level and slightly depressional soils on bottom lands. These soils were derived from alluvium washed from uplands underlain by cherty dolomite. They formed under sedges and other water-adapted plants.

In a typical profile the surface layer is very dark gray silt loam about 8 inches thick. The next layer is silty clay loam that extends to a depth of 62 inches. It is black to a depth of 14 inches, very dark gray mottled with yellowish red to a depth of 18 inches, and dark gray mottled with yellowish brown to a depth of 39 inches. Below a depth of 39 inches, the silty clay loam is gray and has reddish and yellowish stains in a few old root channels.

Elkins soils have slow permeability and a seasonal high water table that has a marked effect on tillage. They are low in natural fertility and strongly acid to very strongly acid. Available moisture capacity is high. Some areas of these soils are subject to flooding.

Because the Elkins soils are poorly drained, most of the acreage is used for permanent pasture. A few areas are in hay. Row crops are grown in many fields that are naturally or artificially drained.

Typical profile of Elkins silt loam (NW $\frac{1}{4}$ SE $\frac{1}{4}$ , section 3, T. 35 N., R. 5 W.) in pasture:

- Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam; weak, fine, subangular blocky structure; very friable; abundant roots; strongly acid (pH 5.2); abrupt, smooth boundary.
- C1g—8 to 14 inches, black (10YR 2/1) silty clay loam; moderate, medium, subangular blocky structure; friable; plentiful roots; strongly acid (pH 5.5); clear, irregular boundary.
- C2g—14 to 18 inches, very dark gray (10YR 3/1) light silty clay loam; few, fine, prominent, yellowish-red (5YR 4/8) mottles; weak, very fine, subangular blocky structure; friable; plentiful roots; strongly acid (pH 5.5); clear, irregular boundary.

C3g—18 to 39 inches, dark-gray (10YR 4/1) light silty clay loam; few, fine, distinct, yellowish-brown (10YR 5/8) mottles; weak, medium, subangular blocky structure; very hard, very firm; few roots in the upper part, trace in the lower part; strongly acid (pH 5.5); clear, irregular boundary.

C4g—39 to 62 inches, gray (N 5/0) light silty clay loam with reddish and yellowish stains in a few old root channels; weak, coarse, subangular blocky structure; firm; trace of fine roots; very strongly acid (pH 5.0).

The C horizon of Elkins silt loam ranges from silt loam to silty clay in texture and from black (10YR 2/1) to grayish brown (10YR 5/2) in color. These soils are stratified in many places.

Elkins soils occur closely with the lighter colored Westerville soils.

**Elkins silt loam (Ek).**—This soil has slopes of 0 to 1 percent. It occurs in slight depressions on bottom lands next to the upland slopes.

This soil is used for pasture, hay, and row crops, but it is better suited to grasses and a few water-tolerant species of trees. It is well suited to alsike and Ladino clovers, but is poorly suited to alfalfa. This soil is also suited to plants that furnish food and cover for wildlife.

If this soil is drained as needed, continuous cropping is satisfactory under good management. Good management provides that all crop residue is left on the surface and later mixed into the soil, that adequate amounts of fertilizer are added, and that minimum tillage is applied. Green manure is highly desirable in areas where cultivated crops are grown intensively. (Capability unit IIw-1; woodland suitability group 7; wildlife suitability group 1)

## Elsah Series

The Elsah series consists of nearly level, somewhat excessively drained to well-drained soils. These soils developed in recent alluvium washed from uplands underlain by cherty dolomite and sandstone. The Elsah soils occur mainly in the narrow stream valleys of the highly dissected parts of the county, though a few small areas are in other parts.

In a typical profile the surface layer is dark-brown cherty loam about 8 inches thick. The underlying material consists of about 7 inches of very dark grayish-brown cherty loam over dark yellowish-brown stratified cherty silt loam to loamy sand.

The Elsah soils have moderately rapid to rapid permeability, medium available moisture capacity, and low to moderate natural fertility. These soils are very strongly acid to strongly acid. Areas of Elsah soils along major streams are subject to flash flooding.

Most of the acreage is used for pasture and hay, and a few areas are in row crops. Droughtiness is the main hazard, but crops grow moderately well if management is good.

Typical profile of Elsah cherty loam (SW $\frac{1}{4}$ SW $\frac{1}{4}$ , section 27, T. 33 N., R. 3 W.):

A11—0 to 5 inches, dark-brown (10YR 4/3) cherty loam; weak, very fine, granular structure; loose when moist; estimated 15 percent subangular fragments of chert; medium acid (pH 5.6); clear, smooth boundary.

A12—5 to 8 inches, dark-brown (10YR 3/3) cherty loam; weak, fine, granular structure; loose when moist; estimated 15 percent subangular fragments of chert; medium acid (pH 6.0); clear, smooth boundary.

C1—8 to 15 inches, very dark grayish-brown (10YR 3/2) cherty loam; weak, fine, subangular blocky structure; very friable; estimated 35 percent subangular fragments of chert; medium acid (pH 5.6); clear, wavy boundary.

C2—15 to 70 inches, dark yellowish-brown (10YR 4/4) stratified cherty silt loam to loamy sand; single grain (structureless); estimated 80 percent subangular fragments of chert; slightly acid (pH 6.1).

The principal variations in the Elsah soils are the texture of the alluvial sediments, the amount of chert present, and the depth to strata of coarse sand and chert. The texture of the alluvium ranges from cherty loam to cherty fine sandy loam. The gravel content ranges from 15 to 70 percent in the A horizon and from 35 to 80 percent in that part of the C horizon above a layer of stratified coarse sand and gravel. The stratified coarse sand and gravel is at a depth ranging from 9 to 36 inches and is 1 to several feet thick.

The A horizon ranges from very dark grayish brown (10YR 3/2) to brown (10YR 5/3). The C horizon is strong brown (7.5YR 5/6-5/8) in some places and ranges from dark brown (10YR 3/3) to light yellowish brown (10YR 6/4) in other places. These soils are very strongly acid to slightly acid.

Elsah soils occur below the Razort soils of the terraces and in narrow bottom lands with the Gladden soils. In many places the Elsah soils are closely associated with the Gladden soils.

**Elsah cherty loam (Et).**—This nearly level soil occurs in narrow areas of flood plain below the Razort soils on terraces.

In many places it is intermingled with Gladden loam and Elsah very cherty loam. Small areas of Gladden loam and Elsah very cherty loam were included with this soil in mapping. The profile of this soil is the one described as typical for the series.

This soil is suited to continuous row crops if all crop residue is left on the field and is later mixed into the soil, if enough fertilizer is added, and if methods of stubble-mulch tillage are used that leaves the stubble standing to protect the soil. Crop growth is limited mainly by droughtiness. This soil is also suited to alfalfa, grasses, trees, and plants that provide food and cover for wildlife. (Capability unit IIIs-1; woodland suitability group 5; wildlife suitability group 5)

**Elsah very cherty loam (Ev).**—This nearly level soil occurs on bottom lands and has a surface layer that contains enough gravel to interfere with tillage. This layer normally grades to dense, cherty, stratified gravel at a depth of 10 inches; otherwise, the profile of this soil is like the one described as typical for the series. In some areas where the stratified gravel is evident at the surface, the soil resembles Riverwash.

Included with this soil in mapping were a few small areas of Elsah cherty loam. Some sandy areas resembling Sandy alluvial land occur where the alluvial sediment is mostly sand.

Because so much cherty gravel is in the surface layer, this soil is difficult to cultivate. Pasture and hay grow well in most areas. Continuous small grain and lespedeza are suited if all crop residue is mixed into the soil, if stubble-mulch tillage is applied, and if enough fertilizer is added. (Capability unit IVs-6; woodland suitability group 5; wildlife suitability group 9)

## Gladden Series

The Gladden series consists of nearly level, well-drained soils that formed in alluvium washed from uplands underlain by cherty dolomite and sandstone. The Gladden soils occupy first bottoms along tributary streams in narrow valleys.

In a typical profile the surface layer is dark-brown loam about 4 inches thick. The subsoil, about 29 inches thick, is dark-brown loam in the upper part and dark-brown cherty loam in the lower part. The underlying material is dark yellowish-brown very cherty sandy loam.

Permeability of the Gladden soils is moderate in the upper part of the soil profile and rapid in the lower part. Available moisture capacity is medium to high, and natural fertility is moderate. These soils are strongly acid to very strongly acid. Areas of Gladden soils on lower valley positions are occasionally flooded.

The Gladden soils are used for row crops, hay, and pasture. Crops grow well if the soils are well managed.

Typical profile of Gladden loam (NE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ , section 26, T. 33 N., R. 6 W.):

- A1—0 to 4 inches, dark-brown (10YR 3/3-4/3) loam, brown (10YR 5/3) when dry; weak, very fine, granular structure; very friable; very strongly acid (pH 4.6); clear, smooth boundary.
- B21—4 to 23 inches, dark-brown (10YR 4/3) loam, pale brown (10YR 6/3) when dry; weak, very fine, granular structure; very friable; very strongly acid (pH 4.8); clear, smooth boundary.
- B22—23 to 33 inches, dark-brown (10YR 3/3-4/3) cherty loam, brown to pale brown (10YR 5/3-6/3) when dry; weak, very fine, granular structure; very friable; estimated 15 percent cherty gravel; very strongly acid (pH 4.8); gradual, wavy boundary.
- C—33 to 63 inches +, dark yellowish-brown (10YR 4/4) very cherty sandy loam, pale brown (10YR 6/3) when dry; structureless; loose when moist; estimated more than 80 percent cherty gravel; very strongly acid (pH 5.0).

In some places the A and B horizons are silt loam or sandy loam. The content of chert in these horizons is less than 15 percent, by volume, but chert makes up 50 to 90 percent of the C horizon. Depth to the C horizon ranges from 20 to 40 inches. The alluvial material of Gladden soils ranges from 5 to 15 feet in thickness.

Gladden soils occur with the more cherty Elsalh soils and the chert-free Sharon soils of the bottom lands.

**Gladden loam (Cd).**—This soil occurs on bottom lands along the stream valleys in the highly dissected parts of the county. Slopes range from 0 to 3 percent. This soil is closely intermingled with Elsalh cherty loam and Sharon silt loam on bottom lands. Gladden loam also occurs with Razort soils of the stream terraces. A few areas of Elsalh cherty loam and Sharon silt loam were included in the mapping.

This soil is well suited to row crops because tilth and drainage are good. Crop growth is limited by slight droughtiness. Row crops can be grown continuously if all crop residue is left on the field and later mixed into the soil, if adequate amounts of fertilizer are added, and if minimum tillage is applied. Also, green manure is highly desirable in areas where cultivated crops are grown intensively. Other well-suited crops include clover, alfalfa, grasses, and trees. Some of the narrow bottom lands are better suited to permanent pasture than to row crops

because areas are too narrow for convenient row arrangement. This soil is also well suited to plants that provide food and cover for wildlife. (Capability unit IIs-1; woodland suitability group 6; wildlife suitability group 5)

## Hobson Series

The Hobson series consists of nearly level to sloping, moderately well drained soils. These soils developed in ancient depressions filled with eroded material that weathered from sandstone in surrounding areas. This sandy material was covered with 18 to 24 inches of loess. The surface relief of the Hobson soils blended with that of the intermingled Lebanon soils after the depressions were filled.

In a typical profile the surface layer is dark yellowish-brown silt loam about 3 inches thick. The subsurface layer is about 5 inches of yellowish-brown silt loam. The subsoil is 52 inches thick. It is strong-brown clay loam and clay in the upper part, a fragipan of yellowish-brown and very pale brown sandy loam in the middle, and mottled strong-brown and yellowish-brown clay loam in the lower part.

Permeability is moderate above the fragipan but slow in it. Available moisture capacity is medium low, and natural fertility is low to moderate. These soils are strongly acid to very strongly acid.

Most of the acreage of Hobson soils is in pasture and hay, though a few areas remain in native hardwoods. Controlling both sheet and gully erosion is the main concern in managing these soils.

In Dent County the Hobson soils are mapped only with Lebanon soils in undifferentiated groups of soils.

Typical profile of a Hobson silt loam (NE $\frac{1}{4}$ SE $\frac{1}{4}$ , section 20, T. 35 N., R. 7 W.) along State Route 0:

- A1—0 to 3 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, very fine, granular structure; friable; strongly acid (pH 5.1); abrupt boundary.
- A2—3 to 8 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak, thin, platy structure; friable; very strongly acid (pH 4.9); clear boundary.
- B21t—8 to 13 inches, strong-brown (7.5YR 5/6) clay loam; moderate, medium, subangular blocky structure; very friable; very strongly acid (pH 4.8); clear boundary.
- B22t—13 to 20 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; sticky, friable, slightly hard; very strongly acid (pH 4.8); clear boundary.
- Bx1—20 to 24 inches, yellowish-brown (10YR 5/6) sandy loam; thick platy structure; very firm, very hard; very strongly acid (pH 4.9); clear boundary.
- Bx2—24 to 42 inches, very pale brown (10YR 7/4) sandy loam with few, fine, faint, brownish-yellow (10YR 6/8) stains; thick platy structure; very firm, very hard; very strongly acid (pH 5.0); clear boundary.
- IIB23tb—42 to 60 inches, mottled strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) heavy clay loam; weak, fine, subangular blocky structure; friable; strongly acid (pH 5.2).

In undisturbed areas, the A1 horizon ranges from silt loam to fine sandy loam in texture, from 2 to 5 inches in thickness, and from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4) in color. In some places the A1 and A2 horizons combined are 12 inches thick, but they are thinner in eroded areas. In areas having a thicker than normal mantle of loess, the A and B horizons contain less sand than

those horizons in the typical profile. In some places where Hobson soils were derived from sandstone nearly free of cherty dolomite, the B horizon contains more sand than the B horizon in the typical profile.

The Hobson soils are closely intermingled with Lebanon soils in many places in the highly dissected parts of the county. The Hobson soils contain more sand throughout the profile than the Lebanon soils and have a thicker fragipan that is not cherty like the pan of the Lebanon soils.

## Lebanon Series

The Lebanon series consists of moderately well drained, nearly level and sloping soils that are silty in the upper part and that have a cherty fragipan. The fragipan is underlain by cherty dolomite or sandstone residuum.

In a typical profile the surface layer is dark grayish-brown silt loam about 6 inches thick. The subsurface layer generally consists of about 2 inches of brown loam. The subsoil is brown silt loam in the upper part, strong-brown silty clay loam in the middle part, and light yellowish-brown and reddish-yellow silty clay loam in the lower part. At a depth of about 24 inches is a fragipan of light yellowish-brown, very hard and brittle cherty loam that is about 80 percent chert fragments. Below a depth of about 31 inches is strong-brown silty clay.

The Lebanon soils are moderately permeable above the fragipan, but slowly permeable in it. Because water moves through the fragipan slowly, the layer below it is frequently dry after rains. In summers, when the upper layers are dry, the fragipan keeps plant roots from obtaining water from the underlying material. Available moisture capacity is moderately low. Natural fertility is low to moderate. These soils are strongly acid to very strongly acid.

Most of the acreage of Lebanon soils is in pasture and hay, though many areas remain in native hardwoods. Under good management, crop growth is moderately good. Controlling erosion, however, is difficult.

Typical profile of Lebanon silt loam (along State Route 0, SW $\frac{1}{4}$ SE $\frac{1}{4}$ , section 20, T. 35 N., R. 7 W.):

- A1—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable; medium acid (pH 5.8); abrupt, wavy boundary.
- A2—6 to 8 inches, brown (10YR 5/3) loam; weak, very fine, subangular blocky structure; very friable; very strongly acid (pH 5.0); abrupt, wavy boundary.
- B1—8 to 13 inches, brown (7.5YR 4/4) heavy silt loam; moderate, very fine, subangular blocky structure; very friable; strongly acid (pH 5.2); clear, smooth boundary.
- B21t—13 to 21 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, very fine, subangular blocky structure; friable; very strongly acid (pH 5.0); clear, smooth boundary.
- B22t—21 to 24 inches, light yellowish-brown (10YR 6/4) and reddish-yellow (7.5YR 6/6) silty clay loam; few, fine, faint mottles; moderate, very fine, subangular blocky structure; hard when dry, friable when moist; very strongly acid (pH 4.8); clear, wavy boundary.
- IIA'xb—24 to 31 inches, light yellowish-brown (10YR 6/4) cherty loam; structureless (massive); very hard and brittle; horizon is 80 percent chert fragments less than 2 inches across; very strongly acid (pH 5.0); abrupt, wavy boundary.
- IIB23tb—31 to 54 inches +, strong-brown (7.5YR 5/6) silty clay; moderate, very fine, subangular blocky structure; friable; yellowish-brown (10YR 5/4) clay films on all peds; very strongly acid (pH 5.0).

In the strongly sloping parts, the A horizon ranges from 6 to 10 inches in thickness, but this horizon is thinner where it is eroded. The texture of the A horizon is silt loam in most places, though it ranges to loam or to cherty silt loam in some areas. In some eroded fields, the A horizon is silty clay loam. Except in the eroded and cherty soils, depth to the fragipan ranges from 18 to 30 inches. The fragipan is generally nearer the surface in the cherty soils. In some areas, the solum contains a small amount of angular fragments of chert and sandstone. Color of the B2 horizon is dominantly strong brown in the upper part but becomes yellower or grayer in the lower part. The B2 horizon is silty clay or silty clay loam, and the fragipan ranges from cherty silt loam to cherty loam.

In many places on the broader ridgetops in the more highly dissected parts of the county, Lebanon soils occur with the Hobson soils and are mapped with them as an undifferentiated unit. The Lebanon soils have a thinner fragipan than that of the Hobson soils, and it is cherty loam rather than sandy loam. Some areas of Lebanon soils are near the Clarksville and Baxter soils, which also are cherty but lack the very hard cherty fragipan.

**Lebanon cherty silt loam, 2 to 9 percent slopes (LcB).**—This soil generally occupies broad ridgetops above the steep and very steep Clarksville and Baxter soils on side slopes. The surface layer and subsurface layer of this soil are 15 to 25 percent chert, and there is a fragipan 12 to 20 inches from the surface. Also, this fragipan is cherty silt loam rather than cherty loam. Otherwise, the profile of this soil is similar to the one described as typical for the series.

Included with this soil in mapping were a few spots of Lebanon silt loam and Clarksville cherty silt loam.

Because this Lebanon soil is droughty, and pieces of chert on the surface interfere with cultivation, row crops are not well suited. Pasture consisting of drought-tolerant plants is a better use.

Legumes are moderately well suited to poorly suited. Grasses and trees grow moderately well. (Capability unit IVE-3; woodland suitability group 2; wildlife suitability group 6)

**Lebanon silt loam, 2 to 5 percent slopes (IbB).**—This soil generally occupies broad ridgetops on slopes above the steep and very steep Clarksville and Baxter soils on the side slopes. Except for the silt loam rather than loam fragipan, the profile of this soil is like that described as typical for the Lebanon series.

Included with this soil in mapping were a few spots of Lebanon cherty silt loam, in similar positions, and a few areas that have been moderately eroded.

This Lebanon soil is better suited to pasture and hay plants consisting of drought-tolerant grasses and legumes than it is to row crops. It is also suitable for plants that furnish food and cover for wildlife and for trees common in Dent County. Because erosion and droughtiness are serious hazards, row crops are only fairly well suited. (Capability unit IIIe-2; woodland suitability group 2; wildlife suitability group 6)

**Lebanon silt loam, 5 to 9 percent slopes (IbC).**—This soil commonly occurs on broad ridges above the steep and very steep Clarksville and Baxter soils on the side slopes. This soil has a slightly thinner surface layer and a fragipan of silt loam rather than loam, but otherwise its profile is similar to the one described as typical for the series.

Included with this soil in mapping were a few small

spots of Lebanon cherty silt loam and a few areas that are moderately eroded. Also included were a few areas where the subsoil is grayer than the one described as typical for the Lebanon series.

This Lebanon soil is better suited to drought-tolerant pasture and hay plants than to row crops. It is also suited to common species of trees and to plants suitable for wildlife food and cover. Because this soil is droughty and subject to erosion, row crops do not grow well. (Capability unit IVE-2; woodland suitability group 2; wildlife suitability group 6)

**Lebanon and Hobson silt loams, 2 to 5 percent slopes (lhB).**—The soils in this undifferentiated unit commonly occupy broad ridgetops above the Nixa-Clarksville cherty loams on the slopes adjacent to the drainageways. A few nearly level areas are adjacent to the Moniteau and Lebanon soils, gray subsoil variant, in level and slightly depressional areas.

Most areas of these soils consist of both Lebanon silt loam and Hobson silt loam, but some areas are nearly all Lebanon silt loam and other areas are nearly all Hobson silt loam. Lebanon silt loam makes up about 70 percent of the total acreage; the Hobson soil, about 25 percent; and other soils, about 5 percent. The Lebanon and Hobson soils have profiles similar to those described as typical for their respective series.

Included in mapping were small spots of Nixa and Clarksville soils.

The soils in this unit are suited to small grain, pasture, or meadow consisting of drought-tolerant grasses and legumes. Other suitable uses are for growing plants for wildlife food and cover and growing those species of trees common in the county. Because these soils are droughty and susceptible to erosion, they are only fairly well suited to row crops. (Capability unit IIIe-2; woodland suitability group 2; wildlife suitability group 6)

**Lebanon and Hobson silt loams, 2 to 5 percent slopes, eroded (lhB2).**—The soils in this unit commonly occupy broad ridgetops above the Nixa and Clarksville soils that are on slopes above the drainageways. In a few areas, these soils are nearly level and are adjacent to the Moniteau and Bado soils, which are level or slightly depressional.

Some areas are nearly all eroded Lebanon silt loam, and a few areas are nearly all eroded Hobson silt loam. Lebanon silt loam makes up about 60 percent of the total acreage; Hobson silt loam, about 25 percent; and other soils, about 15 percent.

The Lebanon and Hobson soils have profiles similar to those described as typical for their respective series, except that the surface layers of these soils have been thinned by erosion. In some cultivated areas, the surface layer and subsurface layer have been mixed. Deep gullies have been cut in many places where the unit consists mainly of eroded Hobson silt loam.

Included in mapping were a few small spots of Nixa and Clarksville soils.

The soils in this unit are better suited to drought-tolerant pasture or meadow plants than to row crops. They are also suitable for trees and for plants that furnish food and cover for wildlife. Because these soils are

droughty and subject to erosion, they are poorly suited to row crops. Needed in cropped areas are varieties of plants that resist droughts and practices that help to control erosion. (Capability unit IVE-2; woodland suitability group 2; wildlife suitability group 6)

**Lebanon and Hobson silt loams, 5 to 9 percent slopes (lhC).**—Soils of this unit commonly occupy slopes on uplands below the nearly level Lebanon and Hobson soils on the ridgetops and above the Nixa and Clarksville soils on the slopes along the drainageways.

Most of this undifferentiated unit consists of both Lebanon silt loam and Hobson silt loam. Some areas are nearly all Lebanon silt loam, but a few others are nearly all Hobson silt loam. Lebanon silt loam makes up approximately 50 percent of the total acreage; Hobson silt loam, about 35 percent; and other soils, 15 percent. Each kind of soil has a profile similar to that described as typical for its series.

Included with these soils in mapping were a few spots of the Nixa and Clarksville soils. Also included were a few spots that have been moderately eroded.

The soils in this unit are mainly in pasture, though a few areas are used for row crops and small grain. Many areas remain in native hardwoods, and a few are idle.

Because these soils are erodible and droughty, they are poorly suited to row crops. They are better suited to drought-tolerant pasture and hay plants. These soils are also suited to common kinds of trees and to plants that furnish food and cover for wildlife.

Controlling erosion and offsetting drought are the main concerns in managing these soils. The Hobson soil is subject to gully erosion. Shaping the waterways and planting sod-forming grass are ways to remove excess water safely and to help control erosion. If the waterways are shaped wide enough, they may be used for hay. (Capability unit IVE-2; woodland suitability group 2; wildlife suitability group 6)

**Lebanon and Hobson silt loams, 5 to 9 percent slopes, eroded (lhC2).**—These soils are commonly on uplands. They lie below the nearly level Lebanon and Hobson soils on the ridgetops and above the Nixa and Clarksville soils on slopes along drainageways.

Most of this mapping unit consists of eroded Lebanon silt loam and eroded Hobson silt loam. The Lebanon soil makes up nearly all of some parts, and nearly all of the other parts consist of the Hobson soil. About 50 percent of the total acreage is eroded Lebanon silt loam; about 35 percent, eroded Hobson silt loam; and the remainder, other soils.

These Lebanon and Hobson soils have a surface layer that is less than 6 inches thick and that has been mixed with the subsoil in many places, but otherwise each kind of soil has a profile similar to the one described as typical for its series.

Included with these soils in mapping were a few spots of the Nixa and Clarksville soils. Also included were a few spots that have not been eroded.

Lebanon and Hobson soils are better suited to drought-tolerant pasture and hay plants than to row crops. Also suitable are common species of trees and plants that furnish food and cover for wildlife. Row crops are poorly

suited because the soils are subject to erosion and are droughty. Stands of grasses are more difficult to establish and maintain on these soils than on the Lebanon and Hobson soils that are not eroded. Preparing seedbeds is also more difficult because of the higher content of clay in the exposed subsoil. (Capability unit IVE-2; woodland suitability group 2; wildlife suitability group 6)

**Lebanon and Hobson silt loams, 9 to 14 percent slopes** (IhD).—These soils commonly occupy convex slopes that are above the drainageways and are below gently sloping Lebanon and Hobson soils. Most of this unit consists of both Lebanon silt loam and Hobson silt loam. Some areas are nearly all Lebanon silt loam, and others are nearly all Hobson silt loam. Lebanon silt loam makes up about 50 percent of the total acreage; Hobson silt loam, about 35 percent; and other soils, 15 percent.

The Lebanon silt loam has a subsoil that is not so clayey as the one in the profile described as typical for the Lebanon series and a fragipan that is not so compact or cherty. The Hobson silt loam has slightly more sand in the surface layer and subsoil than in the profile typical for the Hobson series.

Included with these soils in mapping were a few small areas of Nixa and Clarksville cherty loams. Also included were areas of Hobson soils that have a loam surface layer. These included areas make up less than 15 percent of the area mapped.

These soils are better suited to drought-tolerant pasture or meadow plants than to row crops. They are also suited to common species of trees and to plants that furnish food and cover for wildlife. Row crops do not grow well, because of droughtiness and erosion. Tillage and management practices are more difficult on these soils than on less sloping Lebanon and Hobson soils. (Capability unit IVE-2; woodland suitability group 2; wildlife suitability group 6)

**Lebanon and Hobson silt loams, 9 to 14 percent slopes, eroded** (IhD2).—These soils commonly occupy convex slopes that are above drainageways and below the gently sloping Lebanon and Hobson soils. Most of the unit consists of both Lebanon silt loam and Hobson silt loam. Some areas are nearly all the Lebanon soil, but others are nearly all the Hobson soil. The Lebanon soil makes up about 50 percent of the total acreage; the Hobson soil, about 35 percent; and other soils, the remainder.

In this Lebanon soil the subsoil is not so clayey and the fragipan is not so compact or clayey as those in the profile described as typical for the Lebanon series. Erosion has removed part of the original surface layer from the Hobson soil, and the remaining surface layer and subsoil contain slightly more sand than those layers in the profile described as typical for the Hobson series. Both of these soils have less than 6 inches of surface soil remaining in eroded areas. Where tillage exceeds a depth of 4 or 5 inches, the subsoil has been mixed with the remaining surface soil.

These soils are not suitable as cropland, because they are strongly sloping, droughty, and eroded. They are suited to pasture, timber, and food and cover plants for wildlife. (Capability unit VIe-2; woodland suitability group 2; wildlife suitability group 7)

## Moniteau Series

The Moniteau series consists of nearly level and level, poorly drained soils that formed on loess underlain by cherty dolomite residuum. These soils are at the heads of gently sloping drainageways and on benches along streams.

In a typical profile the surface layer is gray silt loam mottled with dark yellowish brown. It is about 7 inches thick. The subsurface layer, about 4 inches thick, is gray silt loam mottled with pale brown. The subsoil, to a depth of 17 inches, is mottled gray, yellowish-brown, and dark-brown silty clay. Below that depth the subsoil is gray clay loam mottled with yellowish brown and strong brown.

Because of the silty clay layer in the subsoil, these soils are slowly permeable. The subsurface layer is saturated with water during wet periods, and tillage is frequently delayed. In dry periods it is difficult for plant roots to penetrate the subsoil to obtain needed moisture. These soils are medium in available moisture capacity, low to moderate in natural fertility, and strongly acid to slightly acid.

Moniteau soils are used mainly for hay and pasture.

Typical profile of a Moniteau silt loam (SW $\frac{1}{4}$ SE $\frac{1}{4}$ , section 20, T. 32 N., R. 3 W.):

- Ap—0 to 7 inches, gray (10YR 5/1) silt loam with few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, fine, granular structure; very friable; medium acid (pH 6.0); abrupt boundary.
- A2—7 to 11 inches, gray (10YR 6/1) silt loam with common, fine, faint, pale-brown (10YR 6/3) mottles; weak, fine, subangular blocky structure; friable; slightly acid (pH 6.3); abrupt boundary.
- B2t—11 to 17 inches, mottled gray (10YR 6/1), yellowish-brown (10YR 5/6), and dark-brown (10YR 4/3) silty clay; weak, medium, subangular blocky structure; sticky when wet; medium acid (pH 5.9); clear boundary.
- B3—17 to 32 inches, gray (10YR 6/1) clay loam with common, fine, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; firm when moist, hard and slightly brittle when dry; slightly acid (pH 6.4); gradual, smooth boundary.
- C—32 to 50 inches +, gray (10YR 6/1) light clay loam with common, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; massive (structureless); firm; slightly acid (pH 6.4).

In undisturbed areas, the A1 horizon generally ranges from 5 to 8 inches in thickness, but it is 10 inches thick in some places. Color ranges from grayish brown (10YR 5/2) to brown (10YR 4/3). The A2 horizon ranges from gray (10YR 5/1) to light gray (10YR 7/2). The B2 horizon is silty clay or clay. Color ranges from 4 to 6 in value and normally is low in chroma. In some places these soils are underlain by sandy loam at a depth of 45 to 60 inches.

Moniteau soils occur with the Lebanon soils on ridgetops and side slopes. They are lighter colored than the Lebanon soils, have a finer textured subsoil, and lack a cherty fragipan.

**Moniteau silt loam, 0 to 2 percent slopes** (MoA).—This soil normally is on concave slopes in slight depressions at the heads of drainageways. In many places it is surrounded by Lebanon soils that are on slopes above that extend to the ridgetops and on the slopes below along the drainageways. This Moniteau soil commonly is lower in the landscape than the Bado soils, in slight depressions on the ridgetops. About one-third of the total acreage of this soil occupies low benches below the Lebanon or

Clarksville soils. A few areas are terraces higher above the flood plain.

The profile of this soil is similar to the one described as typical for the series.

This soil is poorly suited to row crops, small grain, and trees, but crops common in the county can be grown if management is good. Good management provides that this soil is drained as needed, that all crop residue is left on the field and later mixed into the soil, that minimum tillage is applied, and that adequate amounts of fertilizer are added.

This soil is moderately well suited to pasture and hay mixtures, such as redtop, fescue, Ladino clover, and other water-tolerant grasses and legumes. Pasture plants grow well if topdressed, especially with nitrogen. Grazing should be controlled during wet periods so as to avoid compacting the surface layer. (Capability unit IIIw-3; woodland suitability group 4; wildlife suitability group 4)

**Moniteau silt loam, 2 to 5 percent slopes (MoB).**—This soil commonly is on benches in the middle or lower parts of slopes. The benches in about one-fourth of the area are directly above the flood plain. In the midslope positions, this soil is surrounded by the more strongly sloping Lebanon soils in many places. The surface layer of this Moniteau soil is slightly thinner and the subsoil is coarser textured than those in the profile described as typical for the series.

Included with this soil in mapping were a few small moderately eroded areas. In these areas the surface layer is less than 6 inches thick and is mixed with the subsurface layer in tilled areas.

This soil is used mainly for pasture and hay. The suitability of this soil for growing row crops is limited by poor drainage, low natural fertility, and susceptibility to erosion. If row crops are grown, practices for controlling erosion are needed. (Capability unit IIIe-5; woodland suitability group 4; wildlife suitability group 8)

## Nixa Series

The Nixa series consists of moderately well drained soils that have a cherty fragipan. These soils developed in residuum from cherty dolomite and sandstone. They are nearly level and sloping on upland ridges, but are sloping to moderately steep on convex side slopes.

In a typical profile the surface layer is dark grayish-brown cherty loam about 6 inches thick. The subsurface layer, about 3 inches thick, is brown cherty loam. It is underlain by a subsoil layer consisting of 5 inches of pale-brown cherty loam, and that layer, in turn, by 3 inches of very pale brown cherty fine sandy loam. The lower part of the subsoil is a fragipan. It is light-brown cherty silt loam, mottled with dark brown, in its upper part, and reddish-brown cherty silty clay loam mottled with red and dark red in its lower part. The underlying material is reddish-brown and red cherty silty clay loam.

The Nixa soils have moderately rapid permeability above the fragipan. Permeability in the fragipan is moderately slow in most areas, and slow in a few areas. Available moisture capacity and natural fertility are low. These soils are strongly acid to very strongly acid. The hazard of erosion is moderate.

Most of the acreage of these soils is in pasture and hay, but a few areas are in small grain and row crops. Many areas are wooded, and some are idle. The main limitations to farming are droughtiness, erosion, and chert on the surface interfering with cultivation.

Typical profile of Nixa cherty loam (NW $\frac{1}{4}$ , NE $\frac{1}{4}$ , section 28, T. 33 N., R. 5 W.):

- A1—0 to 6 inches, dark grayish-brown (10YR 4/2) cherty loam; weak, very fine, granular structure; very friable; estimated 20 percent fine chert; strongly acid (pH 5.1); clear, smooth boundary.
- A2—6 to 9 inches, brown (10YR 5/3) cherty loam; weak, thin, platy structure that breaks readily to weak, fine, subangular blocky; very firm; estimated 40 percent chert; very strongly acid (pH 4.9); clear, wavy boundary.
- B2—9 to 14 inches, pale-brown (10YR 6/3) heavy cherty loam; moderate, medium, subangular blocky structure; very firm; estimated 50 percent chert; very strongly acid (pH 5.0); clear, wavy boundary.
- A'2—14 to 17 inches, very pale brown (10YR 7/3) cherty fine sandy loam; weak, thin, platy structure; very firm in place; estimated 60 percent chert; very strongly acid (pH 4.8); clear, wavy boundary.
- Bx1—17 to 23 inches, light-brown (7.5YR 6/4) cherty silt loam; common, fine, faint, dark-brown (7.5YR 4/4) mottles; massive (structureless); extremely firm in place; estimated 75 percent chert; very strongly acid (pH 4.9); clear, wavy boundary.
- Bx2—23 to 33 inches, reddish-brown (5YR 5/4) cherty silty clay loam with common, medium, distinct, red (2.5YR 4/6) and dark-red (2.5YR 3/6) mottles; massive (structureless); very firm in place; estimated 70 percent chert; very strongly acid (pH 5.0); clear, irregular boundary.
- C—33 to 58 inches +, reddish-brown (5YR 5/4) and red (2.5YR 4/6) cherty silty clay loam; structureless; estimated 80 percent chert; very strongly acid (pH 5.0).

In some areas the A1 horizon consists of 2 or 3 inches of silty material that probably is loess. In undisturbed areas the A1 horizon ranges from 5 to 8 inches in thickness and from dark grayish brown (10YR 4/2) to grayish brown (10YR 5/2) in color. In some places the texture of both the A1 and A2 horizons is sandy loam. The size of the chert and sandstone fragments is less than one-half inch in most places but is as much as 3 inches in some areas. The chert content ranges from 5 to 25 percent in the A1 horizon and from 15 to 80 percent in the A2 horizon. The texture of both the A1 and A2 horizons ranges from cherty loam to cherty sandy loam. The B2 horizon is yellowish brown (10YR 5/8) or light yellowish brown (10YR 6/4) in some areas.

In this county the Nixa soils are closely intermingled with the Clarksville soils. Nixa soils have a cherty fragipan, and the Clarksville soils do not. The surface layer of Nixa soils contains less chert than that of Clarksville soils, and the chert is of smaller size.

**Nixa-Clarksville cherty loams, 2 to 5 percent slopes (NcB).**—Most areas of this mapping unit consist of Nixa cherty loam and Clarksville cherty loam that are so intermingled that it is not practical to map them separately. In a few areas, the Clarksville soil is absent. Both kinds of soils commonly occur in an irregular pattern, except on the broad ridges in the highly dissected parts of the county. In these areas the Nixa soil is at the center of the ridge, and the Clarksville soil is on the shoulder of the ridge below the Nixa soil and above steeper Clarksville soils. From the center to the shoulder of the ridge, the characteristics of the Nixa soil grade to those of the Clarksville soil. Commonly, both kinds of soils are on ridgetops above the strongly sloping Nixa and Clarks-

ville soils. Nixa cherty loam makes up about 65 percent of the acreage; Clarksville cherty loam, about 20 percent; and other soils, 15 percent. Relief is nearly level, and runoff is slow.

The profile of the Nixa soil is similar to that of the soil described as typical for the Nixa series except that the surface layer is 1 to 3 inches thicker. In some undisturbed areas, a mantle of loess 2 or 3 inches thick covers the cherty surface layer. The profile of the Clarksville soil is not so cherty as that of the soil described as typical for the Clarksville series.

Included in mapping were small areas of the Lebanon and Hobson soils. Also included were a few areas that have a cherty surface layer underlain by slightly cherty, strong-brown to brown sandy clay to clay loam. Other inclusions were a few moderately eroded areas.

Erosion is the major hazard on these soils, but droughtiness is also a hazard. Row crops are poorly suited to these soils because available moisture capacity is low and enough chert is on the surface to interfere with cultivation. Legumes are moderately well suited to poorly suited. Trees, grasses, and plants that provide food and cover for wildlife are moderately well suited. Pasture of drought-tolerant plants is well suited. (Capability unit IVe-3; woodland suitability group 2; wildlife suitability group 6)

**Nixa-Clarksville cherty loams, 5 to 9 percent slopes (NcC).**—These moderately sloping soils generally occupy uplands below the nearly level Lebanon and Hobson soils on ridgetops. They are also on ridgetops above the steep Clarksville soils on side slopes. Most of this mapping unit consists of Nixa cherty loam and Clarksville cherty loam, but in a few areas, the Clarksville soil is absent. Both kinds of soils are commonly intermingled on the landscape except on the broad ridges in the highly dissected parts of the county. In these areas the Nixa soil occupies the center of the ridge and the Clarksville soil is on the shoulder of the ridge. The characteristics of the Nixa soil grade to those of the Clarksville soil from the center of the ridge to the shoulder.

The Nixa cherty loam makes up about 65 percent of the total acreage; Clarksville cherty loam, about 20 percent; and other soils, 15 percent. Relief is normal, and runoff is medium to rapid.

Except that it has a less cherty surface layer, the profile of the Clarksville soil is like the one described as typical for the series. The profile of the Nixa soil is like that described as typical.

Included with these soils in mapping were areas that have a cherty loam surface soil underlain by a strong-brown to brown sandy clay to clay loam subsoil. Also included were many spots that have a cherty loam surface layer underlain by boulder-sized float rock. Other inclusions were small areas of the Lebanon and Hobson soils and some moderately eroded areas.

Row crops are not well suited. Erosion is the main hazard, and other hazards are droughtiness and surface chert that interferes with tillage. Trees, grasses, and plants that provide food and cover for wildlife are moderately well suited. Pasture of drought-tolerant plants is a better use. (Capability unit IVe-3, woodland suitability group 2; wildlife suitability group 6)

**Nixa-Clarksville cherty loams, 9 to 14 percent slopes (NcD).**—In this mapping unit the Nixa and Clarksville soils are so intermingled it was not practical to map them separately. The Clarksville soil commonly occupies the lower part of the slope next to the drainageways. Commonly, these strongly sloping soils are on convex slopes above the drainageways and below the gently sloping Lebanon and Hobson soils. In the highly dissected parts of Dent County, they occur on spur and main ridges. On spur ridges they occur below the gently sloping Lebanon, Nixa, or Clarksville soils, and on the main ridges above the steep Clarksville soils on the side slopes. The Nixa soil makes up about 55 percent of the acreage mapped; the Clarksville soil, about 25 percent; and other soils, 20 percent.

The Nixa soil has slightly more chert throughout the profile than the soil described as typical for the Nixa series. The Clarksville soil commonly has less chert in the surface layer than the soil described as typical for the Clarksville series.

Included with these soils were areas that have a cherty surface layer, and areas that are moderately eroded.

These soils are not suitable for cultivation, but they are suited to pasture, timber, and plants that provide food and cover for wildlife. (Capability unit VIe-3; woodland suitability group 2; wildlife suitability group 7)

**Nixa-Clarksville cherty loams, 14 to 19 percent slopes (NcE).**—The soils in this complex are moderately steep. They commonly lie on convex slopes to drainageways, though a few areas are on side slopes below the soils on ridgetops and bottom lands. Nixa and Clarksville soils are closely intermingled, and they commonly occur in irregular patterns. The Clarksville soil commonly occupies the lower part of the slope next to the drainageways. Nixa cherty loam makes up about 40 percent of the total acreage; Clarksville cherty loam, about 40 percent; and other soils, 20 percent.

The Nixa soil commonly contains more chert throughout the profile; otherwise, its profile is like the one described for the series. The Clarksville soil commonly has less chert in the surface layer than the soil described for the series.

Included with these soils in mapping were small spots that have a cherty surface layer underlain by chert and sandstone boulders and some areas that have been moderately eroded.

The soils in this complex are not suited to row crops. They are better suited to growing trees. Under controlled grazing, pasture plants are suited. The soils are also suited to plants that provide food and cover for wildlife. (Capability unit VIIe-3; woodland suitability group 2; wildlife suitability group 7)

## Pope Series

The Pope series is made up of level, somewhat excessively drained soils that consist of recently deposited sediment washed from uplands underlain by sandstone and cherty dolomite. These soils are in bottom lands near the stream channels in the wider stream valleys and make up the entire bottom lands of narrow stream valleys in some areas.

In a typical profile the surface layer is dark-brown fine sandy loam about 8 inches thick. The underlying layer is dark-brown fine sandy loam in the upper part and yellowish-brown fine sandy loam in the lower part. Between depths of 33 and 40 inches is fine sandy loam with thin silty coatings of white and yellowish brown.

Pope soils have moderately rapid permeability and medium available moisture capacity. Organic-matter content is low. Droughtiness is the main limitation, but the soils respond to correct amounts of fertilizer. Areas not limed are strongly acid to medium acid. Pope soils next to major streams are subject to flooding.

Most of the acreage is used for pasture and hay, but few areas are used for row crops.

Typical profile of Pope sandy loam (NE $\frac{1}{4}$ SW $\frac{1}{4}$ , section 20, T. 35 N., R. 6 W.):

Ap—0 to 8 inches, dark-brown (10YR 4/3) fine sandy loam; single grain (structureless); loose when moist; neutral (pH 6.9); clear boundary.

C1—8 to 33 inches, dark-brown (7.5YR 4/4) fine sandy loam; single grain (structureless); slightly hard when dry; medium acid (pH 5.8); gradual boundary.

C2—33 to 60 inches +, yellowish-brown (10YR 5/6) fine sandy loam with thin silty coatings that are white (10YR 8/2) and yellowish brown (10YR 5/4); single grain (structureless); slightly hard when dry; strongly acid (pH 5.5).

The Ap and C1 horizons range from dark brown (10YR 4/3) to brown (10YR 5/3). The C horizons range from loam to sandy loam, and in some places contain as much as 20 percent fine gravel. Unlimed areas of the Pope soils are strongly acid to medium acid. Stratified cherty gravel underlies the C horizon at a depth ranging from 33 inches to several feet.

The Pope soils are more sandy and droughty than the Sharon soils but are not so sandy and droughty as Sandy alluvial land.

**Pope sandy loam (Po).**—This level soil occupies first bottoms along many of the drainageways of the county. In most places it occurs next to the stream channel in the wider stream valleys. Slopes are less than 2 percent.

This soil is suited to row crops, pasture, and trees. Droughtiness is the major limitation. Suitable crops can be grown continuously if cover crops are planted in fall and winter and are turned under each year; if all crop residue is left on the field and later mixed into the soil; if adequate amounts of fertilizer are added; and if methods of stubble-mulch tillage are applied that leave stubble standing for protection against erosion. This soil is also suited to plants that furnish food and cover for wildlife. (Capability unit III-4; woodland suitability group 6; wildlife suitability group 5)

## Razort Series

The Razort series consists of dark-brown, level to nearly level, well-drained soils that developed in cherty alluvium. These soils occupy low terraces above the bottom lands in the more highly dissected parts of the county.

In a typical profile the surface layer is dark-brown loam about 7 inches thick. The subsoil extends to a depth of 27 inches. It is dark-brown loam and sandy loam to a depth of 19 inches and is dark-brown sandy loam below. The underlying material is dark-brown sandy loam mottled with pale brown.

Permeability is moderate to moderately rapid, available moisture capacity is medium, and natural fertility is moderate. These soils are medium acid to very strongly acid. Some low areas of these soils are occasionally flooded.

Razort soils are used mainly for pasture and hay, but a few areas have been used for row crops. Droughtiness is the main hazard.

Typical profile of Razort loam, 1 to 3 percent slopes (SE $\frac{1}{4}$ SW $\frac{1}{4}$ , section 15, T. 32 N., R. 4 W.):

A11—0 to 2 inches, dark-brown (10YR 4/3) loam; weak, very fine, granular structure; loose when moist, soft when dry; estimated 5 percent partly rounded chert, less than 2 inches in size; medium acid (pH 5.8); clear, smooth boundary.

A12—2 to 7 inches, dark-brown (10YR 3/3) loam; weak, fine, granular structure; very friable when moist, soft when dry; estimated chert content ranges from 5 to 10 percent; neutral (pH 6.8); clear, smooth boundary.

B1—7 to 12 inches, dark-brown (7.5YR 4/4) loam with common, fine, faint, very dark brown (10YR 2/2) mottles; weak, medium, subangular blocky structure; very friable; estimated chert content ranges from 10 to 15 percent; slightly acid (pH 6.1); clear, irregular boundary.

B2t—12 to 19 inches, dark-brown (7.5YR 4/4) sandy loam; weak, medium, subangular blocky structure that readily breaks to weak, very fine, angular blocky structure; friable; estimated chert content ranges from 10 to 15 percent; strongly acid (pH 5.2); clear, wavy boundary.

B3—19 to 27 inches, dark-brown (7.5YR 4/4) sandy loam; massive (structureless); friable; estimated gravel content ranges from 10 to 15 percent; strongly acid (pH 5.2); clear, wavy boundary.

C—27 to 50 inches +, dark-brown (7.5YR 4/4) gravelly sandy loam with common, fine, faint, very pale brown (10YR 7/3) mottles; moderate, medium, subangular blocky structure; very friable; few, fine, faint, dark-brown (10YR 3/3) stains; estimated chert content 30 to 35 percent; strongly acid (pH 5.2).

The A1 horizon is silt loam in some spots and sandy loam in others. In many areas the surface layer is cherty. In areas undisturbed, the A1 horizon ranges from 6 to 8 inches in thickness and from dark grayish brown (10YR 4/2) to brown (10YR 4/3) in color. Where the A1 horizon is silt loam, the underlying layers are commonly cherty silty clay loam or cherty silt loam. In most areas the B horizon is heavy silt loam or silty clay loam.

The principle variation is the amount of chert in the solum and depth to the very cherty C horizon. The chert content in the A1 horizon ranges from a trace to 25 percent. In some places the B horizon is 35 percent chert and the C horizon is 80 percent chert. Depth to the cherty C horizon ranges from 10 to 36 inches. Depth to this horizon varies within short distances because the horizon is a wavy band.

Razort soils commonly occur with the Ashton soils but have a coarser textured subsoil. Stratified cherty gravel is nearer the surface in the Razort soils than in the Ashton.

**Razort cherty loam, 1 to 3 percent slopes (RcB).**—This soil commonly occupies small areas on low stream terraces below the steep Clarksville and Baxter soils on uplands and above the Elsay and Gladden soils on bottom lands. This soil has more chert in the surface layer than the soil described as typical for the Razort series, and the cherty underlying material is nearer the surface.

Included with this soil in mapping were a few spots that have a very cherty surface layer and layers underlying it.

This Razort soil is well suited to pasture and hay. Its use for row crops is limited by droughtiness and by chert

in the surface layer. Row crops and small grains can be grown continuously if crop residue is left on the field and later mixed into the soil and if large amounts of fertilizer are applied. Minimum tillage helps to maintain structure, and stubble-mulch tillage helps to conserve moisture and protect the soil from erosion. This soil is also suited to trees and plants that supply food and cover for wildlife. (Capability unit IIIs-1; woodland suitability group 5; wildlife suitability group 5)

**Razort loam, 1 to 3 percent slopes (RcB).**—The profile of this soil is the one described as typical for the Razort series. This soil occupies small areas on low stream terraces below the steep Clarksville and Baxter soils on uplands and above the Elsay and Gladden soils of the first bottoms.

Included with this soil in mapping were spots of Ashton silt loam. Small areas of Razort cherty loam were also included where the depth to the coarse material is variable.

This Razort soil is one of the best soils in the county for farming. Pasture, hay, small grain, and row crops are suited, and most kinds of trees common in the county are well suited. Use for row crops is limited because this soil is in small areas. Row crops can be grown each year if all crop residue is left on the field and later mixed into the soil and if enough fertilizer is added. Minimum tillage helps to maintain structure. In open fields plants that provide food and cover for wildlife are also suited. (Capability unit IIs-1; woodland suitability group 6; wildlife suitability group 5)

### Riverwash

Riverwash (Rh) is made up of coarse alluvial materials deposited on flood plains along streams and rivers. These materials consist of large stones, cherty gravel, and sand that are well graded in some areas but are mixed in others.

Riverwash is not suitable for farming, though it is valuable as a source of sand and gravel. It has limited value for recreational areas, such as overnight campsites, picnic areas, or fishing grounds. (Capability unit VIIIs-4; woodland suitability group 8; not assigned to a wildlife suitability group)

### Rock Land

Rock land (Rk) occurs in areas where ledges, boulder-sized float rock, and outcrops of bedrock cover more than 25 percent of the surface. The outcrops and ledges are dolomite, and the large float rocks are mostly sandstone. Areas of this land are small and have slopes of more than 9 percent. Rock land is mostly on south-facing slopes along the larger streams in the county, though a few scattered areas that have other aspects are along secondary tributary streams.

Between the bedrock, ledges, or float rock the soil material varies. In many places this material has a profile similar to that described as typical for the Clarksville or Baxter series. In some areas it has a medium-textured surface layer underlain by plastic clay of varied colors. Small gladelike areas have black clayey materials between ledges of dolomite.

Only a few trees and a small amount of wild grasses grow on Rock land. The many ledges, float rocks, and

bedrock outcrops make logging operations difficult. (Capability unit VIIIs-6; woodland suitability group 3; wildlife suitability group 10)

### Sandy Alluvial Land

Sandy alluvial land (So) consists of excessively drained soil material that was derived from sediments washed from upland areas underlain by sandstone and cherty sandstone. Slopes are less than 2 percent. This land is next to the stream channels in the narrow valleys. It is lower on the flood plains than the Pope and Elsay soils.

Sandy alluvial land is made up of light yellowish-brown to yellowish-brown loamy sand. In some areas very coarse sand and fine gravel make up 15 percent of the soil material. Within small areas thin discontinuous layers occur that are 15 to 60 percent coarse sand and gravel. Thick beds of stratified coarse sand and gravel are at a depth ranging from 36 inches to several feet.

The primary variation in this land type is the amount of coarse sand and gravel in the layers below the thin surface layer. In some areas there is only a trace of this coarse material, but in other areas the soil material is as much as 60 percent sand and gravel in stratified layers. In many places this variation occurs within a small area.

Sandy alluvial land is so droughty that its use for row crops is limited. It is better suited to trees, pasture, or hay. Native hardwoods and shortleaf pine grow in many areas, and a few areas are in pasture. The risk of flooding is moderate to severe.

If farming is intensive, Sandy alluvial land requires proper amounts of lime and fertilizer, stubble-mulch tillage, and practices that leave all crop residue on the field and later mix it into the soil. (Capability unit IVs-4; woodland suitability group 5; wildlife suitability group 9)

### Sharon Series

The Sharon series consists of level to nearly level, well-drained soils that formed in recent alluvium washed from upland areas underlain by cherty dolomite and sandstone. These soils occupy bottom lands along large and small streams. Some areas of these soils are flooded occasionally. These floods most frequently occur in winter and early in spring.

In a typical profile the surface layer of the Sharon soils is dark yellowish-brown silt loam about 7 inches thick. The underlying material extends to a depth of more than 60 inches and consists of dark yellowish-brown to dark-brown silt loam.

The Sharon soils have moderate permeability, high available moisture capacity, and moderate natural fertility. The upper layers are commonly strongly acid but range to neutral in some areas.

These soils are used for row crops, pasture, and hay. Crops grow well if management is good.

Typical profile of Sharon silt loam (SE $\frac{1}{4}$ SE $\frac{1}{4}$ , section 35, T. 34 N., R. 7 W.):

- Ap—0 to 7 inches, dark yellowish-brown (10YR 3/4) silt loam, pale brown (10YR 6/3) when dry; weak, very fine, granular structure; very friable, slightly hard; medium acid (pH 5.6); clear, smooth boundary.
- C—7 to 60 inches +, dark yellowish-brown (10YR 4/4) to dark-brown (10YR 3/3) silt loam, yellowish brown

(10YR 5/4) when dry; weak, very fine, subangular blocky structure; friable, hard; strongly acid (pH 5.2).

The texture of the Ap and C horizons generally ranges from silt loam to loam, but is coarser in places. When the soil is moist, the A horizon is dark brown (10YR 3/3) to brown (7.5YR 5/4) and the C horizon is dark brown (7.5YR 4/4) to brown (10YR 5/3). In some areas along streambanks and in narrow bottom lands, these soils have some cherty gravel throughout the profile. They are commonly strongly acid or medium acid but are very strongly acid or neutral in places.

Sharon soils commonly occur with the Westerville, Atkins, Gladden, and Elsayh soils. Drainage of the Sharon soils is much better than that of the Westerville and Atkins soils. Sharon soils are deeper to gravel and are less gravelly throughout the profile than the Elsayh and Gladden soils.

**Sharon silt loam (Sh).**—This level or nearly level soil occupies first bottoms along all of the major streams in the county. Slopes are less than 2 percent. Included with this soil in mapping were a few spots of the Gladden and Westerville soils.

Because this Sharon soil is deep and has good tilth and drainage, it is well suited to row crops, small grain, clover, alfalfa, and other crops grown locally. It is also suited to grasses, trees, and crops that provide food and cover for openland and woodland wildlife. Additions of green manure and use of minimum tillage are highly desirable where cultivated crops are grown intensively. On some narrow bottom lands, this soil is better suited to pasture than to row crops because areas are too narrow for good row arrangement. (Capability unit I-1; woodland suitability group 6; wildlife suitability group 3)

## Viraton Series

The Viraton series consists of moderately well drained soils that have a cherty fragipan. These soils developed in cherty colluvium. They are sloping to moderately steep.

In a typical profile the surface layer is brown cherty silt loam about 6 inches thick. The subsoil, to a depth of 18 inches, is strong-brown silty clay loam in the upper part, yellowish-brown cherty silty clay loam in the middle, and mottled pale-brown and reddish-yellow cherty silty clay loam in the lower part. Next in the subsoil is a fragipan of mottled yellowish-brown and strong-brown cherty silt loam. It is 18 inches thick. The underlying material is yellowish-red silt loam.

The Viraton soils are moderately permeable above the fragipan, but slowly permeable in it. Because water moves through the fragipan slowly, the layer below it is frequently dry after rains. In summer, when the upper layers are dry, the fragipan prevents plant roots from obtaining water from the underlying material. These soils have low natural fertility and low to medium available moisture capacity. They are very strongly acid to medium acid.

Most of the acreage of Viraton soils is in pasture, though a few areas are used for hay, and others are idle. Controlling erosion is the main concern, and droughtiness and chert on the surface limit use.

Typical profile of Viraton cherty silt loam, 5 to 9 percent slopes (SW $\frac{1}{4}$ , SW $\frac{1}{4}$ , section 28, T. 34 N., R. 2 W.):

- Ap—0 to 6 inches, brown (10YR 5/3) cherty silt loam; weak, very fine, granular structure; very friable; estimated 15 percent chert; medium acid (pH 5.6); abrupt, smooth boundary.
- B1—6 to 10 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; friable, very sticky, nonplastic; estimated 5 to 10 percent chert; very strongly acid (pH 5.0); clear, wavy boundary.
- B21t—10 to 16 inches, yellowish-brown (10YR 5/6) cherty silty clay loam; moderate, medium, subangular blocky structure; friable, sticky, slightly plastic; estimated 15 percent chert; very strongly acid (pH 5.0); clear, smooth boundary.
- B22t—16 to 18 inches, mottled very pale brown (10YR 7/3) and reddish-yellow (7.5YR 6/8) cherty silty clay loam; weak, very fine, subangular blocky structure; friable, sticky, slightly plastic; estimated 20 percent chert; very strongly acid (pH 4.8); clear, wavy boundary.
- Bx—18 to 36 inches, mottled light yellowish-brown (10YR 6/4) and strong-brown (7.5YR 5/8) cherty silt loam; moderate to strong, medium, subangular blocky structure; extremely firm in place; pockets and root channels of light-gray (N 7/0) clay; estimated 85 percent chert content; very strongly acid (pH 4.7); clear, irregular boundary.
- C—36 to 58 inches +, yellowish-red (5YR 5/6) cherty silt loam; friable; about 85 percent chert; very strongly acid (pH 4.7).

In undisturbed areas the A1 horizon is 6 to 8 inches thick and light grayish brown (10YR 6/2) to very dark grayish brown (10YR 3/2). The B horizon ranges from light yellowish brown (10YR 6/4) to strong brown (7.5YR 5/6). Mottling is absent in places. Depth to the fragipan ranges from 15 to 22 inches.

The Viraton soils occur below the steep Clarksville or Baxter soils and above the Elsayh or Razort soils on first bottoms and terraces.

**Viraton cherty silt loam, 5 to 9 percent slopes (VcC).**—This gently sloping soil lies below the steep Clarksville and Baxter soils on uplands and above soils on bottom lands. In many places it is separated from the soils on bottom lands by the soils on terraces or by the strongly sloping Viraton soils. The profile of this soil is the one described as typical for the series.

Included with this soil in mapping were a few spots that lack a fragipan. Also included were a few small areas that have slopes of less than 5 percent.

Because this Viraton soil is cherty and droughty, it is not well suited to row crops. It is better suited to hay, pasture, trees, and plants that provide food and cover for wildlife. (Capability unit IVE-3; woodland suitability group 1; wildlife suitability group 6)

**Viraton cherty silt loam, 5 to 9 percent slopes, eroded (VcC2).**—This soil lies below steep soils on uplands and above soils on bottom lands. In many places this soil is separated from the soils on bottom lands by soils on terraces or by the strongly sloping Viraton soils. The surface layer of this soil is thinner and more cherty than the one in the profile described as typical for the series.

Included with this soil in mapping were a few spots of soils that lack a fragipan.

Because this Viraton soil is droughty and subject to erosion, it is not well suited to row crops. It is better suited to pasture if grazing is controlled. It is also suited to trees and plants that furnish food and cover for wildlife. (Capability unit VIe-3; woodland suitability group 1; wildlife suitability group 7)

**Viraton cherty silt loam, 9 to 14 percent slopes (VcD).**—This soil is on foot slopes below the steep Clarksville and Baxter soils and above soils of the bottom lands. Normally, this soil occurs below the more gently sloping Viraton soils and has more irregular slopes. The profile of this soil is similar to the one described for the series but has more chert in the surface layer and less clay in the subsoil.

Included with this soil in mapping were a few spots that do not have a fragipan. Also included were a few moderately eroded spots.

This Viraton soil is not well suited to row crops, because it is droughty, strongly sloping, and low in natural fertility. It is better suited to trees, pasture, and plants that provide food and cover for wildlife. Grazing should be controlled, and pasture renovated on the contour. (Capability unit VIe-3; woodland suitability group 1; wildlife suitability group 7)

**Viraton cherty silt loam, 14 to 19 percent slopes (VcE).**—This soil occupies long slopes below the steep and very steep Clarksville and Baxter soils on uplands and above other soils on terraces and first bottoms. The surface layer of this soil is thinner and more cherty than that in the profile described as typical for the series, and the subsoil is coarser textured and not so distinct. Also, the fragipan is discontinuous and not so well developed as that in the more gently sloping Viraton soils.

Included with this soil are some spots where the surface layer has been removed through erosion.

Because this Viraton soil is steep and droughty, it is not suited to row crops. It is better suited to trees and plants that provide food and cover for wildlife. It can be pastured and grazed if grazing is controlled. On grassland or woodland, more intensive management is needed than is needed on Viraton cherty silt loam, 9 to 14 percent slopes. (Capability unit VIIe-3; woodland suitability group 1; wildlife suitability group 7)

### Viraton Silt Loam, Red Subsoil Variants

The red subsoil variants of Viraton silt loam are well-drained soils that lack a fragipan. These soils developed in cherty colluvium on slopes ranging from 3 to 16 percent.

In a typical profile the surface layer is dark grayish-brown to dark-brown silt loam 7 inches thick. The subsoil is about 30 inches thick. It is dark-brown silty clay loam in the upper part, strong-brown silty clay loam in the middle, and yellowish-red cherty silty clay loam in the lower part. The underlying material is yellowish-red cherty clay loam.

These soils are moderately permeable, medium in available moisture capacity, and moderately low in natural fertility. They are strongly acid to extremely acid.

Most of the acreage of these soils is in pasture, though a few areas are in trees, and many areas are idle. These soils are subject to erosion, and they are also droughty.

Typical profile of a Viraton silt loam, red subsoil variant (SE $\frac{1}{4}$ NE $\frac{1}{4}$ , section 28, T. 32 N., R. 6 W.):

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) to dark-brown (10YR 4/3) silt loam; weak, very fine, granular structure; soft when dry, very friable when moist; less than 5 percent estimated chert; very strongly acid (pH 5.0); abrupt, smooth boundary.

B1—7 to 14 inches, dark-brown (7.5YR 4/4) light silty clay loam; weak, fine, subangular blocky structure; slightly hard, friable; less than 5 percent estimated chert; very strongly acid (pH 5.0); clear, smooth boundary.

B21—14 to 22 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; slightly hard, friable; 5 to 10 percent estimated chert; very strongly acid (pH 4.7); clear, smooth boundary.

B22—22 to 37 inches, yellowish-red (5YR 4/6-5/6) cherty silty clay loam; moderate, fine, subangular blocky structure; slightly hard, firm; 70 percent estimated chert; extremely acid (pH 4.0); gradual, wavy boundary.

C—37 to 44 inches, yellowish-red (5YR 5/6) cherty clay loam; weak, fine, subangular blocky structure; friable; 65 percent estimated chert; extremely acid (pH 4.0).

In undisturbed areas, the A1 horizon ranges from 5 to 8 inches in thickness and from dark grayish brown (10YR 4/2) to brown (10YR 5/3) in color. The B horizon ranges from silt loam to heavy silty clay in texture and from dark brown (7.5YR 4/4) to yellowish red (5YR 5/8) in color. Depth to the very cherty layer ranges from 18 to 30 inches. In unlimed areas, these soils are medium acid to very strongly acid.

These variants are on foot slopes below the steep Clarksville and Baxter soils and above soils on bottom lands.

**Viraton silt loam, red subsoil variant, 3 to 9 percent slopes (VrC).**—This soil occupies foot slopes below the Clarksville and Baxter soils and above the soils of the bottom lands. The profile of this soil is the one described as typical for the red subsoil variants from the Viraton series.

Included with this soil in mapping were a few areas that have a weak cherty fragipan and areas that have a red clayey subsurface layer. Also included were small areas that have been moderately eroded and areas that have slopes of less than 3 percent.

Because this soil is droughty and susceptible to erosion, it is not well suited to row crops. It is suited to trees, hay and pasture, and plants that provide food and cover for wildlife. If terraces are used, hay and meadow crops can be grown about half of the time without causing excessive erosion. If terraces are not used, this soil should be kept in hay meadow or pasture continuously. (Capability unit IVe-2; woodland suitability group 1; wildlife suitability group 6)

**Viraton silt loam, red subsoil variant, 9 to 16 percent slopes (VrD).**—In undisturbed areas the profile of this soil has a surface layer 2 or 3 inches thinner and a subsoil that is coarser textured than the corresponding layers in the profile described as typical for red subsoil variants of Viraton silt loam.

Included with this soil in mapping were a few small areas that were moderately eroded or that have a cherty surface layer. Also included were small areas that have slopes of less than 9 percent or of more than 16 percent.

Because slopes are strong or steep and erosion is a hazard, this soil is suited only to pasture, trees, and plants that provide food and cover for wildlife. (Capability unit VIe-2; woodland suitability group 1; wildlife suitability group 7)

### Westerville Series

The Westerville series consists of somewhat poorly drained, level or slightly depressional soils on bot-

tom lands. These soils were derived from sediments washed from uplands underlain by cherty dolomite and sandstone.

In a typical profile the surface layer of Westerville soils is grayish-brown silt loam about 13 inches thick. The subsoil extends to a depth of more than 48 inches and consists of brown silt loam mottled with dark yellowish brown and yellowish brown. Black concretions are common in the subsoil.

These soils have moderate to moderately slow permeability, high available moisture capacity, and low to moderate natural fertility. They are extremely acid to medium acid. Many areas of these soils are subject to flooding. Most floods occur in winter and early spring.

Westerville soils are used for row crops, pasture, and hay. If management is good, these crops grow well.

Typical profile of Westerville silt loam (NE $\frac{1}{4}$ NE $\frac{1}{4}$ , section 25, T. 34 N., R. 6 W.):

- A1—0 to 13 inches, grayish-brown (10YR 5/2) silt loam with few, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; very friable; few, fine, black concretions; very strongly acid (pH 4.6); clear, wavy boundary.
- B—13 to 48 inches +, brown (10YR 5/3) silt loam with common, medium, faint, dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) mottles; very weak, fine, subangular blocky structure; common, medium, black concretions; extremely acid (pH 4.4).

The A horizon ranges from loam to silt loam and in many places is browner in tilled areas than in undisturbed areas. The B horizon is mottled with yellow, red, and gray in some areas. In places the A and B horizons are coarser textured than silt loam. Stratified sediments can be seen in the profile in many areas, though the upper 30 inches is generally silt loam or loam. These soils are extremely acid to medium acid.

Westerville soils commonly occur with the Sharon and Atkins soils. They are not so well drained as the Sharon soils but are better drained than Atkins soils.

**Westerville silt loam (We).**—This soil is in slight depressions in the bottom lands adjoining uplands or terraces. Slopes are 1 percent or less. This soil generally is separated from soils next to the stream channel by Sharon silt loam, but along some of the slow-moving streams, Westerville silt loam occupies the entire flood plain.

Included with this soil in mapping were spots of Sharon soils on prominent mounds. Below the mounds Westerville silt loam occurs with Atkins soils.

This soil is used for row crops, pasture, and hay. It is well suited to native grasses, a few kinds of trees, and alsike clover, Ladino clover, and other legumes. Excess water on the surface and poor drainage are the main hazards. Because of wetness and frost heaving in winter, this soil is not suited to alfalfa. Additions of green manure are needed where cultivated crops are grown intensively. (Capability unit IIw-1; woodland suitability group 7; wildlife suitability group 1)

## Use and Management of Soils

Soils of Dent County are used mainly for cultivated crops, pasture, and trees. This section discusses the uses of the soils for these main purposes, and it gives the

estimated yields of the principal crops. Also discussed are the uses of the soils in building highways, farm ponds, and other engineering structures; for growing wildlife habitat; and in developing areas suitable for recreation.

In describing information about the use of soils for crops and pasture, as woodland, and for wildlife habitat, the procedure is to name groups that consist of similar soils and to suggest use and management for those groups. The soils in the subsection on engineering have not been grouped but are placed in tables so that properties significant to engineering can be readily given.

## Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils 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, for forest trees, or engineering.

In the capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and 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 not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife. (None in Dent County.)
- 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.
- 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.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

**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 subclasses indicated by *w*, *s*, and *c*, because 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, 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-3 or IIIe-1. 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.

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

### **Management by capability units**

A capability unit is made up of soils that have about the same limitations to use and susceptibility to damage, and that need about the same management. In the following pages each capability unit in the county is described, and management for each is suggested. The mention of the soil series represented in a unit does not mean that all the soils in the series are in the unit. The soils in each capability unit can be found by referring to the "Guide to Mapping Units" at the back of this survey.

#### **CAPABILITY UNIT I-1**

In this capability unit are nearly level, well-drained Ashton and Sharon soils. These soils are deep, have a moderately permeable subsoil, and have high available moisture capacity. They are easy to manage, to conserve, and to keep in good tilth.

The soils in this unit are among the best in the county for cultivated crops. They can be farmed safely if management is good. Where fertility is kept at a high level, these soils can be intensively cultivated to corn, small grains, forage crops, truck crops, and other special crops.

Also well suited are pasture plants, trees, and plants that provide food and cover for wildlife.

#### **CAPABILITY UNIT IIe-1**

Only Ashton silt loam, 2 to 5 percent slopes, is in this capability unit. Available moisture capacity is high. Erosion is a moderate hazard, but tilth is easy to maintain.

The soil in this unit is suited to corn, small grain, forage crops, and special crops. It is well suited to pasture plants and trees and to food and cover for wildlife.

Terracing and contour farming help to control water erosion and to conserve moisture. Returning all crop residue to the soil helps to maintain organic-matter content and to improve tilth. Grassed waterways are necessary for disposal of excess runoff. Under intensive management, a suitable cropping system is 3 years of row crops followed by 1 year of small grain and a winter cover crop turned under for green manure. More years of meadow or other close-growing crops are required if this soil is not terraced and farmed on the contour.

#### **CAPABILITY UNIT IIw-1**

This unit consists of deep Elkins and Westerville soils that are on first bottoms. These soils are level and somewhat poorly drained and poorly drained. Available moisture capacity is high, permeability is moderately slow, and the hazard of overflow is slight.

Because the soils are wet during winter and early in spring, some crops, such as alfalfa, are subject to frost heaving. The soils in this unit are suited to row crops, pasture, and hay. They are well suited to a few legumes, such as alsike and Ladino clovers, but are poorly suited to alfalfa. Food and cover for wildlife are other suitable uses. These soils are suited to most kinds of hardwoods common in Dent County but not to the conifers that ordinarily grow on uplands.

Diversion terraces are necessary in some places where wetness, caused by runoff from hills, is an obstacle. Lime and phosphate are needed on most of these soils unless these amendments have been applied recently. Crops generally grow well if nitrogen and potash are added. Content of organic matter needs to be increased, especially in the Westerville soil. Returning all crop residue helps to maintain content of organic matter at a high level. Additions of large amounts of barnyard manure and plowing under green-manure crops are also helpful. Under intensive management, continuous row crops can be grown.

#### **CAPABILITY UNIT II<sub>s</sub>-1**

This unit consists of the nearly level, well-drained Razort and Gladden soils. These soils are moderately deep to layers high in chert content. Available moisture capacity is moderate, and permeability is moderate to moderately rapid. Most areas of the Gladden soil occasionally receive overflow from the main streams. The Razort soil is on low terraces, and the Gladden soil is on bottom lands.

The soils in this unit are among the most fertile in the county. They are suited to row crops, small grain, meadow, and to trees and plants that provide food and cover for wildlife.

Crop residue should be left on the field and mixed in the soil. In most areas applications of lime are frequently needed. Also, moderate to large amounts of phosphate and potash generally are necessary. Crop response is good if supplemental nitrogen is added. If intensive management is practiced and minimum tillage is applied, continuous row crops can be grown.

#### CAPABILITY UNIT IIIe-1

Only Ashton silt loam, 5 to 9 percent slopes, is in this capability unit. Available moisture capacity is high. Erosion is a moderate hazard, but this soil is easy to work and to keep in good tilth.

The soil in this unit is suited to row crops, small grain, or meadow. It is also suited to timber and to food and cover for wildlife.

Terracing and contour farming help to control water erosion and to conserve moisture. Diversion terraces are needed in some fields to protect the soil against excess water from higher slopes. Returning all crop residue to the soil is a good way to maintain organic-matter content and to improve tilth. Grassed waterways are necessary for disposal of excess runoff. Under intensive management, an example of a suitable cropping system is 2 years of row crops followed by 1 year of small grain and 1 year of meadow. More years in meadow and other close-growing crops are required if the soil is not terraced and farmed on the contour.

#### CAPABILITY UNIT IIIe-2

In this capability unit are moderately well drained, nearly level Lebanon and Hobson soils that have a slowly permeable fragipan. Available moisture capacity is moderately low. Erosion has been slight.

The soils in this unit are well suited to pasture and hay consisting of grasses and legumes that tolerate drought. The soils are also suited to food and cover for wildlife and to the kinds of trees commonly grown in Dent County. Small grain grows fairly well on these soils. Row crops are not well suited, for the soils in this unit are droughty.

Terracing and contour farming are needed on the soils in this unit to help control erosion and to conserve moisture. Returning all crop residue to the soil helps to maintain the content of organic matter and to improve soil tilth. Grassed waterways are necessary for disposal of excess water from runoff. If intensive management is applied, an example of a suitable cropping system is 1 or 2 years of row crops followed by 1 year of small grain and 1 year of meadow crops. Close-growing crops and meadow are required more frequently if terracing and contour farming are not practical.

#### CAPABILITY UNIT IIIe-5

In this capability unit are deep, poorly drained, nearly level Bado and Moniteau soils. These soils have a clayey, slowly permeable subsoil. Available moisture capacity is low or medium. The soils in this unit are frequently wet late in spring and are droughty late in summer, but erosion is fairly easy to control. The water table fluctuates, however, and is near the surface during periods of high rainfall.

The soils in this unit are poorly suited to row crops, small grain, and trees, though meadow crops are moder-

ately well suited if redtop, fescue, Ladino clover, and other water-tolerant grasses and legumes are grown. Also suitable are food and cover for wetland kinds of wildlife.

Terracing and contour farming help to control erosion and to conserve moisture. Returning all crop residue is a good way to maintain the content of organic matter and to improve tilth. Grassed waterways are needed for disposal of excess runoff. Under intensive management, an example of a suitable cropping system is 1 or 2 years of row crops followed by 1 year of small grain and 1 year of meadow crops. Close-growing crops and meadow are required more frequently if terracing and contour farming are not practical.

#### CAPABILITY UNIT IIIw-1

Only Atkins loam is in this capability unit. This soil has high available moisture capacity. It frequently remains wet for long periods because permeability is moderately slow to slow and drainage is poor.

Small grain and meadow crops are well suited, and row crops are fairly well suited. Alfalfa is poorly suited, but trees grow fairly well. Unless adequate drainage is provided, this soil is often too wet to be planted or cultivated. It is better suited to plants that provide food and cover for wetland wildlife than are most other soils in Dent County.

Most areas need applications of lime unless lime has been applied recently. Also generally needed are moderate to large amounts of phosphate and potash.

Crops grow well if supplemental nitrogen is added. Plowing under green-manure crops and all crop residue helps to maintain organic-matter content and to improve tilth. In drained areas that are intensively managed, row crops can be grown continuously.

#### CAPABILITY UNIT IIIw-3

Moniteau silt loam, 0 to 2 percent slopes, is the only soil in this capability unit. This soil has a slowly permeable, fine-textured subsoil. Drainage is poor, and available moisture capacity is medium. This soil is subject to droughtiness during part of the year. It is generally wet late in spring and droughty late in summer. The water table fluctuates and is near the surface during periods of high rainfall.

The soil in this unit is poorly suited to row crops, small grain, and trees. It is moderately well suited to meadow consisting of redtop, fescue, Ladino clover, or other water-tolerant grasses. Also suitable are plants that provide food and cover for wetland wildlife.

In most areas of this soil lime is needed unless it has been applied recently. Also generally needed are moderate to large amounts of phosphate and potash. Crop response is good if supplemental nitrogen is applied. Plowing under green-manure crops and returning crop residue are essential for maintaining the content of organic matter. In drained areas that are intensively managed, a suitable cropping system is 4 years of row crops followed by 1 year of small grain and a crop turned under for green manure.

#### CAPABILITY UNIT IIIs-1

This unit consists of Elsay and Razort soils that are shallow to the layers high in chert. These soils are level

or nearly level, and they are well drained to somewhat excessively drained. They have medium available moisture capacity but are slightly droughty. The Elsay soil is subject to occasional flooding. The soils in this unit have moderate and moderately rapid permeability.

These soils are well suited to pasture plants, but use for row crops is limited because the soils are droughty and occupy small areas. These soils are suited to trees and to plants that provide food and cover for wildlife. Cultivating the soils in this unit generally is not practical, because they have a cherty surface layer.

Most of the soils need lime if it has not been added recently. Also generally needed are moderate to large amounts of phosphate and potash. Crops respond well if supplemental nitrogen is added. Row crops can be grown continuously if fall and winter cover crops are planted and fertilizer is added. Minimum tillage is a necessary practice. Crop residue should be left on the field and mixed into the soil.

#### CAPABILITY UNIT III<sub>s</sub>-4

Only Pope sandy loam is in this capability unit. This nearly level soil has medium available moisture capacity and moderately rapid permeability. It is somewhat excessively drained and droughty, but frequent flooding is likely.

The soil in this unit is well suited to pasture plants and hay. Row crops and small grain grow moderately well when rainfall is adequate. Entire crops are often lost, however, when damaging floods occur. This soil is also suited to trees and food and cover for wildlife.

Organic-matter content can be maintained and tilled improved by returning all crop residue to the soil. Under intensive management, an example of a suitable cropping system is 3 years of row crops followed by 1 year of small grain.

#### CAPABILITY UNIT IV<sub>e</sub>-2

This capability unit consists of the well drained or moderately well drained Lebanon and Hobson soils. Also in this unit is the red subsoil variant of the Viraton soils. These soils are deep. Except for the red subsoil variant, the soils in this unit have a slowly permeable fragipan. Available moisture capacity is medium or moderately low. As a result, these soils are commonly droughty, and the nearly level soils and some of the sloping soils are moderately eroded. Further erosion is likely if the soils are not protected.

The soils in this unit are suited to pasture and hay crops consisting of drought-tolerant grasses and legumes. They are also suited to plants that provide food and cover for wildlife and to the trees that are common in Dent County. Small grain grows moderately well. Because of droughtiness, row crops do not grow well on the Lebanon and Hobson soils. Row crops, however, are moderately well suited to the red subsoil variant of the Viraton soils.

Contour farming and terracing are required on the soils of this unit for controlling erosion and conserving moisture. Organic-matter content can be maintained and tilled improved by returning all crop residue to the soil. Grassed waterways are needed for disposal of excess water from runoff. Under intensive management, an

example of a suitable cropping system that helps to control erosion is 1 year of row crops followed by 1 year of small grain and 2 years of meadow. Continuous meadow, pasture, or trees are required if these soils are not terraced or farmed on the contour.

#### CAPABILITY UNIT IV<sub>e</sub>-3

In this unit are nearly level to sloping Lebanon, Nixa, Clarksville, and Viraton soils. These soils have a slowly permeable, cherty fragipan. They are moderately well drained to somewhat excessively drained. Because many fragments of chert occur throughout the profile and a cherty fragipan is near the surface, the available moisture capacity is moderately low to low. The chert in the surface layer also interferes with tillage. Use for row crops is greatly limited, because these soils are droughty, high in chert content, and subject to moderate erosion.

The soils in this unit are suited to hay or pasture plants, but use for small grain is limited. Row crops do not grow well, though trees and plants that provide food and cover for wildlife are well suited.

Diversion terraces are required above the nearly level soils to protect them from runoff water. Because the chert content is high, constructing diversion ditches and terraces is difficult in some places. Terracing and contour farming are helpful in controlling erosion and in conserving moisture. Returning all crop residue is a way of maintaining organic-matter content and of improving tilled soil. For disposing of excess runoff water, grassed waterways are needed. Under intensive management, an example of a suitable cropping system is 1 year of row crops followed by 1 year of small grain and 2 years of meadow crops. For protection against erosion, a permanent vegetative cover is needed if terracing or farming on the contour is not practical.

#### CAPABILITY UNIT IV<sub>s</sub>-4

Only Sandy alluvial land is in this capability unit. This nearly level land has low available moisture capacity and natural fertility. Drainage is excessive, but frequent flooding is likely. The soil material is strongly acid to very strongly acid.

This land is well suited to trees and to plants that provide food and cover for wildlife. It is moderately suited to small grain and meadow crops. Use of this land for row crops is limited because the soil is droughty, subject to flooding, and low in natural fertility.

Continuous small grain is suitable in the cropping system if all crop residue is left on the field and mixed into the soil, if proper amounts of lime and fertilizer are added, and if minimum tillage is practiced. Where small grain or meadow crops are grown, enough fertilizer needs to be added for satisfactory crop growth. Phosphate and potash are needed in large amounts. Lime also is required.

#### CAPABILITY UNIT IV<sub>s</sub>-6

This unit consists of the somewhat excessively drained Clarksville, Coulstone, and Elsay soils. These soils are on flood plains and on the rounded ridgetops in the highly dissected parts of the county. Available moisture capacity is medium to low. The Elsay soil occurs along the flood plains where frequent flooding is likely. Because

the surface layer has a high chert content, the soils in this unit are droughty and difficult to till.

The soils in this unit are not suited to row crops, though they are moderately well suited to meadow crops and small grain. The chert content of the surface layer makes it difficult to harvest the small grain and hay. Nevertheless, trees and plants that provide food and cover for wildlife grow well on these soils.

Where adequate fertilizer is added and minimum tillage is practiced, an example of a suitable cropping system is continuous small grain and a catch crop of legumes. Most fields need applications of lime and moderate to large amounts of phosphate and potash.

#### CAPABILITY UNIT VIe-2

In this capability unit are the moderately well drained and well drained Lebanon, Hobson, and Viraton soils. These soils are strongly sloping to moderately steep. Available moisture capacity is medium and moderately low. The upper 7 inches of the Lebanon and Hobson soils generally consists of a mixture of the original surface soil and part of the subsoil. Permeability is moderate in the upper layers of these soils, and it is slow in the fragipan of the Lebanon and Hobson soils.

Because most fields are eroded, the rate of water intake is reduced, runoff is increased, and the soil is susceptible to further erosion. These soils are droughty.

Row crops are not suited to the soils in this unit, but trees, pasture plants, and plants that provide food and cover for wildlife are suited. Nearly all of these soils need lime unless it has been added recently. Also needed are moderate to large amounts of phosphate and potash.

#### CAPABILITY UNIT VIe-3

In this capability unit are the somewhat excessively drained and moderately well drained Nixa, Clarksville, and Viraton soils. These soils are on uplands and are sloping to strongly sloping. The Nixa and Viraton soils have a slowly permeable fragipan. Because many fragments of chert occur throughout the profile, available moisture capacity is low or moderately low in all the soils in this unit. The chert makes tillage difficult.

These soils are suited to trees, pasture plants, and plants that provide food and cover for wildlife. Growth of plants is limited greatly by the large amounts of chert. Fertilizer and lime should be applied on pasture. Nearly all of these soils need lime, and generally they need moderate to large amounts of phosphate and potash.

#### CAPABILITY UNIT VIe-6

This unit consists of deep Clarksville and Coulstone soils that have a very cherty subsoil. Drainage is somewhat excessive, and permeability is moderate to rapid. Available moisture capacity is low.

These soils are so cherty, droughty, and steep that cultivation is impractical, but they are well suited to meadow crops and the kinds of trees common in the county. They are also suited to plants that provide food and cover for wildlife.

If pasture is established on these soils, applications of lime and fertilizer are needed. Moderate to large amounts of phosphate and potash are generally needed unless these amendments have been applied recently.

#### CAPABILITY UNIT VIIe-3

This unit consists of somewhat excessively drained and moderately well drained Nixa, Clarksville, and Viraton soils. These soils are on uplands and are sloping to moderately steep. The fragipan in the Nixa and Viraton soils have slow permeability. These soils have low available moisture capacity because many fragments of chert are scattered throughout the profile, and a cherty layer or fragipan, is near the surface. The chert in these soils makes them difficult to till.

Crop growth is greatly limited because of chert, droughtiness, and the hazard of erosion. These soils are suited to trees, pasture plants, and plants that provide food and cover for wildlife. If pasture plants are grown, fertilizer and lime should be added. Moderate to large amounts of phosphate and potash are needed in most areas. Nearly all of the soils need lime at frequent intervals.

#### CAPABILITY UNIT VIIe-6

In this unit are the deep Baxter, Coulstone, and Clarksville soils. Also in this unit is Rock land. The soils in this unit have moderate and moderately rapid permeability. Available moisture capacity is low, and drainage is good to somewhat excessive. The subsoil of the Clarksville and Coulstone soils is very cherty.

Because these soils are so cherty and droughty, cultivated crops are not suited. Also, some soils in this unit are too steep for pasture to be maintained.

These soils are well suited to the trees that are common in Dent County and to plants that provide food and cover for wildlife. If a pasture mixture is to be sown, drought-tolerant plants, such as tall fescue, should be used and lime and fertilizer should be added. For maintaining good stands, nearly all the soils need lime, phosphate, and potash. Supplemental additions of nitrogen are also helpful.

#### CAPABILITY UNIT VIIIe-4

Only Riverwash is in this capability unit. Riverwash consists of large stones, cherty gravel, or sand. These soil materials occupy the flood plain along streams and rivers. In some areas these materials are well graded, but in others they are mixed.

Riverwash is valuable mainly as a source of sand and gravel. It has limited value for overnight campsites, picnic areas, fishing grounds, and other recreational sites.

## Predicted Yields

Table 2 gives the predicted yields per acre of the principal crops and hay for pasture plants grown on the soils of Dent County that are generally cultivated. The yields are for nonirrigated soils under two levels of management. Some soils in the county are too steep, cherty, or stony for cultivation and are not included in table 2.

The yields given are based on information obtained through interviews with farmers in the county. They were estimated by representatives of the Extension Service, Soil Conservation Service, and others familiar with farming in Dent County.

Yields in columns A are those to be expected under ordinary management. In this kind of management only

small amounts of lime and fertilizer are added, ordinary cropping systems are used, and only a few practices are followed to control erosion.

Yields in columns B are those to be expected under a high level of management. In this kind of management, farmers use adequate amounts of lime and fertilizer. Suitable cropping systems are provided, and maximum amounts of crop residue are applied. Methods of controlling erosion are complete and effective. Practices for

controlling weeds, disease, and insects are effective and timely.

Predicted yields shown in table 2 are based on estimates of the averages on nonirrigated soils over long periods. They reflect the combined effects of slope, erosion, weather, and levels of management. Because damage to crops is normally slight, the hazard of flooding is not taken into account, even though some soils on bottom lands are flooded at infrequent intervals.

TABLE 2.—Predicted average acre yields of principal crops under two levels of management

[Absence of yield indicates soil is not suited to the crop]

Soil	Corn		Barley		Sorghum (grain)		Tall fescue hay		Alfalfa and orchard grass hay		Lespedeza and fescue hay		Fescue-Ladino clover pasture		Lespedeza-fescue pasture		Tall fescue pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Ashton silt loam, 0 to 2 percent slopes	Bu. 55	Bu. 85	Bu. 30	Bu. 45	Bu. 40	Bu. 62	Tons 1.55	Tons 2.5	Tons 2.25	Tons 4.0	Tons 1.5	Tons 2.75	Cow-acre-days <sup>1</sup> 100	Cow-acre-days <sup>1</sup> 180	Cow-acre-days <sup>1</sup> 90	Cow-acre-days <sup>1</sup> 160	Cow-acre-days <sup>1</sup> 90	Cow-acre-days <sup>1</sup> 150
Ashton silt loam, 2 to 5 percent slopes	50	75	30	45	35	60	1.5	2.5	2.25	4.0	1.5	2.75	100	180	90	160	90	150
Ashton silt loam, 5 to 9 percent slopes	40	65	25	40	30	55	1.25	2.25	2.0	3.5	1.25	2.5	90	150	75	145	75	135
Atkins loam	45	60	20	35	35	60	1.0	2.0			1.5	2.75	62	75	70	140	60	120
Bado silt loam, 2 to 5 percent slopes	25	40	15	25	35	40	1.0	2.0			1.5	2.75	62	130	80	150	50	110
Clarksville cherty silt loam, 2 to 9 percent slopes															55	120		
Clarksville cherty silt loam, 9 to 14 percent slopes															65	120		
Coulstone and Clarksville cherty soils, 2 to 9 percent slopes															65	120		
Coulstone and Clarksville cherty soils, 9 to 14 percent slopes															65	120		
Elkins silt loam	55	75			37	60	1.25	2.5	1.75	2.25	1.5	2.75	80	150	90	165	75	150
Elsah cherty loam	25	45	25	35	37	50	1.25	2.5	2.25	3.0	1.5	2.75	120	167	87	165	70	140
Elsah very cherty loam							.75	1.5			1.0	2.0			60	120	40	90
Gladden loam	47	70	30	45	37	59	1.25	2.5	2.25	3.0	1.5	2.75	120	167	87	190	80	147
Lebanon cherty silt loam, 2 to 9 percent slopes							.75	1.0			.75	1.25	40	70	60	87		
Lebanon silt loam, 2 to 5 percent slopes			20	35	35	55	1.0	2.0		1.75	1.0	2.0			60	120		
Lebanon silt loam, 5 to 9 percent slopes			20	30			1.0	1.75		1.75	1.0	2.0			60	120		
Lebanon and Hobson silt loams, 2 to 5 percent slopes			20	35	35	55	1.0	2.0		2.0	1.0	2.0			62	125		
Lebanon and Hobson silt loams, 2 to 5 percent slopes, eroded			20	30	30	50	1.0	2.0		1.75	1.0	2.0			50	115		
Lebanon and Hobson silt loams, 5 to 9 percent slopes			20	30	30	50	1.0	1.75		2.0	1.0	2.0			50	120		
Lebanon and Hobson silt loams, 5 to 9 percent slopes, eroded			20	30	30	50	.75	2.0		1.75	1.0	2.0			50	110		
Lebanon and Hobson silt loams, 9 to 14 percent slopes			20	30	30	50	1.0	1.75		2.0	1.0	2.0			50	115		
Lebanon and Hobson silt loams, 9 to 14 percent slopes, eroded							.75	1.75		1.75	.75	1.75			50	115		
Moniteau silt loam, 0 to 2 percent slopes	35	50	15	25	35	50	1.0	2.0			1.5	2.75	62	130	80	150	50	110
Moniteau silt loam, 2 to 5 percent slopes	25	40	15	25	35	40	1.0	2.0			1.5	2.75	62	130	80	150	50	110
Nixa-Clarksville cherty loams, 2 to 5 percent slopes			12	20			.75	1.0			.75	1.25			45	75	45	75
Nixa-Clarksville cherty loams, 5 to 9 percent slopes			12	20			.75	1.0			.75	1.25			45	75	45	75

See footnote at end of table.

TABLE 2.—Predicted average acre yields of principal crops under two levels of management—Continued

Soil	Corn		Barley		Sorghum (grain)		Tall fescue hay		Alfalfa and orchard grass hay		Lespedeza and fescue hay		Fescue-Ladino clover pasture		Lespedeza-fescue pasture		Tall fescue pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.	Tons	Tons	Tons	Tons	Tons	Tons	Cow-acre-days <sup>1</sup>	Cow-acre-days <sup>1</sup>	Cow-acre-days <sup>1</sup>	Cow-acre-days <sup>1</sup>	Cow-acre-days <sup>1</sup>	Cow-acre-days <sup>1</sup>
Nixa-Clarksville cherty loams, 9 to 14 percent slopes.....															40	70		
Nixa-Clarksville cherty loams, 14 to 19 percent slopes.....															40	70		
Pope sandy loam.....	40	55	30	50	35	55	1.0	2.0	2.0	3.0	1.5	2.5	87	142	87	140	60	122
Razort cherty loam, 1 to 3 percent slopes.....	20	40	20	35	35	55	.75	1.25		1.75	1.0	2.0	65	120	55	115	42	75
Razort loam, 1 to 3 percent slopes.....	40	70	35	60	37	59	1.25	2.5	2.25	3.0	1.5	2.75	80	167	87	160	75	147
Sandy alluvial land.....	20	35	15	25	16	24	.75	1.6	1.75	2.25	1.0	2.0			60	110		
Sharon silt loam.....	55	85	30	45	40	62	1.5	3.0	2.25	4.0	1.75	3.00	110	180	100	170	85	170
Viraton cherty silt loam, 5 to 9 percent slopes.....			12	20			.75	1.0			.75	1.25			50	87	40	60
Viraton cherty silt loam, 5 to 9 percent slopes, eroded.....															40	70	40	60
Viraton cherty silt loam, 9 to 14 percent slopes.....															40	70	40	60
Viraton cherty silt loam, 14 to 19 percent slopes.....															40	70	40	60
Viraton silt loam, red subsoil variant, 3 to 9 percent slopes.....	25	40	20	30	30	50	.75	1.25		1.75	1.0	2.0			50	115	45	75
Viraton silt loam, red subsoil variant, 9 to 16 percent slopes.....															40	100		
Westerville silt loam.....	55	75	25	35	37	60	1.25	2.5			1.5	2.75	100	170	85	160	75	147

<sup>1</sup> Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days.

**Use of Soils for Wood Crops <sup>2</sup>**

The wood industry is of major importance in Dent County. Throughout the county there are 21 wood-using plants (4). Lumber, flooring, crossties, charcoal, posts, poles, and pallets are the main products.

Dent County was originally covered with forest. Apparently, the forest in the northern two-thirds of the county consisted mainly of upland oaks mixed with a few scattered pines, and the southern one-third was of the shortleaf pine-oak forest type (7). From 1880 to 1920, all of the valuable, accessible timber was cut and removed.

According to the U.S. Forest Service, in 1959 about 326,000 acres, or 67 percent of the county, remained in trees. The farmers owned most of this forest, and National forests occupied the next largest acreage. In 1959 the total acreage of land in forest was classed by ownership in Dent County as follows (12):

Ownership class:	Acres
National.....	64, 800
State, county, and municipal.....	14, 700
Farmer.....	181, 300
Forest industry and miscellaneous private.....	62, 200

<sup>2</sup> ROBERT E. HARTUNG, woodland conservationist, Soil Conservation Service, assisted with this section.

**Forest types**

The major forest type in Dent County is the black-scarlet oak type. It occupies approximately 190,000 acres, or more than half of the forest in the county. Other forest types are the post-blackjack oak type covering 46,500 acres, the oak-pine type covering 30,300 acres, the white oak type covering 27,600 acres, and the pine type covering 12,800 acres. Many of the wooded areas support stands that range from poor to medium in quality.

In growing stock and sawtimber, black oak is the dominant species in the county. Following in order of decreasing dominance are white oak, shortleaf pine, scarlet oak, and other hardwoods.

Shortleaf pine, the only pine native to Dent County, was a highly desirable tree when the logging industry was at its peak, and it remains highly desirable. Many areas in Dent County have been successfully planted and seeded to shortleaf pine.

**Woodland suitability groups <sup>3</sup>**

Management of woodland can be planned more effectively if soils are grouped according to those character-

<sup>3</sup> A field party consisting of soil scientists and a woodland conservationist obtained and analyzed the data on which this subsection is based. The U.S. Forest Service Central States Forest Experiment Station contributed some data from field plots of several kinds of soil.

istics that affect the growth of trees and the management of the stands. The soils of Dent County have been placed in eight woodland groups. Each group consists of soils that generally are suited to the same kinds of trees, that need similar management, and that have about the same potential productivity. The factors considered in placing each soil in a woodland group include potential productivity, which is expressed as site index and in board feet; species to be preferred for planting; and soil-related hazards and limitations to be considered in management.

The eight woodland suitability groups in Dent County are described in this subsection, and additional information about species of trees on the soils in each group is given in table 3. This table lists potential productivity of the soils in each group and rates hazards and limitations that affect management. Common species of trees that grow on the soils are classed as most desirable, acceptable, and least desirable. Also listed are species suitable for planting. Some of the terms used in table 3 and in the descriptions of the woodland suitability groups require explanation.

Figure 7 shows how the three kinds of aspects—*neutral*, *north* and *east*, and *south* and *west*—can be determined by the azimuth of the direction the slope faces. The azimuth is the number of degrees in an arc measured from north clockwise to the direction the slope faces. Aspect has much to do with the growth and adaptability of trees.

Aspect is *neutral* for all slopes that have an azimuth of 120° to 150° and 300° to 330°, for all slopes of less than 14 percent, and for all ridgetops. The north and east aspect applies to slopes of 14 percent or more that have an azimuth

of 0 to 120° and 330° to 360°. The south and west aspect applies to all slopes of 14 percent or more that have an azimuth of 150° to 300°.

The potential productivity of a soil for a kind of tree is expressed as the *site index* and as average annual growth per acre. Site index is the average height of the dominant and codominant trees in a stand at 50 years of age. The site index in table 3 was estimated after measuring the height of trees in a number of plots. The average annual growth per acre is given in board feet for an unmanaged, well-stocked acre of trees. Timber stands as much as 80 years of age were used for the estimates.

Some of the limitations shown in table 3 are expressed in the relative terms of *slight*, *moderate*, or *severe*. Such terms express the degree of limitation, as explained in the following paragraphs.

Erosion hazard is rated according to the risk of erosion on woodland where normal practices are used in managing and harvesting trees. It is *slight* if erosion control is not an important concern. The hazard is *moderate* if some attention must be given to check soil losses.

Seedling mortality refers to the expected degree of mortality of naturally occurring or planted seedlings, as influenced by soil texture, depth, drainage, flooding, height of the water table, and degree of erosion. Plant competition is assumed not to be a limiting factor. Mortality is *slight* if the expected loss is less than 25 percent; *moderate* if losses are between 25 to 50 percent; and *severe*, if losses are more than 50 percent.

Plant competition refers to the invasion of growth of unwanted trees, shrubs, vines, or other plants when openings are made in the canopy. Competition is *slight* if it does not hinder the establishment of a desirable stand, and it is *moderate* if competing plants delay the establishment of a desirable stand.

The ratings for equipment limitations are based on the degree that soils and topographic features restrict or prohibit the use of equipment normally employed in tending a crop of trees. The limitation is *slight* if there is little or no restriction on the type of equipment that can be used or the time of year that equipment can be used. It is *moderate* if the use of equipment is seasonally limited, or if modified equipment or methods of harvesting are needed. The limitation is *severe* if special equipment is needed or if the use of such equipment is severely restricted by one or more unfavorable soil characteristics. These unfavorable soil characteristics include drainage, slope, number or size of stones, or soil texture.

Windthrow hazard indicates the relative danger of trees being blown over by high winds that normally occur, excluding tornadoes. The hazard is *slight* if windthrow is no special concern, and it is *moderate* if roots hold the trees firmly, except when the soil is excessively wet, or when the wind is strongest.

**WOODLAND SUITABILITY GROUP 1**

Soils of this group are on uplands in the highly dissected parts of the county. They are in the Clarksville, Baxter, Coulstone, and Viraton series. The Clarksville soils are on ridges and side slopes, the Baxter soils are on the slopes below the Clarksville soils, and the Viraton soils are on foot slopes below the Clarksville soils.

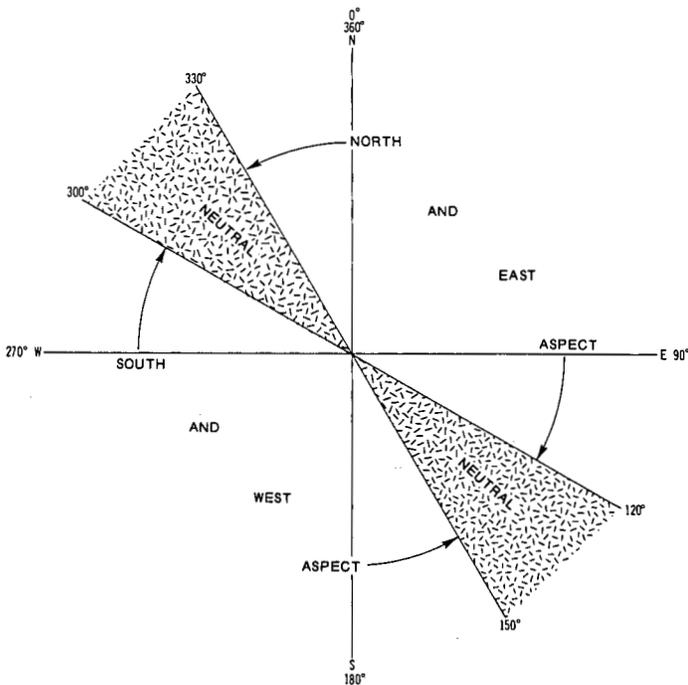


Figure 7.—Aspect for slopes of 14 percent or more. For slopes of less than 14 percent, aspect is considered neutral.

TABLE 3.—Woodland suitability groups of soils and their potential productivity,

Group No. and map symbol	Aspect	Potential soil productivity			Erosion hazard	Seedling mortality	Plant competition
		Species	Site indexes <sup>1</sup>	Approximate average annual growth per acre <sup>2</sup>			
Group 1: (CcC, CcD, CcF, CcG, CfF, CfG, CkC, CkD, CkF, CkG, VcC, VcC2, VcD, VcE, VrC, VrD).	South and west.	Oak----- Shortleaf pine.	48-58 (15) 51-57 (9)	<i>Board feet</i> 150 325	Slight-----	Moderate---	Slight-----
	Neutral----	Oak----- Shortleaf pine.	54-64 (31) 50-58 (9)	190 325	Slight-----	Slight-----	Slight-----
	North and east.	Oak----- Shortleaf pine.	58-70 (38) 52-66 (5)	225 390	Slight-----	Slight-----	Slight-----
Group 2: (LbB, LbC, LcB, LhB, LhB2, LhC, LhC2, LhD, LhD2, NcB, NcC, NcD, NcE).	-----	Oak----- Shortleaf pine.	51-59 (30) 50-60 (13)	160 337	Slight to moderate.	Slight-----	Slight-----
Group 3: (Rk).	-----	Oak----- Shortleaf pine.	30-60 30-60	-----	Slight-----	Slight to severe.	Slight to moderate.
Group 4: (BaB, MoA, MoB)	-----	Oak-----	48 (1)	-----	Slight-----	Slight-----	Slight-----
Group 5: (Et, Ev, RcB, Sa).	-----	( <sup>4</sup> )-----	-----	-----	Slight-----	Slight-----	Slight-----
Group 6: (AsA, AsB, AsC, Gd, Po, RaB, Sh).	-----	( <sup>4</sup> )-----	-----	-----	Slight-----	Slight-----	Moderate---
Group 7: (At, Ek, We).	-----	( <sup>4</sup> )-----	-----	-----	Slight-----	Slight-----	Moderate---
Group 8: (Rh).	-----	( <sup>4</sup> )-----	-----	-----	Not rated--	Not rated---	Not rated--

<sup>1</sup> Number in parentheses is the number of plots on which trees were measured.

<sup>2</sup> Average annual growth per acre in board feet (International 1/8-inch rule) in a well-stocked, unmanaged stand at 80 years of age (8, 18)

These soils generally have a cherty surface layer and subsurface layer, but the Viraton soils, red subsoil variant, are fairly free of chert to a depth of 18 to 37 inches. Except for the Viraton soils that have a fragipan, the soils in this group are deep and well drained to somewhat excessively drained. The Viraton soils that have a fragipan are moderately well drained and moderately deep to the pan.

Because available water capacity is low for the soils in this group, seedling mortality is moderate on the south and west aspect. After an excessively dry year, some replanting or reseedling may be needed.

Normally, it is fairly easy to convert cull hardwoods to

pine on the neutral or south and west aspect (fig. 8). In this conversion adequate sources of seed must be available, or it is necessary to seed or plant the pines. On the north and east aspect, much more care is needed in converting hardwood stands to pine. Maintaining stands of pine on these soils is impractical in most areas.

#### WOODLAND SUITABILITY GROUP 2

This group consists of gently sloping soils on uplands and small terraces. These soils are in the Lebanon, Hobson, Nixa, and Clarksville series. All of them except the Clarksville soil have a fragipan. The soils in this group are somewhat excessively drained or moderately well

*hazards and limitations, common trees, and trees suitable for planting*

Equipment limitation	Windthrow hazard	Common trees			Suitable for planting
		Most desirable	Acceptable	Least desirable	
Moderate or severe: Moderate where slopes are 15 percent; severe where slopes are more than 30 percent.	Slight-----	Shortleaf pine, black oak, and white oak.	Scarlet oak and post oak.	Hickory and black-jack oak.	Shortleaf pine.
Moderate or severe: Moderate where slopes are 15 percent; severe where slopes are more than 30 percent.	Slight-----	Shortleaf pine, black oak, and white oak.	Scarlet oak and post oak.	Hickory and black-jack oak.	Shortleaf pine.
Moderate or severe: Moderate where slopes are 15 percent; severe where slopes are more than 30 percent.	Slight-----	Black oak, scarlet oak, and shortleaf pine.	Red oak and post oak.	Hickory, black gum, blackjack oak, and maples.	Shortleaf pine.
Slight to moderate-----	Slight to moderate.	Shortleaf pine, black oak, and white oak.	Scarlet oak, red oak, and post oak.	Hickory and black-jack oak.	Shortleaf pine.
Moderate to severe-----	Slight-----	Shortleaf pine, black oak, white oak, and scarlet oak.	Red oak, post oak, and eastern redcedar.	Hickory, blackjack oak, and chinkapin oak.	Shortleaf pine. <sup>3</sup>
Moderate-----	Slight to moderate.	Post oak and black oak.	Hickory-----	Blackjack oak-----	None.
Slight-----	Slight-----				Shortleaf pine, walnut, <sup>3</sup> and sycamore. <sup>3</sup>
Moderate-----	Slight-----				Walnut and sycamore.
Moderate-----	Slight-----				Walnut <sup>3</sup> and sycamore. <sup>3</sup>
Not rated-----	Not rated-----				None.

<sup>3</sup> Planting has limitations; see description of woodland suitability group.

<sup>4</sup> Stands suitable for measurement were not available.

drained. Permeability is moderate and moderately rapid in the upper horizons, but it is slow in the fragipan. Available water capacity is low.

Equipment limitation on these soils is slight to moderate. In spring when these soils are saturated, logging operations are restricted.

The hazards of erosion and windthrow are slight to moderate. Some windthrow can be expected in normally occurring stands under average management. Where logging is done, roads and skid trails should be on the level or nearly level areas.

Where cull hardwood stands grow on these soils, they

generally can be readily converted to pine. Natural seeding or direct seeding and planting are successful.

#### WOODLAND SUITABILITY GROUP 3

Rock land is the only mapping unit in this group. It consists of areas where ledges, boulder-sized float rock, and outcrops of bedrock cover 25 percent or more of the surface. Most of these areas have steep, south-facing slopes along the larger streams, but a few areas along secondary tributaries have other aspects.

Both upland hardwoods and shortleaf pine grow on this land. Eastern redcedar and chinkapin oak grow on



**Figure 8.—Top:** Hardwood stands on the Clarksville soils. **Bottom:** Use of underplanting and aerial spraying has converted the area on the left from a poor stand of hardwoods to a stand of shortleaf pine.

the steep, gladelike areas. Shortleaf pine is the preferred species on the better sites, and eastern redcedar is preferred on other sites. Planting or seeding of pine is successful only on the better sites.

Because float rock, ledges, and rock outcrops are excessive, equipment limitation is moderate to severe.

Seedling mortality is slight to severe because of varia-

tions in thickness of soil material. Plant competition is slight to moderate. Rock land is normally droughty, and its available water capacity is low.

#### WOODLAND SUITABILITY GROUP 4

This group consists of level and nearly level soils on broad ridges or terraces. These soils are in the Bado and Moniteau series. They have a compact clayey subsoil that is slowly permeable. These soils are seasonally wet and have poor drainage. The clayey subsoil of the Bado soil is underlain by a compact fragipan.

Few areas of the soils of this group remain in trees. The remaining areas, locally known as post oak flats, consist of blackjack oak, post oak, black oak, and hickory.

Equipment limitations are moderate. Use of logging equipment on the soils in this group is restricted because the soils are wet for several months in each year. The windthrow hazard is slight to moderate, and trees are likely to be uprooted when the soils are saturated.

#### WOODLAND SUITABILITY GROUP 5

The soils of this group occupy first bottoms or low terraces and are occasionally flooded. They are Elsayh and Razort soils and Sandy alluvial land. They are excessively drained to well drained. Permeability is moderate to rapid, and available water capacity is medium to low.

The existing stands on the soils in this group are mostly of the upland oak-hickory forest type, but some stands of shortleaf pine are included. Sycamore and walnut grow in a few low spots or in areas adjoining intermittent streams. Shortleaf pine can be planted on the soils in this group. Walnut and sycamore are suitable for planting in areas adjoining intermittent streams.

Average site indexes have not been determined, but the potential productivity is similar to that given in table 3 for the neutral and north and east aspects of woodland suitability group 1.

#### WOODLAND SUITABILITY GROUP 6

This group consists of soils on first bottoms and terraces. These soils are in the Ashton, Gladden, Pope, Razort, and Sharon series. Except for the Pope soils, these soils are well drained. The Pope soils are somewhat excessively drained. The soils of this group have moderate to moderately rapid permeability and high to medium available moisture capacity. The Gladden and Razort soils are underlain by cherty gravel at a depth of about 30 inches. The other soils in this group are deeper to underlying material.

Although most of the acreage of these soils has been cleared, stands of elm, sycamore, walnut, honey locust, ash, birch, and cherry grow in varying combinations. Walnut and sycamore are suitable for planting.

Because grass and brush grow rapidly, they give moderate competition to plantings and natural regeneration. Limitations to the use of heavy equipment are moderate.

Average site indexes have not been estimated, but the potential productivity of these soils is good for selected trees.

#### WOODLAND SUITABILITY GROUP 7

This group consists of deep, somewhat poorly drained or poorly drained soils in slightly depressional areas on bottom lands. These soils have a seasonal high water

table and are subject to occasional flooding. Available moisture capacity is high, and permeability is moderate to slow. These soils are in the Atkins, Elkins, and Westerville series.

Dominant in the existing stands are elm, sycamore, honeylocust, ash, and walnut. The walnut grows on high mounds. Sycamore and walnut are suitable for planting in high areas.

Grass and brush give moderate competition to desirable trees. The soils are wet several months in the year, and equipment limitation is also moderate. Site indexes have not been estimated, though potential productivity for selected trees is good.

#### WOODLAND SUITABILITY GROUP 8

Riverwash, the only mapping unit in this group, consists of large stones, cherty gravel, or sand. It is on flood plains adjacent to rivers and other streams.

Trees do not grow in fully stocked stands on Riverwash. They are in small clumps where silt and gravel have accumulated. Sycamore and river birch grow closest to the streams. Planting of trees is impractical.

### Use of Soils for Wildlife<sup>4</sup>

In this subsection, the wildlife of Dent County is discussed and elements of wildlife habitat are described. Wildlife suitability groups of soils are discussed according to their suitability for establishing and maintaining elements of wildlife habitat and for supporting the four broad classes of wildlife. Also in this subsection is a discussion of general management suitable for the four classes of wildlife.

Assistance in developing wildlife habitat can be obtained from the Missouri Department of Conservation, the Dent County Extension Center, or the Soil Conservation Service.

Dent County originally was inhabited by many kinds of wildlife, but many of the species disappeared soon after early settlement. There were small numbers of bison, black bear, bobcat, gray fox, and mourning dove. Rabbits and quail were not abundant and were confined to semiopen, nearly level ridgetops. Wild turkeys were found in moderate numbers on upland ridgetops in summer and along streams in winter. Ruffed grouse, or wood pheasant, were present in fair numbers. The number of passenger pigeons was large when a colony of these birds stopped in the county for nesting. Large numbers of deer roamed in the bottom lands and in a few semiopen areas, the same areas where the number of cougars was appreciable. Squirrels, particularly gray squirrels, were abundant. Raccoon, muskrat, beaver, and other furbearers were common along the major drainageways.

Smallmouthed bass were plentiful in the streams, and there were some small sunfish. Both resident and migratory songbirds were abundant, but robins and bluebirds were scarce until after the early settlements were built.

Many species of wildlife became scarce or were driven away soon after the early settlements were established. Other species temporarily increased, mainly because

many small openings were made in the forest for gardens and crops. In these openings the upper few inches of soil contained an abundant supply of organic matter. Cultivation was crude, however, and most of the large stumps were left to rot. Wild, natural legumes and annual plants grew in abundance and provided more than enough food for some kinds of wildlife. The population of quail, turkey, dove, rabbit, fox squirrel, and similar species increased.

Small numbers of rabbit, red and gray foxes, and mourning dove now live in Dent County. The population of quail is moderate to large in the open and semiopen fields and varies with the severity of the season. Wild turkeys are still present in moderate numbers because of public and private efforts to provide suitable habitat and protection. Deer are in fair amounts, and gray squirrels are common. The populations of most furbearers are small. Many of the streams contain large numbers of smallmouthed bass and small sunfish. The stream in Montauk State Park has been improved through put-and-take stocking, and fishing for rainbow trout is good. Many farm ponds have been stocked with largemouthed bass and bluegill. Both migratory and resident songbirds are still abundant.

#### *Elements of wildlife habitat and classes of wildlife*

In this subsection groups of soils are rated according to their suitability for elements of wildlife habitat and according to their suitability for openland wildlife, woodland wildlife, wetland wildlife, and pond fish. These groups of soils are called wildlife suitability groups and are described in this subsection. Explanations are needed for elements of wildlife habitat and for classes of wildlife.

The following defines eight elements of wildlife habitat and gives examples of each.

*Grain crops* are annual plants that provide good food and cover for wildlife and that are grown in a way similar to that used for harvested grain or seed crops. Some examples are corn, small grain, and sorghums.

*Legumes and grasses* are native or herbaceous legumes and grasses that furnish food and cover for wildlife. Examples are common forage grasses and legumes grown locally, bluestems, panicgrass, mannagrass, and reed canarygrass.

*Upland hardwoods* are hardwood trees and shrubs, especially those that provide fruits, mast, or browse. These trees and shrubs commonly grow naturally in the county or are planted on well-drained sites. Some examples are oak, hickory, sugar maple, cherry, and dogwood.

*Lowland hardwoods* are hardwood trees and shrubs, especially those that produce fruits, mast, or browse. These trees and shrubs are planted on moist and poorly drained sites. Examples are walnut, high-bush blueberry, pin oak, hackberry, pawpaw, and deciduous holly.

*Upland conifers* include shortleaf pine, redcedar, and other conifers that grow naturally or that are planted on well-drained to excessively drained soils.

*Wetland food plants* are native herbaceous plants that grow on damp to wet soils, in ponds, and along the

<sup>4</sup>HAROLD V. TERRILL, Missouri Conservation Commission, assisted in preparing this subsection.

edges of water. Some examples are smartweeds, pondweeds, burreeds, arrowheads, spikesedges, and cattails.

*Shallow water developments* are impoundments, pot-holes, level ditches, and other shallow water structures.

*Fishponds* are dug-out or impounded structures that have enough water of good quality and of suitable depth for the production of fish.

The following defines and gives examples of the four classes of wildlife.

*Openland wildlife* consists of birds and mammals that commonly make their homes in crop fields, in meadows and pastures, in nonforested and overgrown fields, or along the borders of such areas. Among the openland wildlife in Dent County are quail, cottontail rabbit, red fox, mourning dove, and field sparrow.

*Woodland wildlife* consists of birds and mammals that commonly frequent wooded areas and the edges of woods. Some examples are fox squirrel, gray squirrel, gray fox, turkey, deer, ruffed grouse, raccoon, opossum, woodcock, and woodpecker.

*Wetland wildlife* consists of birds and mammals that commonly make their homes in marshes and swamps. Examples are beaver, muskrat, mink, raccoon, duck, and jacksnipe.

*Pond fish* include the kinds of fish commonly stocked in small ponds. Some examples are largemouth bass and bluegill sunfish.

### **Wildlife suitability groups**

The soils in the county have been placed in 10 wildlife suitability groups according to similarity in characteristics that determine suitability as habitat for wildlife. These groups of soils are rated according to their suitability for elements of wildlife habitat and for the four classes of wildlife. The soil series represented in each of these groups are named, but this does not mean that all the soils in the series are in the group. To determine the soils in each wildlife suitability group, refer to the "Guide to Mapping Units" at the back of this survey.

The ratings used in the descriptions of the wildlife suitability groups are well suited, suited, poorly suited, and not suited. A rating of *well suited* for a particular habitat element indicates that, under good management, the element can be established so that it provides optimum food and cover for the kind of wildlife to be favored. A rating of *well suited* does not mean that the group of soils is well suited to a crop or tree grown for harvesting. A rating of *suitied* indicates that the group of soils is suitable for establishing the habitat element, but that a higher degree of management is needed than for soils rated *well suited*. A rating of *poorly suited* means that the habitat element may be established under a high level of management. A rating of *not suited* means that establishing the habitat element on the group of soils is not practical.

The woodland suitability groups of soils are also rated according to their ability to support the four classes of wildlife. The rating for openland wildlife depends on the potential of the group of soils for producing grain

crops, legumes and grasses, upland or lowland hardwoods, and upland conifers. For woodland wildlife, the rating depends on the potential of the group of soils for growing legumes and grasses, upland or lowland hardwoods, and upland conifers. In rating wetland wildlife, consideration was given to the potential of the group of soils for the establishment and growth of grain crops or wetland food plants. Also, the suitability of the soils for establishing shallow water developments and fishponds was considered. Considered in rating a group of soils for producing pond fish were suitability for constructing ponds or dams and ability of the soils to provide nutrients for the production of plankton, aquatic insects, and other aquatic fish food.

#### **WILDLIFE SUITABILITY GROUP 1**

This group consists of deep soils that occupy first bottoms. These soils are in the Westerville and Elkins series. They have moderate to slow permeability and are somewhat poorly drained and poorly drained. The surface layer is silt loam, and the subsoil is slightly finer textured. Available moisture capacity is high. Slopes are not more than 1 percent.

If adequate amounts of fertilizer and lime are applied, these soils are suited to grain crops, grasses, wetland food plants, and most legumes. Deep-rooted legumes such as alfalfa do not grow well, because they are subject to damage by frost heaving in winter and early in spring when the soil is saturated. Under good management, these soils are suited to both lowland and upland hardwoods. They are not suited to upland conifers, however, and planting species such as shortleaf pine is not advisable.

The soils in this group are suitable for constructing fishponds and shallow water developments in those places where enough water is received from higher areas. These soils are also suited to openland, woodland, and wetland wildlife.

#### **WILDLIFE SUITABILITY GROUP 2**

The only soil in this group is Atkins loam. This poorly drained soil is on the flood plains, where slopes range from 0 to 1 percent. It is deep and moderately permeable to slowly permeable. Available moisture capacity is high.

If enough fertilizer and lime are added, Atkins loam is suited to grain crops, grasses, and wetland food plants. This soil is also suited to most legumes, especially deep-rooted ones such as alfalfa, but these plants are subject to damage by frost heaving early in spring when the soil is saturated. Lowland hardwoods grow well, but upland hardwoods and conifers do not. This soil is well suited as a site for constructing shallow water developments and fishponds in those places where enough water is received from higher areas.

Under good management, the soil in this group supports openland, woodland, and wetland wildlife.

#### **WILDLIFE SUITABILITY GROUP 3**

This group consists of deep soils on first and second bottoms. These soils are in the Ashton and Sharon series. They have a silt loam surface layer and a moderately permeable subsoil. Slopes range from 0 to 9 percent. The soils in this group are well drained and have high available moisture capacity.

If adequate amounts of fertilizer and lime are added, these soils are well suited to grain crops, legumes, and grasses. They are also well suited to upland and lowland hardwoods, but the Ashton soils are better suited to upland hardwoods and Sharon soils are better suited to lowland hardwoods. The soils in this group are poorly suited to upland conifers.

These soils store enough water to supply most plants except wetland food plants. Because most of the underlying material is highly porous, these soils generally are not suitable for constructing shallow water developments or fishponds. In some places on the sloping soils, terraces are needed to reduce soil losses.

The soils in this group are well suited to openland and woodland wildlife.

#### WILDLIFE SUITABILITY GROUP 4

The only soil in this group is Moniteau silt loam, 0 to 2 percent slopes. This deep soil occurs on uplands and terraces. It has a slowly permeable silty clay or clay subsoil. Drainage is poor, and available moisture capacity is medium.

If adequate amounts of lime and fertilizer are added, this soil is suited to most legumes and grasses and is well suited to grain crops. Deep-rooted crops such as alfalfa are subject to damage by frost heaving when the soil is saturated. Desirable kinds of upland and lowland hardwoods do not grow well. Upland conifers may grow satisfactorily under good management. These soils normally are suited to wetland food plants. Ponds and shallow water developments can be constructed where enough water is received from higher areas.

The soil in this group is suited to wetland wildlife and pond fish, but it is poorly suited to openland and woodland wildlife.

#### WILDLIFE SUITABILITY GROUP 5

This group consists of slightly droughty soils in which depth to sandy or cherty material is variable. These soils are in the Elsay, Gladden, Pope, and Razort series. They commonly occupy first bottoms and low terraces along the small streams of the county. Slopes range from 0 to 3 percent. Both the surface layer and subsurface layer are commonly loam, sandy loam, or cherty loam. These soils are well drained to somewhat excessively drained and are medium in available moisture capacity.

Where adequate amounts of fertilizer and lime are added, the soils in this group are well suited to grain crops, legumes, and grasses. They are also well suited to upland and lowland hardwoods but are poorly suited to upland conifers. Because they are droughty and porous, these soils normally are not suited to wetland food plants and are not suitable for constructing shallow water developments or fishponds.

The soils in this group are suited to woodland wildlife and are suited to well suited to openland wildlife.

#### WILDLIFE SUITABILITY GROUP 6

This group consists of soils on ridges, low slopes, and terraces. These soils are in the Lebanon, Hobson, Nixa, Clarksville, and Viraton series. Except for the Clarksville soil and the red subsoil variant of Viraton soil, the soils in this group have a fragipan. Slopes range from 2 to 9 percent. Drainage is somewhat excessive to moder-

ately good, and available moisture capacity is medium to low.

These soils are well suited to grain crops, legumes, and grasses if adequate amounts of fertilizer and lime are added. They are well suited to upland hardwoods and are suited to conifers. They are not suited to wetland food plants and lowland hardwoods. Because these soils are strongly sloping in places and are highly porous, they are not suitable for constructing shallow water developments. Careful investigation at proposed sites is necessary before a pond is constructed, for these soils have variable characteristics. Terraces may be needed on the sloping soils to reduce soil losses through erosion.

The soils in this group are suited to openland and woodland wildlife.

#### WILDLIFE SUITABILITY GROUP 7

This group consists of Lebanon, Hobson, Nixa, Clarksville, and Viraton soils on uplands. Slopes range from 5 to 19 percent. Except for the Clarksville and Viraton soils, red subsoil variant, the soils in this group have a fragipan. Permeability is moderate to slow except in the Clarksville soils, which have moderately rapid permeability. The soils in this group are moderately well drained to somewhat excessively drained. Available moisture capacity is medium to low.

These soils are so eroded, steep, and cherty that they are not suited to grain crops, lowland hardwoods, and wetland food plants. Also, they are not suitable for constructing shallow water developments. These soils are, however, suited to grasses and legumes and are well suited to upland hardwoods and conifers. They generally are poorly suited as pond sites because soil characteristics are so variable. A careful investigation of any site is required before a pond is constructed. Because these soils are susceptible to erosion, practices are needed to reduce the loss of soil.

The soils in this group are suited to openland and woodland wildlife.

#### WILDLIFE SUITABILITY GROUP 8

This group consists of soils that occur on uplands and terraces and have a clayey subsoil. These soils are in the Moniteau and Bado series. They have slow permeability and are poorly drained. The Bado soil has a dense fragipan. Slopes of the soils in this group range from 2 to 5 percent. Available moisture capacity is medium to low.

If enough fertilizer and lime are added, these soils are suited to grain crops, grasses, and some legumes. Where these crops are grown, however, practices of erosion control are needed. These soils are not suited to upland and lowland hardwoods, and they are poorly suited to upland conifers. Because these soils are sloping, they are poorly suited to wetland food plants and are not suitable for constructing shallow water developments. Sites for ponds, however, are good.

The soils in this group are suited to well suited to pond fish. They are poorly suited to openland and woodland wildlife.

#### WILDLIFE SUITABILITY GROUP 9

This group consists of Elsay very cherty loam and Sandy alluvial land, both of which are on first bottoms. Slopes range from 0 to 3 percent. These soils are exces-

sively drained and somewhat excessively drained. Available moisture capacity is low to moderate.

Because the soils in this group have low capacity for storing moisture, they are poorly suited to grain crops and most grasses. They are also poorly suited to upland and lowland hardwoods and to upland conifers. Because they have porous upper layers and underlying material, these soils are not suited to wetland food plants and are not suitable for constructing shallow water developments or fishponds. Deep-rooted legumes can be grown in many places if proper amounts of fertilizer are added.

The soils of this group are not well suited to any kinds of wildlife, but they can be used for openland or woodland wildlife if management is good.

#### WILDLIFE SUITABILITY GROUP 10

This group consists of cherty soils and Rock land that occur on narrow ridges and side slopes. The soils are in the Clarksville, Baxter, and Coulstone series. They have a very cherty loam or very cherty silt loam surface layer and a subsoil that is commonly very cherty loam or very cherty silt loam. Slopes range from 2 to more than 20 percent. Drainage is somewhat excessive, and available moisture capacity is low.

Because these soils are generally steep, and their surface layer contains an excessive amount of chert, they are poorly suited to grain crops, legumes, or grasses. Nevertheless, these plants can be grown in small less cherty and less steep areas. Upland hardwoods and conifers grow well, but these soils are so stony and droughty that lowland hardwoods and wetland food plants do not. Constructing shallow water developments is impractical. Ponds can be constructed at the sites that are carefully selected. If well managed, these ponds produce fish.

The soils in this group are suited to woodland wildlife.

#### **Management for openland, wetland, and woodland wildlife and for fish**

Discussed in the following paragraphs are management practices that improve wildlife habitat for openland, wetland, and woodland wildlife and for pond fish.

*Openland wildlife.*—Travel lanes for openland wildlife can be provided by planting hedgerows and by preserving the existing woody cover in fence rows. This kind of cover protects the animals when they travel to and from areas of food, resting places, and nests. All cleared fields should be 10 acres or less in size and should be bordered by woody fence rows or hedgerows. Where grain crops are not commonly grown, patches of grain or grasses and legumes should be planted to provide food for openland wildlife. Additions of fertilizer are needed. If shrubs are planted in clumps of 15 to 50 plants, nesting places for birds and winter cover are provided. The overgrazing of pastures should be avoided. Noxious weeds and unwanted woody plants can be controlled by spot spraying. Where mowing is necessary, it should be done only after July 15 so that nests and nesting birds are not disturbed. Water is provided by building ponds. Not all species of openland wildlife require drinking water, but ponds attract many kinds of wildlife.

*Wetland wildlife.*—Livestock should be excluded from ponds, lakes, and streams because wetland wildlife feed on, nest in, and receive protection from the aquatic plants that grow along the edges of wetlands. These aquatic plants provide important food, nesting cover, and winter cover. Shallow water areas 3½ to 5 feet deep can be created by building dams across waterways or by excavating soils that have a high water table. Where possible, controlling the water level is advisable. If an area is drained or flooded at the proper time, food plants can be grown for wetland wildlife. Unwanted weeds can be controlled by manipulating the water level.

*Woodland wildlife.*—Woodlands should be protected from wildfires and grazing so as to maintain a good habitat for woodland wildlife. Retaining mast-producing wolf trees is advisable because these trees are important sources of nuts and other food for many kinds of wildlife. Woodland wildlife is attracted by planting nut trees or by encouraging the growth of existing trees that produce food for wildlife. Habitat is improved in heavily timbered areas by making openings of 1 to 5 acres in size. If the cut timber is piled along the edge of the clearing, herbaceous plants and shrubs revegetate in the clearing. These clearings attract many kinds of wildlife. Ponds can be built for drinking water if it is not available. Nesting places for birds and mammals can be provided in hollow trunks and limbs by killing two or three unwanted trees per acres and leaving the dead trees standing. The edges of trails and roads should be seeded to legumes.

*Pond fish.*—The troublesome weeds that grow in shallow water can be avoided by constructing ponds so that only a small area of water is less than 3 feet deep. Deposits of silt in ponds can be kept to a minimum by controlling erosion on the watershed above the pond. Livestock should be excluded from ponds. Diverting barnyard drainage away from the pond is essential in preventing excessive fertility of the water. High fertility may cause a low supply of oxygen and a loss of fish. Technical advice on stocking rates and suitable species of fish can be obtained through your soil and water conservation district. In constructing ponds, care should be taken to provide a way to lower the water level because this helps to control overpopulation of fish and the fertility of the water. Harvesting is an essential part of management because it is essential when fish reach a usable size.

### Engineering Uses of Soils

This subsection describes the systems of engineering soil classification currently used and gives engineering test data for selected soil types in Dent County. Engineering properties of the soils in the county are estimated, and soil features that affect the use of soil in engineering structures and practices are listed.

The information in this survey can be used to—

1. Make studies of soil and land use that will aid in selecting and developing industrial, business, residential, and recreational sites.

2. Make preliminary estimates of the engineering properties of soils that will help in planning structures for drainage and irrigation, and for farm ponds, terraces and diversions, waterways, and other structures that help to conserve soil and water.
3. Make preliminary evaluations of the soil and ground conditions that will aid in selecting locations for highways and airports and in planning detailed investigations at the selected locations.
4. Locate probable sources of sand, gravel, and other construction materials.
5. Correlate performance of engineering structures with soil mapping units, and thus develop information that will be useful in designing and maintaining the structures.
6. Determine the suitability of the soils for supporting vehicles and construction equipment that move across them.
7. Supplement information obtained from other published maps and reports and from aerial photographs for the purpose of making maps and reports that will be more useful to engineers.
8. Make preliminary evaluation of the suitability of a particular area for construction purposes.

The engineering interpretations in this subsection can be useful for many purposes, but it should be emphasized that they will not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Even in these situations, however, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used by the soil scientists may not be familiar to the engineer, and some terms may have a special meaning in soil science. Several of these terms are defined in the Glossary at the back of this survey.

Most of the information in this subsection is in tables 4, 5, and 6, but additional information useful to engineers can be found in other sections of this soil survey, particularly "Descriptions of the Soils," and "Recreational Uses of Soils."

### **Engineering classification systems**

The soil scientists of the U.S. Department of Agriculture classify soils according to texture. In some ways this system of naming textural classes is comparable to the two systems used by engineers for classifying soils; that is, the system used by the American Association of State Highway Officials (AASHO) (1) and the Unified system (14).

Most highway engineers classify soil material in accordance with the classification developed by the American Association of State Highway Officials. In this system soil materials are classified in seven principal groups. The groups range from A-1, consisting of gravelly soils of high bearing capacity, to A-7, consisting of clayey soils that have low strength when wet. Under this system the soils of Dent County range from A-1 through A-7 (see

table 5). Within each group the relative engineering value of the soil material can be indicated by a group index number (see table 4). Group index numbers range from 0 for the best material to 20 for the poorest.

Some engineers prefer to use the Unified soil classification system (14). In the Unified system, soil materials are identified as coarse grained, eight classes; fine grained, six classes; and highly organic. Within these classes two letters, for example, ML, are used to indicate the kind of soil material and to designate each soil group. The letters used to indicate kinds of soil material are G, S, M, and C, which stand for gravel, sand, nonplastic fines, and plastic fines, respectively. The letter O is used to indicate silt or clay that has a high content of organic matter.

The letters W, P, L, and H, stand for well graded, poorly graded, low liquid limit, and high liquid limit, respectively. Where the symbols of two soil separates are given, for example SM for sand and nonplastic fines, the first letter indicates the dominant soil separate. Soils on the borderline between two classifications are given a joint classification, for example GP-GM.

### **Engineering test data**

Engineering test data are given in table 4 for five soil series in Dent County. Samples were taken, by horizons, and were tested in accordance with standard procedures of the American Association of State Highway Officials. These samples were obtained from depths of less than 6 feet and do not represent materials encountered in earthworks at greater depths.

Table 4 gives moisture-density data for the soils tested. In the moisture-density (compaction) test, soil material is compacted several times, each time at a successively higher moisture content. Assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with an increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density.

Engineering soil classifications given in table 4 are based on data obtained by mechanical analysis and on the results of tests made to determine the liquid limit and plasticity index of the soils. Mechanical analyses were made by combined sieve and hydrometer methods.

The results of the mechanical analyses may be used to determine the relative proportions of the different sized particles. The clay content obtained by the hydrometer method should not be used in naming soil textural classes.

Tests for liquid limit and plastic limit indicate the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The

TABLE 4.—*Engineering*

[Tests performed by the Missouri State Highway Commission in accordance with

Soil name and location	Parent material	Missouri report No.	Depth	Moisture density <sup>1</sup>	
				Maximum dry density	Optimum moisture
Clarksville cherty silt loam: Middle of east boundary of SW¼SW¼ sec. 3, T. 32 N., R. 3 W.	Cherty dolomite.	62-2471	<i>Inches</i> 4-11	<i>Lb. per cu. ft.</i> 123	<i>Percent</i> 10
		62-2472	26-37	125	10
		62-2473	37-52	114	13
Lebanon silt loam: SE¼SW¼ sec. 36, T. 33 N., R. 4 W.-----	Cherty dolomite and sandstone with loess mantle.	62-2468	1½-3½	100	17
		62-2469	15-20	105	20
		62-2470	20-28	118	13
Moniteau silt loam: SW¼SE¼ sec. 13, T. 34 N., R. 7 W., 200 yards north of Lenox Microwave Tower on State Highway C.	Cherty dolomite with loess mantle.	63-28646	7-18	112	15
		63-28647	22-35	91	28
		63-28648	35-39	112	16
Razort loam: SE¼SW¼ sec. 22, T. 34 N., R. 3 W.-----	Alluvium.	63-28643	17-44	114	14
Sharon silt loam: NE¼SE¼ sec. 26, T. 33 N., R. 5 W.-----	Alluvium.	63-28644	15-23	119	13
		63-28645	26-40	124	10

<sup>1</sup> Based on AASHO Designation T 99-57, Method C (1).<sup>2</sup> Mechanical analyses according to the American Association of State Highway Officials Designation T 88-54 (1). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the

test data

standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis <sup>2</sup>									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—					AASHO <sup>3</sup>	Unified <sup>4</sup>
3 inch	¾ inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.001 mm.				
100	96	69	58	53	38	35	10	4	17	2	A-4(1)	SM
100	69	64	63	53	28	28	16	6	16	6	A-2-4(0)	GM-GC
100	77	72	72	60	25	25	24	18	33	17	A-2-6(0)	SC
			100	97	91	86	24	3	27	2	A-4(8)	ML
			100	98	94	92	50	31	48	25	A-7-6(16)	CL
100	98	77	60	52	48	46	20	13	28	9	A-4(3)	SC
	100	97	96	87	78	25	25	12	27	7	A-4(8)	ML-CL
		100	99	98	96	66	66	50	70	43	A-7-6(20)	CH
	100	98	97	93	83	32	32	17	37	20	A-6(12)	CL
			100	99	79	77	28	15	30	14	A-6(10)	CL
100	99	96	94	88	63	61	28	17	29	15	A-6(8)	CL
100	88	50	36	20	10				17	3	A-1-a(0)	GP-GM

pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for naming textural classes for soils.

<sup>3</sup> Based on AASHO Designation M 145-49 (1).

<sup>4</sup> Based on the Unified Soil Classification System (14). SCS and the Bureau of Public Roads (BPR) have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification. An example of a borderline classification obtained by this use is GP-GM.

TABLE 5.—*Estimated*

Soil series and map symbol	Depth to—		Depth from surface	Classification
	Bedrock	Seasonal high water table		USDA texture
Ashton (AsA, AsB, AsC)-----	>60	>4	<i>Inches</i> 0-13 13-50	Silt loam----- Silty clay loam-----
Atkins (At)-----	>60	<2	0-19 19-60	Loam----- Loam to silty clay loam-----
Bado (BaB)-----	>60	<2	0-12 12-17 17-29 29-48 48-66	Silt loam----- Silty clay loam----- Clay----- Silt loam (fragipan)----- Silty clay loam-----
Baxter (mapped only in complexes with Clarksville soils)-----	>60	>4	0-10 10-17 17-60	Very cherty silt loam----- Silty clay----- Clay-----
Clarksville (CcC, CcD, CcF, CcG, CfF, CfG)----- For properties of the Baxter soils in mapping units CfF and CfG, see the Baxter series.	>60	>4	0-20 20-72	Cherty silt loam, cherty loam----- Cherty silty clay loam-----
Coulstone (CkC, CkD, CkF, CkG)----- For properties of the Clarksville soils in all these mapping units, see the Clarksville series.	>60	>4	0-11 11-26 26-37 37-52	Cherty loam----- Cherty loam----- Cherty sandy loam----- Sandstone fragments.
Elkins (Ek)-----	>60	<2	0-8 8-14 14-62	Silt loam----- Silty clay loam----- Silty clay loam-----
Elsah: Cherty loam (Et)-----	>60	>4	0-15 15-70	Cherty loam----- Gravel; cherty silt loam to loamy sand-----
Very cherty loam (Ev)-----	>60	>4	0-10 10-68	Cherty loam----- Gravel; cherty silt loam to loamy sand-----
Gladden (Gd)-----	>60	>4	0-33 33-63	Loam----- Gravel; very cherty sandy loam-----
Hobson (mapped only in undifferentiated groups with Lebanon soils).	>60	2-4	0-8 8-20 20-36 42-60	Silt loam----- Clay loam, sandy clay loam----- Sandy loam (fragipan)----- Clay loam-----
Lebanon: Cherty silt loam (LcB)-----	>60	<2	0-7 7-14 14-40	Cherty silt loam----- Cherty silt loam----- Cherty silt loam-----
Silt loam (LbB, LbC, LhB, LhB2, LhC, LhC2, LhD, LhD2). For properties of the Hobson soils in mapping units LhB through LhD2, see the Hobson series.	>60	<2	0-8 8-24 24-31 31-54	Silt loam, loam----- Silty clay loam----- Cherty loam (fragipan)----- Silty clay-----
Moniteau (MoA, MoB)-----	>60	<2	0-7 7-11 11-17 17-32 32-52	Silt loam----- Silt loam----- Silty clay----- Clay loam----- Clay loam-----
Nixa (NcB, NcC, NcD, NcE)----- For properties of the Clarksville soils in all these mapping units, see the Clarksville series.	>60	>4	0-14 14-23 23-33 33-58	Cherty loam----- Cherty silt loam----- Cherty silty clay loam (fragipan)----- Cherty silty clay loam-----

See footnotes at end of table.

## properties of the soils

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200				
ML CL	A-4 A-4 or A-6	85-100 85-100	80-100 80-100	65-100 80-100	<i>Inches per hour</i> 0.8-2.5 0.8-2.5	<i>Inches per inch of soil</i> 0.18-0.23 0.19-0.21	<i>pH</i> 5.6-6.5 5.1-5.5	Moderate. Moderate.
ML CL	A-4 A-4 or A-6	85-100 85-100	80-100 80-100	50-80 75-100	0.8-2.5 0.2-0.8	0.14-0.23 0.18-0.21	4.5-5.5 4.5-5.5	Moderate. Moderate.
CL-ML CL CH-MH CL CL	A-4 A-6 A-7 A-4 A-6	85-100 80-100 85-100 60-90 80-100	80-100 80-100 80-100 50-90 80-100	65-100 80-100 70-100 50-90 65-100	0.8-2.5 0.2-0.8 0.05-0.2 0.05-0.2 0.8-2.5	0.18-0.23 0.19-0.21 0.15-0.18 0.02-0.04 0.18-0.23	4.5-6.0 4.5-5.5 4.5-5.5 4.5-5.5 4.5-6.0	Moderate. Moderate. Moderate. Moderate. Moderate.
SM CL CH-MH	A-2, A-4 A-7 A-7	60-80 85-100 85-100	50-65 80-100 80-100	25-45 80-100 70-100	2.5-5.0 0.8-2.5 0.8-2.5	0.04-0.18 0.15-0.18 0.15-0.18	5.6-6.5 4.5-5.5 4.5-5.5	Moderate. Moderate. Moderate.
GM, ML GC	A-2, A-4 A-2, A-4	55-80 55-80	45-65 30-50	20-60 10-50	2.5-5.0 2.5-5.0	0.04-0.18 0.04-0.18	4.5-5.5 4.5-5.5	Moderate. Moderate.
SM SM SC	A-2, A-4 A-2, A-4 A-2, A-4	60-80 55-80 60-85	50-65 55-75 65-80	25-45 20-45 20-45	2.5-5.0 2.5-5.0 2.5-5.0	0.04-0.18 0.04-0.18 0.04-0.18	4.5-5.5 4.5-5.5 4.5-5.5	Moderate. Moderate. Moderate.
ML CL CL	A-4 A-4 or A-6 A-4 or A-6	85-100 85-100 85-100	80-100 80-100 80-100	65-100 80-100 80-100	0.8-2.5 0.2-0.8 0.05-0.2	0.18-0.23 0.19-0.21 0.19-0.21	5.1-6.0 5.1-6.0 5.1-5.5	Moderate. Moderate. Moderate.
SM GP-GM	A-2, A-4 A-1	60-80 1-40	50-85 0-35	25-45 0-15	2.5-5.0 >10.00	0.10-0.14 0.02-0.04	5.1-6.0 ( <sup>1</sup> )	Moderate. Low.
SM GP-GM	A-2, A-4 A-1	45-80 10-60	40-75 5-50	20-40 0-15	2.5-5.0 >10.00	0.06-0.14 0.02-0.04	5.1-6.0 ( <sup>1</sup> )	Moderate. Low.
ML GP-GM	A-6 A-1	85-100 10-60	80-100 5-50	50-80 0-15	0.8-2.5 >10.00	0.14-0.18 0.02-0.04	5.1-6.0 ( <sup>1</sup> )	Moderate. Low.
ML CL SM CL	A-4 A-7 A-2, A-4 A-7	85-100 85-95 95-100 85-100	80-100 80-100 80-100 85-100	65-100 80-100 20-50 80-100	0.8-2.5 0.8-2.5 0.05-0.2 0.6-2.0	0.18-0.23 0.19-0.21 0.02-0.04 0.19-0.21	5.1-6.0 4.5-5.5 4.5-5.5 4.5-5.5	Moderate. Moderate. Moderate. Moderate.
ML, SC CL SC, ML	A-4 A-6 A-2, A-4	65-85 65-85 50-70	60-80 60-80 45-65	40-65 50-75 35-60	0.8-2.5 0.8-2.5 0.2-0.8	0.12-0.16 0.14-0.18 0.06-0.08	5.1-6.0 4.5-5.5 4.5-5.6	Moderate. Moderate. Moderate.
ML CL SC, ML CL	A-4 A-7-6 A-4 A-7	85-100 85-95 60-90 85-100	80-100 80-100 50-90 80-100	65-100 80-100 40-90 80-100	0.8-2.5 0.8-2.5 0.05-0.2 0.8-2.5	0.12-0.16 0.14-0.18 0.06-0.08 0.15-0.18	5.1-6.0 4.5-5.5 4.5-5.5 4.5-5.5	Moderate. Moderate. Moderate. Moderate.
ML CL-ML CL CL CL	A-4 A-4 A-7-6 A-6 A-6	85-100 85-100 85-100 85-100 85-100	80-100 80-100 80-100 80-100 80-100	65-100 65-100 70-100 80-100 80-95	0.8-2.5 0.8-2.5 0.05-0.2 0.2-0.8 0.2-0.8	0.18-0.23 0.18-0.23 0.15-0.18 0.19-0.21 0.19-0.21	5.6-6.5 5.0-5.5 4.5-5.5 4.5-5.5 4.5-5.5	Moderate. Moderate. Moderate. Moderate. Moderate.
SM SM-SC SC SC	A-4 A-4 A-2, A-4 A-4	70-85 70-85 60-75 60-75	65-85 65-85 40-75 40-75	35-50 35-50 35-50 35-50	2.5-5.0 2.5-5.0 0.2-0.8 2.5-5.0	0.06-0.14 0.06-0.14 0.02-0.04 0.06-0.14	4.5-5.5 4.5-5.5 4.5-5.5 4.5-5.5	Moderate. Moderate. Moderate. Moderate.

TABLE 5.—*Estimated*

Soil series and map symbol	Depth to—		Depth from surface	Classification
	Bedrock	Seasonal high water table		USDA texture
Pope (Po).....	>60	>4	<i>Inches</i> 0-33 33-60	Fine sandy loam..... Fine sandy loam.....
Razort: Loam (RaB).....	>60	>4	0-27 27-50	Loam, sandy loam..... Gravel, sandy loam.....
Cherty loam (RcB).....	>60	>4	0-15 15-42	Cherty loam..... Gravel.....
Riverwash (Rh).....	( <sup>1</sup> )	( <sup>1</sup> )	0-50	Gravel.....
Rock land (Rk) <sup>2</sup> .....	( <sup>1</sup> )	>4		
Sandy alluvial land (Sa).....	>60	( <sup>1</sup> )	0-26 26-58	Loamy sand..... Loamy sand.....
Sharon (Sh).....	>60	>4	0-65	Silt loam.....
Viraton (VcC, VcC2, VcD, VcE).....	>60	2-4	0-6 6-18 18-36 36-58	Cherty silt loam..... Cherty silty clay loam..... Cherty silt loam (fragipan)..... Cherty silt loam.....
Viraton soils, red subsoil variants (VrC, VrD).....	>60	>4	0-7 7-46	Silt loam..... Silty clay loam.....
Westerville (We).....	>60	2-4	0-48	Silt loam.....

<sup>1</sup> Variable.

## properties of the soils—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200				
SM-SC	A-2, A-4	85-100	80-100	25-45	<i>Inches per hour</i> 2.5-5.0	<i>Inches per inch of soil</i> 0.10-0.14	pH 5.6-6.6	Low.
SM-SC	A-2, A-4	85-100	80-100	25-50	2.5-5.0	0.12-0.16	5.1-6.5	Low.
CL, SM-SC	A-4 or A-6	85-100	80-100	40-80	0.8-2.5	0.14-0.18	4.5-5.5	Moderate.
SM, GP-GM	A-1 or A-2	10-60	5-50	5-30	>10.00	0.02-0.04	4.5-5.5	Low.
ML	A-4 or A-6	70-85	65-85	50-70	2.5-5.0	0.10-0.14	4.5-5.5	Moderate.
SM, GP-GM	A-1 or A-2	10-60	5-50	5-25	>10.00	0.02-0.04	( <sup>1</sup> )	Low.
GP	A-1	( <sup>1</sup> )	( <sup>1</sup> )	( <sup>1</sup> )	>10.00	<0.02	( <sup>1</sup> )	Low.
SM	A-2	85-100	80-100	10-35	5.0-10.0	0.04-0.06	5.6-6.5	Low.
SM	A-2	85-100	80-100	10-35	5.0-10.0	0.04-0.06	4.5-5.5	Low.
CL	A-6	85-100	80-100	65-100	0.8-2.5	0.18-0.23	5.1-6.0	Moderate.
ML	A-4	65-85	65-85	50-85	0.8-2.5	0.10-0.14	5.1-6.0	Moderate.
CL	A-4 or A-6	20-85	65-85	65-85	0.8-2.5	0.14-0.18	4.5-5.5	Moderate.
ML, SM	A-4	60-90	50-90	40-90	0.05-0.2	0.02-0.04	4.5-5.0	Moderate.
ML	A-4	65-85	65-85	50-85	0.8-2.5	0.10-0.14	5.1-6.0	Moderate.
ML	A-4	65-100	80-100	85-100	0.8-2.5	0.18-0.23	4.5-5.5	Moderate.
CL	A-6	80-100	80-100	80-100	0.8-2.5	0.19-0.21	4.5-5.0	Moderate.
CL	A-4 or A-6	85-100	80-100	65-100	0.8-2.5	0.18-0.23	4.5-6.0	Moderate.

<sup>2</sup> Too variable in characteristics for properties to be estimated.

TABLE 6.—*Interpretations of*

Soil series and map symbol	Suitability as source of—			
	Topsoil	Sand	Gravel	Road fill
Ashton (AsA, AsB, AsC)-----	Surface layer good.	Unsuitable-----	Unsuitable-----	Fair-----
Atkins (At)-----	Fair-----	Unsuitable-----	Unsuitable-----	Poor-----
Bado (BaB)-----	Surface layer fair to good.	Unsuitable-----	Unsuitable-----	Unsuitable-----
Baxter-----	Unsuitable-----	Unsuitable-----	Unsuitable-----	Good-----
Clarksville (CcC, CcD, CcF, CcG, CfF, CfG)----- For properties of the Baxter soils in mapping units Ccf and CfG, see the Baxter series.	Unsuitable-----	Unsuitable-----	Unsuitable-----	Good-----
Coulstone (CkC, CkD, CkF, CkG)----- For properties of the Clarksville soils in all these mapping units, see the Clarksville series.	Unsuitable-----	Unsuitable-----	Unsuitable-----	Good-----
Elkins (Ek)-----	Good-----	Unsuitable-----	Unsuitable-----	Fair to poor-----
Elsah (Et, Ev)-----	Surface layer fair.	Unsuitable-----	Fair in sub- stratum.	Good-----
Gladden (Gd)-----	Surface layer good.	Unsuitable-----	Poor in sub- stratum.	Fair to good-----
Hobson-----	Surface layer fair to good.	Unsuitable-----	Unsuitable-----	Fair to good-----
Lebanon: Cherty silt loam (LcB)-----	Surface layer fair to good.	Unsuitable-----	Unsuitable-----	Fair to poor-----
Silt loam (LbB, LbC, LhB, LhB2, LhC, LhC2, LhD, LhD2). For properties of Hobson soils in mapping units LhB through LhD2, see the Hobson series.	Surface layer fair.	Unsuitable-----	Unsuitable-----	Fair to good-----
Moniteau (MoA, MoB)-----	Surface layer fair to good.	Unsuitable-----	Unsuitable-----	Unsuitable-----

*engineering properties of the soils*

Soil features affecting—				
Farm ponds		Agricultural drainage	Terraces and diversions	Waterways
Reservoir	Embankment			
Moderate permeability; moderate hazard of excess seepage.	Slow permeability-----	Good drainage-----	Soil properties favorable.	Low natural fertility.
Seasonal high water table; moderate hazard of excess seepage.	Moderate permeability.	Seasonal high water table; moderately slow to slow permeability.	Not needed-----	Low natural fertility.
Slow permeability in dense clay subsoil; slight hazard of excess seepage.	Slow permeability in clayey subsoil.	Slow permeability in subsoil; fragipan at a depth of 30 inches.	Nearly level soils; poor drainage.	Low available water capacity; low natural fertility.
Moderately rapid permeability; high to moderate seepage hazard; steep slopes.	Moderate permeability.	Good drainage-----	Steep slopes; stony material in surface layer.	Low available water capacity; rocky surface; steep slopes.
Moderately rapid permeability; high to moderate seepage hazard; steep in some areas.	Moderate to moderately rapid permeability.	Good drainage-----	Steep slopes; stony material in upper 5 feet.	Low available water capacity; rocks throughout soil profile; steep in places.
Moderately rapid permeability; high to moderate seepage hazard; steep in some areas.	Moderate to rapid permeability.	Good drainage-----	Steep slopes; stony material in upper 5 feet.	Low available water capacity; rocks throughout soil profile; steep in places.
Stratified layers may cause moderate seepage hazard.	Slow permeability-----	Slow permeability in subsoil.	Not needed-----	Low natural fertility.
Moderately rapid permeability; high seepage hazard.	Rapid permeability in gravelly substratum.	Good drainage-----	Not needed-----	Low available water capacity; low natural fertility.
Permeability moderate in upper 30 inches, rapid below that depth; high hazard of excess seepage.	Rapid permeability in gravelly substratum.	Good drainage-----	Not needed-----	Low available water capacity; low natural fertility.
Permeability moderate above the fragipan, slow in the fragipan; moderate hazard of excess seepage.	Resistance to piping fair; permeability moderate.	Fragipan at a depth of about 2 feet.	Soil properties favorable.	Low natural fertility; vegetation difficult to establish.
Permeability moderate above the fragipan, slow in the fragipan; bedrock cavernous in some places; moderate to high hazard of excess seepage.	Resistance to piping fair; permeability moderate.	Fragipan at a depth of about 2 feet.	Stony material throughout the upper 5 feet.	Low natural fertility; rocks throughout soil profile; vegetation difficult to establish.
Permeability moderate above the fragipan, slow in the fragipan; moderate hazard of excess seepage.	Moderate permeability.	Fragipan at a depth of about 2 feet.	Soil properties favorable.	Low natural fertility; vegetation difficult to establish.
Slow permeability in dense clay subsoil; slight hazard of excess seepage.	Slow permeability in clayey subsoil.	Slow permeability in subsoil.	Nearly level soils; poor drainage.	Low natural fertility.

TABLE 6.—*Interpretations of*

Soil series and map symbol	Suitability as source of—			
	Topsoil	Sand	Gravel	Road fill
Nixa (NcB, NcC, NcD, NcE)----- For properties of Clarksville soils in all these mapping units, see Clarksville series.	Poor-----	Unsuitable-----	Unsuitable-----	Good-----
Pope (Po)-----	Poor-----	Poor-----	Unsuitable-----	Good-----
Razort: Loam (RaB)-----	Surface layer fair to good.	Unsuitable-----	Substratum fair to good below a depth of about 20 inches.	Fair to good-----
Cherty loam (RcB)-----	Surface layer poor.	Unsuitable-----	Substratum fair to good.	Good-----
Riverwash (Rh)-----	Unsuitable-----	Fair-----	Good-----	Good-----
Rock land (Rk)-----	Unsuitable-----	Unsuitable-----	Unsuitable-----	Unsuitable in most places.
Sandy alluvial land (Sa)-----	Unsuitable-----	Good-----	Fair-----	Good-----
Sharon (Sh)-----	Good-----	Unsuitable-----	Unsuitable-----	Poor-----
Viraton (VcC, VcC2, VcD, VcE)-----	Poor-----	Unsuitable-----	Unsuitable-----	Fair-----
Viraton, red subsoil variant (VrC, VrD)-----	Surface layer good.	Unsuitable-----	Unsuitable-----	Poor-----
Westerville (We)-----	Fair-----	Unsuitable-----	Unsuitable-----	Poor-----

*engineering properties of the soils—Continued*

Soil features affecting—				
Farm ponds		Agricultural drainage	Terraces and diversions	Waterways
Reservoir	Embankment			
Permeability moderately rapid above the cherty fragipan, but moderately slow in it; bedrock cavernous in some places; high to moderate seepage hazard.	Cherty soils; moderate permeability.	Cherty fragipan at a depth of about 14 inches.	Fine cherty material throughout upper 6 feet.	Low natural fertility; very low available water capacity; fine chert throughout soil profile.
Moderately rapid permeability; high seepage hazard.	Sandy loam soils; high permeability.	Good drainage-----	Not needed-----	Low available water capacity; low natural fertility.
Permeability moderate to a depth of about 2 feet, but rapid below that depth; high hazard of excess seepage.	Rapid permeability in cherty substratum.	Good drainage-----	Soil properties favorable.	Low natural fertility; low available water capacity.
Rapid permeability; high hazard of excess seepage.	Rapid permeability in cherty substratum.	Good drainage-----	Soil properties favorable.	Low natural fertility; low available water capacity.
Not applicable-----	Not applicable-----	Not applicable-----	Not applicable-----	Not applicable.
Not applicable-----	Not applicable-----	Not applicable-----	Not applicable-----	Not applicable.
Rapid permeability; high hazard of excess seepage.	Rapid permeability---	Good drainage-----	Not needed-----	Low available water capacity; low natural fertility.
Moderate permeability; high hazard of excess seepage.	Moderate to slow permeability.	Good drainage-----	Not needed-----	Low natural fertility.
Permeability moderate above the fragipan, but slow in the fragipan; low to moderate hazard of excess seepage.	Moderate permeability.	Fragipan at a depth of about 24 inches.	Soil properties favorable.	Low natural fertility.
Permeability moderate above the fragipan, but slow in the fragipan; low to moderate hazard of excess seepage.	Slow permeability in subsoil.	Good drainage-----	Soil properties favorable.	Low natural fertility.
Seasonal high water table; moderate hazard of excess seepage.	Moderate to slow permeability.	Seasonal high water table.	Not needed-----	Low natural fertility.

plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is in a plastic condition.

### **Engineering properties of the soils**

In table 5, by soil layers, are estimates of important properties that affect the use of soils in Dent County for engineering. The estimates are based on laboratory data given in table 4; on laboratory tests of similar soils in other counties (3); and on field observations.

Depth from the surface and the estimates of properties are generally those for the layers in the profile described as typical for the series in the section "Descriptions of the Soils." For the Lebanon soils, however, estimates were made for layers in more than one profile. The soil material is classified according to textural terms of the United States Department of Agriculture and according to the AASHO and Unified systems. Estimated percentages of material that passes No. 4, No. 10, and No. 200 sieves are also given.

Permeability is the quality of the soil that enables it to transmit water and air. In table 5 permeability is estimated for undisturbed soil material in inches of water percolation per hour. The estimates are based on soil structure and consistence and on field observations. Limited laboratory data were also available.

Available water capacity, estimated in inches per inch of soil depth, is the amount of moisture that the soil can hold in a form that is readily available to plants. It is the difference between the amount of moisture in a soil at field capacity and the amount in the soil at the permanent wilting point.

The acid or alkaline reaction of the soil is expressed as a range in pH values. A pH of 7.0 is neutral; values lower than 7.0 are acid; and values higher are alkaline.

Shrink-swell potential indicates how much the volume of the soil layers changes as a result of changes in their moisture content. The ratings given are *high*, *moderate*, and *low*. Soils that contain a large amount of plastic fine material may have high shrink-swell potential. Those that contain a high percentage of sand and small amounts of nonplastic fine material have low shrink-swell potential.

### **Engineering interpretations of the soils**

In table 6 the soils in Dent County are rated according to their suitability as a source of topsoil, sand, gravel, and road fill. Also given in table 6 are the specific properties that affect suitability of the soils for farm ponds, agricultural drainage, terraces and diversions, and waterways.

Each soil in table 6 is rated as a source of topsoil and as a source of sand and gravel. The rating applies to all the layers within a depth of 40 inches if only one rating for a soil is given. If only one layer is given a rating, however, the other layers in the soil profile are considered not suitable.

Chert gravel can be used economically for secondary highways and county roads, but normally it is not dur-

able enough to be used in concrete structures or as subgrade material for primary roads. Crushed limestone is more satisfactory. Chert can be used, however, under suitable crushed limestone to decrease the amount of limestone needed.

Also rated in table 6 is suitability of the soils as a source of road fill. Generally, the most desirable material for road fill is coarse textured and easily drained. This kind of material is fairly plentiful in Dent County. The most suitable deposits generally are in the Clarksville, Elsay, Nixa, Pope, and Razort soils and in the land types Sandy alluvial land and Riverwash.

Soil features that affect the construction of farm ponds also are given in table 6. The ratings are based on the risk of failure of the reservoir because of excessive seepage. Among factors that impede construction of a farm pond are a permeable substratum, cavernous bedrock, and inadequate embankment material. Stored water may be lost if a permeable substratum occurs near the surface, or if the pond is in an area where the ground water is low. In areas where caverns exist in limestone bedrock, the water may escape through the substratum into the cavernous rock. Thus, a rating of slight, such as that shown for the Bado and Moniteau soils, means the chance of excess seepage in the reservoir is small.

Terraces and diversions are not needed on many soils in the county, though other soils in the county have properties favorable for their installation. Features unfavorable for installation of terraces and diversions are poor drainage, strong or steep slopes, and stony or cherty material through the top 5 or 6 feet.

In areas where waterways are needed, their construction is impeded by low available water capacity and natural fertility, steep slopes, and rocks throughout the profile.

Not rated in table 6 is suitability of the soils for road subgrade. Location of secondary roads largely depends on slope, depth to bedrock, and kinds of bedrock. By ascertaining the kinds of bedrock, the engineer can determine the difficulty in excavating. Some factors important in the construction of all highways are the possibility of slides in the dipping strata and of seepage along or through the bedrock. Also, the presence of poor material within the road subgrade or slightly below it should be considered. A layer of plastic clay, for example, impedes internal drainage and provides a poor foundation for a subgrade. In some places, the layer of clay should be removed before the pavement is constructed. In places where drainage is poor, such as in low flat areas, an embankment section should be constructed to keep the roadway above the clay layer. Boulders, cobblestones, and stones are likely to cause problems in grading.

In Dent County the vertical alinement of roads is affected by poor drainage. In areas where the water table is seasonally high, such as in areas of Atkins, Bado, Elkins, and Moniteau soils, an embankment section should be constructed to keep the roadway above the high water level. Because they are flooded from time to time, such embankments also are required on the Elsay, Gladden,

Pope, Sharon, and Westerville soils. In areas where sub-surface seepage occurs, interceptor ditches or underdrains are needed, commonly in alluvium at the base of slopes. In poorly drained soils, seepage along the back slope of cuts may cause slumping or sliding of the overlying material. Depth to bedrock also affects the vertical alinement of roads.

In some parts of the county, it is possible to excavate, haul, and compact well-drained, coarse-textured soil material during long wet spells. Silty and clayey materials, however, are likely to absorb so much water that they cannot be readily dried to the optimum moisture content needed.

### Recreational Uses of Soils<sup>5</sup>

In this subsection soils are grouped in table 7 according to their degree of limitations if used for cottages and utility buildings, intensive campsites, picnic areas, intensive play areas, trails and paths, and golf fairways. Also in this subsection is a broad discussion of recreational facilities in the three soil associations in the county.

The individual mapping units for which map symbols are given in table 7 are described in the section "Descriptions of the Soils" and are located on the detailed soil map in the back of this survey. The soil associations are described in the section "General Soil Map" and are located on the general soil map.

Also helpful in planning for recreational facilities are the subsections on engineering, woodland, and wildlife uses of soils. Assistance in developing recreational sites can be obtained from the Soil Conservation Service through the Dent County Soil and Water Conservation District.

In general, the potential for developing recreational facilities on private lands in Dent County is high. Examples of recreational facilities that can be developed in all the areas of the county are small lakes, camping areas, picnic areas, riding trails, and nature trails.

Groups of soils are interpreted in table 7 in terms of limitations to use of soils as recreational sites. The same soil properties that affect agricultural use of soils generally affect use for recreation. For example, soils subject to flooding have limitations for both cropland and as recreational sites. Frequent flooding is a serious limitation for use as sites for camping and most recreational buildings. Where flooding is infrequent, use for hiking trails, for study of nature, or for green open spaces may be only slightly limited. Soils not subject to flooding that are wet a significant part of a season of use for recreation are not well suited as campsites, recreational roads and trails, playgrounds, golf fairways, and picnic areas. Droughty soils also may have limitations, and sandy or stony soils are hazardous for many recreational uses. Silty soils may be excessively dusty, and clayey

soils may be sticky and slippery. The steep soils normally have severe limitations for recreational use, but nearly level, well-drained, stone-free soils above the level of flooding normally have little or no limitation for recreational use. Depth to hard rock also is a hazard to use of the soils for playgrounds that require leveling, planting vegetation, constructing roads, and similar operations.

The ratings to show the limitations of the groups of soils in table 7 are *moderate* and *severe*, but even a rating of *severe* does not mean that the soils in a group cannot be manipulated so as to overcome the limitations. The kinds of recreational sites for which limitations of groups of soils are rated in table 7 require explanation.

*Cottages and utility buildings.*—The ratings are for limitations of soils used seasonally and the year round for recreational buildings such as cottages, washrooms and bathhouses, picnic shelters, and service buildings. Because sanitary facilities are needed and are closely related to soil properties, limitations are severe for soils that are slowly permeable, poorly drained, shallow to rock, subject to flooding, or steeply sloping if used for septic-tank filter fields.

*Intensive campsites.*—The ratings apply to soils suitable for sites for tents and small camp trailers and for the accompanying activities for outdoor living. The limitation of the soil for growth of traffic-bearing vegetation is an important consideration. Growth of traffic-bearing vegetation is limited by the rocky surface layer, steep slopes, poor drainage, and floods, particularly the flash floods in narrow stream valleys.

*Picnic areas.*—The ratings apply to limitations of soils used for community or other picnic areas that are used seasonally. The presence of stones, susceptibility to flooding, access, and texture of surface layer are significant properties. Sustained growth of vegetation that withstands heavy traffic is important.

*Intensive play areas.*—Evaluations apply to soils that may be used for playgrounds and for baseball, football, badminton, and other organized games. Areas selected for these uses are subject to intensive foot traffic, and they should be able to support protective vegetation. Nearly level, well-drained soils having a surface soil with texture and consistence that provide a firm surface are generally most suitable. Soils with less desirable properties of the surface layer require more preparation and maintenance.

*Trails and paths.*—The ratings apply to soils that are used for trails, cross-country hiking, bridle paths, and other nonintensive uses that allow for random movement of people. It is assumed that such areas will require minimum excavation and other site preparation. Swamps, very stony areas, and sand dunes are generally severe hazards to use for trails and paths.

*Golf fairways.*—The ratings of limitations apply to use of soils for golf fairways, or the areas between greens. It is assumed such areas will be vegetated. Of primary concern in rating limitations are rocky surfaces, steep slopes, flooding, sandy areas, wetness, and difficulty in establishing and maintaining vegetative cover.

<sup>5</sup> HAROLD E. GROGGER, State soil scientist, and MAX HAMILTON, wildlife biologist, Soil Conservation Service, prepared this subsection.

TABLE 7.—*Limitations of soils*

Recreational group, soil series, and map symbol	Cottages and utility buildings	Intensive campsites
<p>Group 1: Moderately well drained to somewhat excessively drained, cherty, mostly permeable soils that, except for a small acreage, are not flooded;<sup>1</sup> 0 to 50 percent slopes:            Clarksville (CcC, CcD, CcF, CcG).            Clarksville-Baxter (CfF, CfG).            Coulstone and Clarksville (CkC, CkD, CkF, CkG).            Elsay (Et, Ev).            Nixa-Clarksville (NcB, NcC, NcD, NcE).            Viraton (VcC, VcC2, VcD, VcE).            Viraton, red subsoil variant (VrC, VrD).</p>	<p>Rock content and flooding of stream valleys are severe limitations; slope is a severe limitation if more than 15 percent and moderate if 6 to 15 percent.</p>	<p>Rock content and flooding of stream valleys are severe limitations; slope is a severe limitation if more than 15 percent and moderate if 6 to 15 percent.</p>
<p>Group 2: Well-drained, moderately permeable soils that are subject to frequent flooding;<sup>2</sup> silty surface layer; little or no chert or gravel to a depth of 5 feet; 0 to 9 percent slopes:            Ashton (AsA, AsB, AsC).            Sharon (Sh).</p>	<p>Flooding is a severe limitation--</p>	<p>Flooding is a severe limitation; the silty surface layer is a moderate limitation.</p>
<p>Group 3: Well-drained and somewhat excessively drained soils that have a loamy surface layer and are subject to flooding; permeability is moderate to moderately rapid; 0 to 3 percent slopes:            Gladden (Gd).            Pope (Po).            Razort (RaB, RcB).</p>	<p>Flooding is a severe limitation--</p>	<p>Flooding is a severe limitation--</p>
<p>Group 4: Poorly drained and somewhat poorly drained soils that have a silt loam or loam surface layer and are essentially chert-free throughout; most soils are subject to frequent flooding and have slow permeability, but unit We has moderate permeability; unit BaB occurs on uplands, is not subject to flooding, and has a fragipan at a depth of about 30 inches:            Atkins (At).            Bado (BaB).            Elkins (Ek).            Moniteau (MoA, MoB).            Westerville (We).</p>	<p>Wetness and flooding are severe limitations.</p>	<p>Wetness and flooding are severe limitations; slow permeability and the silty surface layers are moderate limitation.</p>
<p>Group 5: Moderately well drained soils that have a silty surface layer; at a depth of about 18 to 24 inches is a slowly permeable, very dense and hard, cherty loam or sandy loam fragipan; 2 to 14 percent slopes:            Lebanon (LbB, LbC, LcB).            Lebanon and Hobson (LhB, LhB2, LhC, LhC2, LhD, LhD2).</p>	<p>Depth to cherty fragipan is a severe limitation; slopes of 6 to 14 percent are moderate limitations.</p>	<p>Slow permeability, silty surface layer, and slopes of 6 to 14 percent are moderate limitations.</p>
<p>Group 6: Excessively drained, rapidly permeable areas of large stones, cherty gravel, sand, or loamy sand that may or may not be mixed; subject to frequent flooding:            Riverwash (Rh).            Sandy alluvial land (Sa).</p>	<p>Flooding is a severe limitation--</p>	<p>Flooding and the rocky, sandy surface layer are severe limitations.</p>
<p>Group 7: Limestone ledges, rock outcrops, and rock cover of boulders on more than 25 percent of surface; the material between the rocks is stony and cherty; strong slopes:            Rock land (Rk).</p>	<p>Stones, ledges, shallow depth to rock, and slopes of more than 15 percent are severe limitations.</p>	<p>Stones, ledges, and slopes of more than 15 percent are moderate limitations.</p>

<sup>1</sup> Units Et and Ev of stream valleys are the main soils subject to flooding, but some of the sloping soils on talus slopes are subject to flash flooding.

*used for recreational sites*

Picnic areas	Intensive play areas	Trails and paths	Golf fairways
Rock content and flooding of stream valleys are severe limitations; slope is a severe limitation if more than 15 percent and moderate if 6 to 15 percent.	Rock content and flooding of stream valleys are severe limitations; slope is a severe limitation if more than 6 percent and moderate if 2 to 6 percent.	Rock content and flooding of stream valleys are severe limitations; slope is a severe limitation if more than 20 percent and moderate if 12 to 20 percent.	Rock content and flooding of stream valleys are severe limitations; slope is a severe limitation if more than 20 percent and moderate if 8 to 20 percent.
Flooding is a severe limitation; the silty surface layer is a moderate limitation.	Flooding is a severe limitation; slopes of 2 to 9 percent and the silty surface layer are moderate limitations.	Flooding is a severe limitation; the silty surface layer is a moderate limitation.	Flooding is a severe limitation.
Flooding is a severe limitation--	Flooding is a moderate limitation; the moderately shallow depth to rock and slopes of 2 to 3 percent are moderate limitations.	Flooding is a severe limitation--	Flooding is a severe limitation.
Wetness and flooding are severe limitations; the silty surface layer is a moderate limitation.	Wetness and flooding are severe limitations; slopes of 2 to 5 percent and slow permeability are moderate limitations; the silty surface layer is a moderate limitation.	Wetness and flooding are severe limitations; the silty surface layer is a moderate limitation.	Wetness and flooding are severe limitations.
Silty surface layer and slopes of 6 to 14 percent are moderate limitations.	Depth to cherty fragipan is a severe limitation; slope is a severe limitation if more than 6 percent and moderate if 2 to 6 percent; silty surface layer and slow permeability are moderate limitations.	The silty surface layer is a moderate limitation.	Slopes of 8 to 9 percent are moderate limitations.
Flooding and the rocky, sandy surface layer are severe limitations.	Flooding and the rocky, sandy surface layer are severe limitations.	Flooding and the rocky, sandy surface layer are severe limitations.	Flooding and the rocky, sandy surface layer are severe limitations.
Stones, ledges, and slopes of more than 15 percent are moderate limitations.	Stones, ledges, shallow depth to rock, and slopes of more than 6 percent are severe limitations.	Stones, ledges, and slopes of more than 20 percent are severe limitations.	Stones, ledges, and slopes of more than 20 percent are severe limitations.

<sup>2</sup> Flooding includes the flash flooding that can occur on sloping soils on talus slopes.

#### RECREATIONAL FACILITIES IN THE SOIL ASSOCIATIONS OF DENT COUNTY

Soil association 1 consists mainly of gently rolling soils. It has many farm ponds, and larger lakes could be built (fig. 9). In general, smaller structures are required in developing lakes in this soil association than in the other two associations in the county. Most openland wildlife in the county and an appreciable amount of woodland wildlife live in this area. This association has a high potential for developing hunting preserves.

Soil associations 2 and 3 have steep soils, narrow ridges, and narrow valleys. Flowing in soil association 2 are the Current and Meramec Rivers. The Current River cuts the southwestern corner of the county, and the Meramec River cuts the northeastern corner. These rivers provide float fishing, swimming, and camping. Two State parks are located in soil association 2. Montauk State Park, in the southwestern part of the county, provides trout fishing, camping facilities, and picnic areas. Indian Trail State Park is in the northeastern part of the county and offers hunting and primitive camping. Soil associations 2 and 3 have many caves and springs and an abundance of woodland wildlife.

### *Formation, Morphology, and Classification of Soils*

This section discusses the effects of the five factors of soil formation on the soils in Dent County. It also describes the morphology and the composition of the soils, explains the current system of soil classification, and places the soil series in higher categories. A discussion of each soil series in the county and a description of a profile typical for each series is given in the section "Descriptions of the Soils."

### **Factors of Soil Formation**

Soil is a natural body on the surface of the earth in which plants grow and is composed of organic and min-

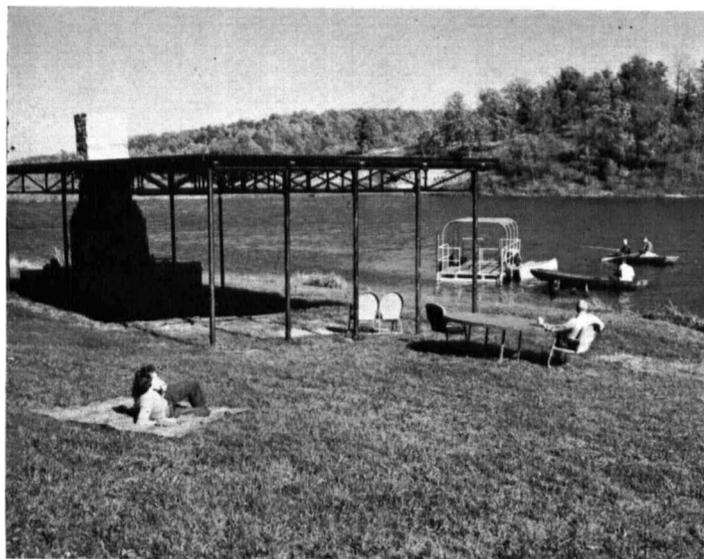


Figure 9.—Private lake development on soil association 1.

eral material. It is formed by weathering and other processes that act on parent materials. The characteristics of the soil at any given point depend upon (1) the parent material, (2) the climate, (3) plants and animals, (4) relief, and (5) time. All five factors are active in the formation of every soil, but the relative importance of each differs from place to place. In extreme instances one factor may dominate in the formation of a soil and fix most of its properties. In general, however, it is the combined action of the five factors that determines the present character of each soil. The five factors of soil formation are discussed in the paragraphs that follow.

### **Parent material**

In Dent County differences in parent material have caused important differences among the soils. The parent material consists (1) of material weathered in place from rock; (2) of loess, or material transported by wind; and (3) of alluvium and colluvium, or material transported by water and gravity. The material weathered in place from rock is related directly to the underlying rock. Materials moved by wind, water, or gravity and laid down as unconsolidated deposits of sand, silt, clay, and fragments of rock commonly are related to the transported soils or rocks from which they formed.

Sedimentary rocks of the Ordovician and Cambrian periods are the parent material of soils formed in material weathered in place from rock. Sandstone of the Roubidoux formation, which is of the Ordovician period, is the most extensive underlying rock in the county. Soils formed in material weathered from this rock are highly leached, are very strongly acid, and generally contain many fragments of sandstone and chert. Appreciable amounts of sand occur throughout the profile of most of these soils. The surface layer commonly is loam or sandy loam. Examples are soils of the Clarksville and Nixa series.

Thick-bedded cherty dolomite of the Gasconade formation, also of the Ordovician period, underlies the Roubidoux formation. Soils formed in material weathered from this rock are highly leached, are very strongly acid, generally are cherty throughout, and contain little sand. Clarksville soils are examples. In a few low areas of the county, the Gasconade formation thins out and comes into contact with older cherty dolomite of the Eminence formation, which is of the Cambrian period. Soils formed here generally have a redder, more clayey subsoil than those that formed in material from other rock formations in the county. Examples are soils of the Baxter series.

Loess was deposited over most of the county (6), probably during Wisconsin time. Except on the gentle slopes, much of the loess has been removed by geologic erosion. Consequently, some soils on uplands formed partly in loess and partly in material weathered from sedimentary rocks of the Ordovician or Cambrian period. Formed from such materials are soils of the Bado, Hobson, Lebanon, and Moniteau series.

Soils formed in alluvium and colluvium differ mainly because of the kind of parent material from which the material washed or rolled, the length of time the material has been deposited, and the kind of slope on which the soil formed.

Most of the soils formed in colluvium are in areas where the Gasconade and Eminence formations are dominant. The soils therefore have many properties similar to those of soils on surrounding uplands. On the stream terraces, the colluvium has been in place long enough for the soils to have horizons that are moderately developed. Along the drainageways on first bottoms, the soil material has been in place only long enough for the soils to have a profile that at most is weakly developed. Colluvium is the parent material of soils of the Viraton series and of the red subsoil variants from the Viraton series.

The kind of bedrock underlying the uplands and the general relief of the area account for differences among the soils formed in alluvium. Material weathered from sandstone of the Roubidoux formation, for example, is sandier throughout than that washed from dolomite of the Gasconade and Eminence formations. Alluvium washed from the highly dissected parts of the county contains considerable chert and gravel because water moving at high velocity washed the material from steep drainageways. Deposits laid down by fast-moving water generally are coarse, and those laid down by slow-moving water are fine. The coarse material is deposited near stream channels or on narrow bottoms where the water flows with greater velocity. Fine material is deposited on the broader, more level flood plain away from the stream channel. Of the soils formed in alluvium, the Ashton and Razort are on terraces, and the Atkins, Elkins, Elsah, Gladden, Pope, Sharon, and Westerville are on first bottoms.

### *Climate*

The climate of Dent County is fairly humid and is marked by extremes in temperature. The average annual precipitation is about 42 inches, and a considerable part of this comes as rain during the growing season. Because the climate is fairly uniform throughout the county, it has caused no major differences among the soils. A more complete discussion of the climate is given in the section "General Nature of the County."

### *Plants and animals*

Plants have had a great effect on the soils that formed in Dent County. Man and other animals, however, have also had a strong influence.

Most of the soils in the county formed under deciduous trees. The principal kinds of trees were oaks, hickory, maple, walnut, and elm, but shortleaf pine grew among the hardwoods in some areas. In many of the level and nearly level areas, the plant cover consisted chiefly of post oak and blackjack oak. The differences in vegetation from place to place probably were caused by differences of drainage.

The roots of most trees extend moderately deep into the soil and take up plant nutrients. Most of the trees and shrubs in the county shed their leaves each year. In this way large amounts of bases and phosphorus are returned to the surface layer and partly replace the depleted nutrients. Generally, deciduous trees return larger amounts of bases and phosphorus to the soil in their leaves than coniferous trees.

Organic matter is added to soils under forest by the decay of leaves, twigs, roots, and entire plants. Most of

the material accumulates on the surface, where it is acted upon by micro-organisms, earthworms, and other forms of life and is subjected to direct chemical reactions. Plant nutrients released by this form of decay are available for new growth of plants.

When trees are overthrown by high winds, their roots have a marked effect on the physical breakup of structure in the underlying material. This breakup partly accounts for the horizon discontinuity in many soils in the county.

Man has greatly changed the soils in many areas. He removed the protective cover of trees and other plants; then he plowed the soils, planted crops, added fertilizer, and provided drainage if needed. As the result of clearing the land and plowing the soil, accelerated erosion occurred. Much of the original surface layer was washed away, and material from the subsoil was mixed with the remaining surface layer by plowing. The texture and color of the surface layer thus were altered. Accelerated erosion also caused increased deposition of material on the flood plains. In addition it changed the drainage pattern because the gullies that cut the areas drained some soils that formerly had poor surface drainage and a high water table.

### *Relief*

Relief is important in soil formation because of its influence on drainage, runoff, infiltration, and other related factors, including accelerated erosion. Slopes range from nearly level to very steep in the county. The maximum difference in elevation between the valleys and the adjacent hilltops is about 300 feet.

Runoff is more rapid on steep slopes than on more nearly level ones. Thus, steep soils erode faster than more nearly level ones, even if both are of the same material. Steep soils are likely to be shallow and have little profile development. Soils in more nearly level areas, where the water table is high, are likely to be gray and wet and have strong profile development.

Many soils in the county are gently sloping, and relief has not adversely affected their development. Most of the soils, however, have stronger slopes. Many of these have a weakly developed profile. Slope, for example, probably has caused the differences between the Lebanon and Moniteau soils, which formed from similar material. Geologic erosion has been slight on the level or nearly level slopes where the Moniteau soils formed, but it has been more rapid on the stronger slopes where the Lebanon soils formed.

### *Time*

Time is needed for the factors of climate, plants and animals, and relief to act upon the parent material to form a soil. In turn, the length of time needed for a soil to form in a particular place depends upon the natural forces operating in the area. In this county the Elsah and Sharon soils are examples of young soils. These soils formed along the drainageways where alluvial materials have been in place too short a time for distinct horizons to form or where scouring has removed the deposits. Older soils in the county are those of the Moniteau series. These soils occupy level or slightly depressional areas that have not been affected by geological erosion. They have a mature profile that has distinct horizons.

## Morphology and Composition of Soils

Soil morphology in Dent County is expressed generally in prominent horizons. In some of the soils, however, the solum is weakly developed, and the horizons are faint or indistinct. For example, soils formed in medium- to fine-textured materials on well-drained, gently sloping uplands generally show distinct differentiation of horizons. The Lebanon soils, weathered from cherty dolomite, are some of these. In contrast, the Pope soils, formed in recent sandy alluvium, have faint horizons.

The differentiation of horizons in soils of the county is the result of one or more of the following processes: (1) Accumulation of organic matter, (2) leaching of carbonates and salts, (3) removal and subsequent accumulation of silicate clay minerals, and (4) reduction and transfer of iron.

Some organic matter has accumulated in the uppermost layers of all but a few soils in Dent County to form an A1 horizon. Much of that organic matter is in the form of humus. The quantities are small in some soils but fairly large in others. Such soils as Atkins loam have faint and thin A1 horizons that are low in organic matter at best. Other soils, such as those of the Ashton and Moniteau series, have thicker A1 horizons that are fairly high in content of organic matter.

Leaching of carbonates and salts has occurred in almost all soils of the county, though it has been of limited importance in horizon differentiation. The effects have been indirect, in that the leaching permitted the subsequent translocation of silicate clay minerals in some soils. Carbonates and salts have been carried out of the profiles of most of the well-drained soils. Even in the wettest soils, some leaching is indicated by the absence of free carbonates and by the acid reaction. Leaching of these wet soils is slow because movement of water through the profile is slow.

Accumulation of silicate clay minerals has contributed to the development of horizons in many soils of Dent County. Soils in an advanced stage of development have illuvial horizons of clay accumulation. In some mature soils, such as the Lebanon and Moniteau soils, formed from material fairly free of chert on nearly level to gentle slopes, silicate clay accumulation is expressed in illuvial B horizons that contain more total clay and more fine clay than the horizons above or below. In soils formed from very cherty sandy material on stronger slopes, for example the Nixa soils, the illuvial horizons may have no more total clay than the C horizon, but they do have some fine clay. Clay films occur as thin layers on the faces of peds in most soils that have blocky structure. If the amount of translocated clay is large, it fills the natural cracks of the soil and moves into crevices and openings left by plant roots, animals, or insects.

The reduction and transfer of iron have occurred in all of the very poorly drained, poorly drained, and somewhat poorly drained soils. In the naturally wet soils in the county, the reduction and transfer of iron, a process often called gleying, is important in horizon differentiation. Gleying is most pronounced in the Atkins, Elkins, Moniteau, and Westerville soils.

The gray colors in the deeper horizons of wet soils indicate the reduction of iron oxides. This reduction

commonly is accompanied by some transfer of the iron. After it has been reduced, iron may be removed completely from some horizons and may even go out of the soil profile. More commonly in Dent County, the iron has moved a short distance and stopped either in the horizon of its origin or in a nearby horizon. Iron has been segregated within deeper horizons of some of the soils to form yellowish-red, strong-brown, or yellowish-brown mottles. Spots of black concretions, probably of manganese, also are common.

## 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 their response to manipulation. First, through classification, and then through use of soil maps, we can apply our knowledge to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and applied in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The current system of classifying soils was placed in general use by the National Cooperative Soil Survey in 1965. It is under continual study. Therefore, readers interested in developments of this system should refer to the latest literature available (9, 11). In table 8, the soil series represented in Dent County are placed in higher categories of the current system. The classes of the current system are briefly defined in the following paragraphs:

**ORDER:** Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. The exceptions, Entisols and Histosols, occur in many different climates.

Four soil orders are represented in Dent County—Alfisols, Entisols, Inceptisols, and Ultisols.

Alfisols are soils that have a clay-enriched B horizon that has high base saturation.

Entisols are young mineral soils that do not have genetic horizons or have only the beginnings of such horizons.

Inceptisols are mineral soils in which horizons have definitely started to develop. They generally are on young, but not recent, land surfaces.

Ultisols are soils that have a thoroughly leached subsoil that has a base saturation of less than 35 percent. They commonly occur on old land surfaces.

**SUBORDER:** Each order is subdivided into suborders, primarily on the basis of soil characteristics that seem to produce classes having greatest genetic similarity. The

TABLE 8.—*Soil series classified according to the current system*

Series	Current system <sup>1</sup>		
	Family	Subgroup	Order
Ashton.....	Fine-silty, mixed, mesic.....	Mollic Hapludalfs.....	Alfisols.
Atkins <sup>2</sup> .....	Fine-silty, mixed, acid, mesic.....	Fluventic Haplaquepts.....	Inceptisols.
Bado.....	Fine, mixed, mesic.....	Typic Fragiaqualfs.....	Alfisols.
Baxter.....	Fine, mixed, mesic.....	Typic Paleudults.....	Ultisols.
Clarksville.....	Loamy-skeletal, siliceous, mesic.....	Humic Haplaquepts.....	Ultisols.
Coulstone.....	Loamy-skeletal, siliceous, mesic.....	Typic Paleudults.....	Ultisols.
Elkins.....	Fine-silty, mixed, acid, mesic.....	Fluventic Humaquepts.....	Inceptisols.
Elsah.....	Loamy-skeletal, mixed, nonacid, mesic.....	Typic Udifluvents.....	Entisols.
Gladden.....	Coarse-loamy, siliceous, mesic.....	Fluventic Dystrochrepts.....	Inceptisols.
Hobson.....	Fine-loamy, siliceous, mesic.....	Typic Fragiudalfs.....	Alfisols.
Lebanon.....	Fine, mixed, mesic.....	Typic Fragiudalfs.....	Alfisols.
Moniteau.....	Fine-silty, mixed, mesic.....	Typic Ochraqualfs.....	Alfisols.
Nixa.....	Loamy-skeletal, siliceous, mesic.....	Ochreptic Fragiudults.....	Ultisols.
Pope.....	Coarse-loamy, mixed, mesic.....	Fluventic Dystrochrepts.....	Inceptisols.
Razort.....	Fine-loamy, mixed, mesic.....	Mollic Hapludalfs.....	Alfisols.
Sharon.....	Coarse-silty, mixed, mesic.....	Fluventic Dystrochrepts.....	Inceptisols.
Viraton.....	Fine-loamy, siliceous, mesic.....	Typic Fragiudalfs.....	Alfisols.
Westerville.....	Fine-silty, mixed, acid, mesic.....	Aeric Fluventic Haplaquepts.....	Inceptisols.

<sup>1</sup> Placement of some soil series in the current system, particularly placement in families, may change as more precise information becomes available.

<sup>2</sup> In many places in Dent County, the Atkins soils are fine-loamy instead of fine-silty.

suborders have a narrower climatic range than the orders. The criteria for suborders mainly reflect the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

**GREAT GROUP:** Soil suborders are separated into great groups on basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make the separations are those in which clay, iron, or humus has accumulated or those that have pans interfering with growth of roots or movement of water. Among the characteristics considered are the self-mulching properties of clay, soil temperature, and major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium). The great group is not shown in table 8, because it is the last word in the name of the subgroup.

**SUBGROUP:** Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and others, called intergrades, that have properties of one great 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.

**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.

## Chemical and Physical Analysis of Soils

Table 9 contains data on laboratory analyses of samples from the profiles of four selected soils in Dent

County. These data provide information useful in determining how the soils formed and in classifying them.

The samples of the profiles analyzed were from Ashton silt loam, Clarksville cherty silt loam, Hobson silt loam, and Lebanon silt loam. Profiles typical of these soils are described in the section "Descriptions of the Soils." The Ashton soils formed in alluvium on stream terraces. The Clarksville soils formed in residuum from cherty dolomite or a mixture of cherty dolomite and limestone. The Hobson and Lebanon soils formed in loess-mantled residuum from cherty limestone and sandstone.

Samples from the surface layers of many different kinds of soils have been analyzed at the Dent County Soil Laboratory, but the results of these analyses are not reported in this survey. More than half of the samples analyzed showed that the surface layers were low in nitrogen, phosphorus, and calcium. Many other samples from surface layers had an inadequate amount of potassium and magnesium. More than half of the samples were very strongly acid or strongly acid. The rest of the surface layers analyzed had received additions of fertilizer.

Detailed analyses of profiles from undisturbed areas indicate that, in general, the soils in Dent County have low base saturation, low total cation-exchange capacity, and low levels of nitrogen and phosphorus.

## Field and Laboratory Methods

All samples used to obtain the data in table 9 were collected from carefully selected pits. These samples were taken from each horizon for analysis. The samples were air dried, crushed by a rolling pin, and passed through a 2-millimeter sieve. All laboratory analyses were made on material less than 2 millimeters in diameter.

The content of organic matter was determined by wet combustion, using Graham's modification of the Walkley-

TABLE 9.—*Chemical and mechanical*

Soil	Horizon	Depth	Organic matter	Phosphorus (P <sub>2</sub> O <sub>5</sub> )	Exchangeable cations	
					Hydrogen	Calcium
		<i>Inches</i>	<i>Percent</i>	<i>Lbs. per acre</i>	<i>Meq./100 gm.</i>	<i>Meq./100 gm.</i>
Ashton silt loam.	A1	0-8	2.6	5	4.0	5.4
	B1	8-13	1.5	19	4.0	4.2
	B21t	13-24	.8	6	5.0	3.1
	B22t	24-29	.4	6	7.0	1.9
	B3	29-50	.5	13	7.0	1.8
Clarksville cherty silt loam.	A1	0-1	4.2	29	6.0	1.2
	A2	1-13	.9	16	4.0	.2
	B2t	13-20	.6	8	8.5	.7
	B3	20-36	.5	12	4.5	1.0
Hobson silt loam.	A1	0-3	2.0	14	4.2	.8
	A2	3-8	.6	14	5.0	.3
	B21t	8-13	.8	16	8.8	.5
	B22t	13-20	.4	16	10.2	.5
	Bx1	20-24	.3	13	7.4	.3
	Bx2	24-42	.4	11	3.9	.2
Lebanon silt loam.	A1	0-6	2.2	11	3.5	2.2
	A2	6-8	1.6	9	2.5	2.1
	B1	8-13	1.0	3	4.0	1.5
	B21	13-21	.9	3	10.5	1.8
	B22	21-24	.7	0	10.0	1.3
	IIA2bx	24-31	.8	3	6.0	.8
	IIB2tb	31-54	.5	2	12.0	3.4

<sup>1</sup> Analyses made by the Department of Soils, College of Agriculture, University of Missouri.

Black method (2). Phosphorus was determined colorimetrically by using the dilute acid-fluoride method of extraction (2). The exchangeable bases were extracted by the ammonium acetate method (2). Calcium and magnesium were analyzed by using the EDTA titrations (2). Extractable potassium and sodium were analyzed on the Coleman Model 21 flame photometer. Exchangeable hydrogen was determined by using Woodruff's buffered solution and glass electrode (15). Reaction (pH) was determined by using the glass electrode in the 1:1 saturated paste of soil and water and also in a 1:1 paste of soil and 0.01 molar calcium chloride.

Analysis of particle-size distribution was determined by using the hydrometer method (2) on samples from which organic matter and free salts had been removed.

## General Nature of the County

This section provides information of interest to those not familiar with Dent County. Information is given about geology, physiography, and drainage; climate; settlement and population; water supply; and transportation, industry, and markets. Also given are farming statistics from the 1964 Census of Agriculture.

## Geology, Physiography, and Drainage<sup>6</sup>

Dent County lies on the Salem Plateau of the Ozark Province. The entire county is underlain by sedimentary

<sup>6</sup> JAMES A. MARTIN, geologist, Missouri Geological Survey and Water Resources, prepared the descriptions of the formations.

rocks ranging from the Lower Ordovician to the Upper Cambrian age. Throughout most of the county the rock strata deviate only slightly from the horizontal. The structural attitude of the rock strata is controlled principally by the shape of the Ozark uplift. The apex of this uplift forms the core of the St. Francois Mountains to the east of Dent County. The rock strata dip away from this apex in all directions and dip from east to west in Dent County.

From the oldest to the youngest, the geologic formations cropping out in the county are the Potosi, Eminence, Gasconade, Roubidoux, and Jefferson City. Figure 10 shows the bedrock formations in the county (5). These formations are described in the following paragraphs. Their role in the formation of soils is discussed under "Parent Material" in the section "Formation, Morphology, and Classification of Soils."

The Potosi Formation consists of dark-gray, massive, medium-grained dolomite that contains an abundance of quartz druse, sometimes called mineral blossom. The dolomite gives off an offensive odor when struck by a hammer. The residuum from this formation is a sticky, dark-red clay that contains many fragments of quartz druse. The maximum thickness of the Potosi Formation recorded in drilling wells in the county is about 300 feet. Outcrops of the Potosi Formation in Dent County are only in an area near Boss along Huzzah Creek and its tributaries, where the upper 100 feet of the formation is exposed.

The Eminence Formation is massive-bedded, medium to coarsely crystalline dolomite. It is light gray and contains a small amount of chert. Occurring with some of

analyses of four selected soils<sup>1</sup>

Exchangeable cations—Continued			Sum of cations	Base saturation	Reaction	Particle-size distribution (hydrometer)		
Magnesium	Potassium	Sodium				Sand (2.0 mm.— 0.05 mm.)	Silt (0.05 mm.— 0.002 mm.)	Clay (<0.002 mm.)
<i>Meq./100 gm.</i>	<i>Meq./100 gm.</i>	<i>Meq./100 gm.</i>	<i>Meq./100 gm.</i>	<i>Percent</i>	<i>pH</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
2.6	0.2	0.2	12.4	68	6.0	17	66	17
2.0	.1	.2	10.5	62	5.7	17	61	22
2.6	.2	.2	11.1	54	5.4	14	55	32
2.7	.2	.2	12.0	42	5.2	14	57	29
3.3	.2	.2	12.5	44	5.1	16	55	29
.4	.3	.4	8.3	28	4.8	24	67	19
.2	.1	.2	4.7	15	4.6	27	60	13
1.4	.2	.2	11.0	23	4.7	34	45	21
1.6	.2	.2	7.5	40	4.9	16	47	37
.4	.2	.2	5.8	28	5.1	35	53	12
.9	.2	.2	6.6	24	4.9	33	51	16
1.5	.2	.2	11.2	21	4.8	32	42	26
2.0	.3	.2	13.2	11	4.8	47	27	26
1.3	.2	.2	9.4	21	4.9	58	24	18
.7	.1	.2	5.1	24	5.0	72	20	8
.8	.2	.1	6.8	48	5.1	29	61	10
.4	.1	.1	5.2	52	5.3	24	65	11
.4	.1	.1	6.1	34	5.2	23	64	13
2.4	.2	.1	15.0	30	4.8	21	54	25
1.8	.2	.1	13.4	25	4.8	29	46	25
1.4	.1	.2	8.5	29	4.8	40	46	14
6.0	.2	.7	22.3	47	4.7	17	19	64

the chert is a small amount of quartz druse similar to that in the Potosi Formation. On slopes where the residuum from the Eminence Formation is fairly thin, rounded pinnacles of vuggy, or porous, dolomite protrude above the shallow soil. In Dent County the Eminence Formation crops out along the Meramec River from Stone Hill northward to the county line, in the Boss-Howes Mill area, along the drainageways in the southeastern part of the county, and along Crooked Creek in the northeastern corner of the county. Average thickness of the formation in the county is 250 feet.

The Gasconade Formation consists of light-gray, cherty, crystalline dolomite. The Gunter member occurs at the base of this formation and is a persistent sandstone. Residual slopes of the Lower Gasconade Formation are thickly mantled with light-gray chert fragments and are called snowy slopes. In the upper Gasconade Formation steep slopes and bluffs have formed along stream valleys, but the residuum of chert fragments is not extensive. The thickness of the Gasconade Formation generally ranges between 250 and 300 feet, though Precambrian highs or collapse of solution has caused a marked decrease in thickness in local areas.

The Roubidoux Formation is predominantly sandstone, dolomitic sandstone, and dolomite. Generally, there is a massive middle unit of sandstone about 60 feet thick. Dolomite, generally cherty, and sandstone lie above and below the middle unit. The estimated thickness of the Roubidoux Formation is about 150 feet. Average thickness is difficult to estimate since much of the Roubidoux Formation is present only as residuum of insoluble material.

The Jefferson City Formation occurs only in the extreme northwestern corner of the county near Lecoma. The basal part of the formation is all that remains. It consists of medium to massive beds of brown to grayish-brown dolomite. About 50 feet is the maximum thickness of this formation in Dent County.

Much of Dent County is mantled by fairly thick residuum. The beds of calcium carbonate in this material have been removed by leaching or in solution, and only the insoluble sand, chert, and red clay remain. Variations in thickness are extreme. In Dent County this residual material is more than 50 feet thick. Some wells used for domestic needs were drilled through 200 feet of residuum before bedrock was reached. All of the Roubidoux Formation and much of the Upper Gasconade Formation remain only as a residual cover.

Loess, probably of Wisconsin age, was laid down over most of the county. Most of the loess has been removed by geologic erosion, and only the nearly level areas of the uplands are now mantled with significant amounts of the original loess.

The surface of the Salem Plateau is undulating and is cut by young valleys (fig. 11). Depth of the valleys increases along the edges of the Salem Plateau. Elevations on the central part of the uplands are more than 1,300 feet above sea level, but the valley floors in the northern part are less than 900 feet.

Drainage is generally to the north or south, for the plateau extends across the middle part of the county in an east-west direction. The Meramec River, in the northeastern part, flows to the north. Dry Fork Creek rises in the northwestern part of the county and also flows to the

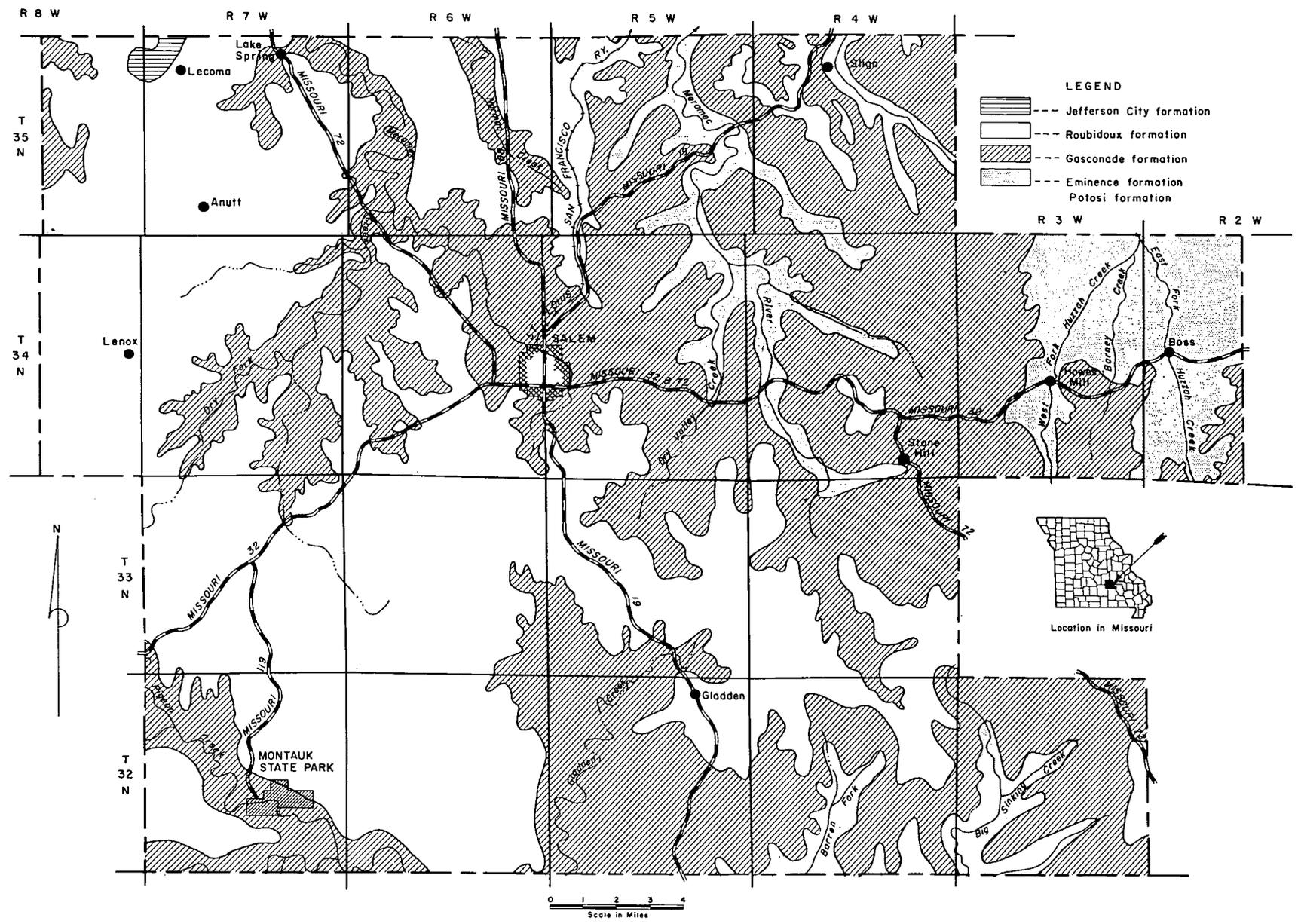
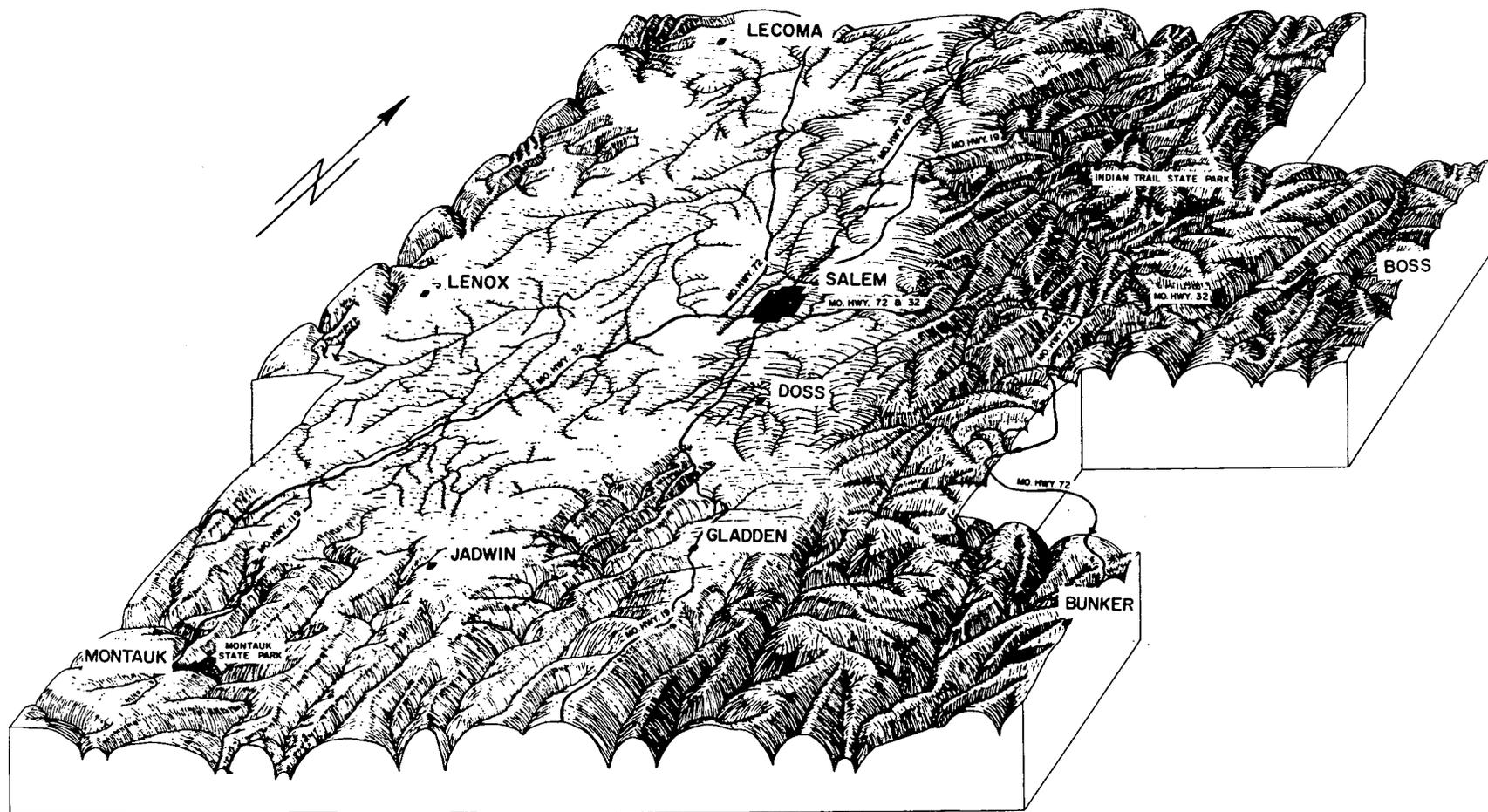


Figure 10.—Bedrock formations of Dent County.



DENT COUNTY, MISSOURI

Figure 11.—Relief and drainage pattern of Dent County.

north. The southeastern corner of the county is drained by Big Sinking Creek, which flows to the south. Large areas surrounding the bottom lands of these major drainageways are very steep. Most of the soils are very stony, especially those in the deeply dissected watershed of the Meramec and Current Rivers.

## Climate <sup>7</sup>

In preparing the text and tables in this section, records at Salem were used. The records are for the year 1930 and the period 1932 through 1960, excluding 1931. Data for 1931 were not used, because many breaks in the record occurred in that year. Temperature readings were obtained from a standard instrument at a height of 5 feet above the ground. The observing station was in the immediate vicinity of Salem during the entire period of record.

Much of the information in this section is in tables 10, 11, 12, 13, 14, and 15. Table 10 is a climatic summary that gives data on precipitation and temperature at Salem. The average annual precipitation ranges from slightly below 20 inches to 57 inches. April, May, and June have the greatest average rainfall. During these months thunderstorms are most frequent, though storms have occurred during each month of the year. During the growing season, the amount of rainfall decreases in July and August, as shown in table 10.

<sup>7</sup> By JAMES D. McQUIGG, State climatologist, U.S. Weather Bureau, Columbia, Mo.

Table 11 lists the amount of rainfall likely to be received at Salem, in 30 minutes, 60 minutes, and 24 hours, during 1 year in 2, 1 year in 10, and 1 year in 100 years. In about 1 year in 10, for example, 2.45 inches is the most intense rainfall likely to be received in 60 minutes.

Table 12 shows chance, in percent, of receiving 0.4, 1.0, 2.0, and 4.0 inches of rainfall during periods of 2 weeks from March 1 through October 10. Much of the precipitation comes in thunderstorms during the growing season, when there is also a risk of hail. Another risk, though slight, is that of having an occasional tornado. Table 12 shows that the probability of receiving large amounts of rainfall generally decreases during the latter part of the growing season.

In two of the 30 winters used for the period of record at Salem, there was no snow at all. One-third of the winters had 6 inches of snow or less, and slightly less than one-third of the winters had 12 inches or more. Precipitation in winter is usually snow or a mixture of snow and rain. Freezing rain generally occurs about once or twice during a winter.

As previously stated, table 10 gives a summary of temperature at Salem, but there are local areas in Dent County that have temperatures differing from those recorded at Salem. This is particularly true on clear, still nights in low areas, where temperatures are several degrees less than the temperatures recorded in table 10. The temperature near the ground, however, is more uniform when the wind is blowing or the sky is overcast.

TABLE 10.—*Precipitation and*

Month	Precipitation								
	Average total	One year in 10 will have—		Extreme values in monthly precipitation		Greatest daily rainfall	Number of days when precipitation is—		
		Less than—	More than—	Least	Most		0.10 inch or more	0.20 inch or more	1.00 inch or more
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>			
January .....	2.18	0.55	6.00	0.12	7.33	2.88	6	4	( <sup>1</sup> )
February .....	2.58	.93	5.00	.29	6.33	3.30	6	4	1
March .....	3.60	1.10	6.50	.60	10.30	2.56	7	5	1
April .....	4.24	1.65	8.20	1.25	9.74	3.45	7	6	1
May .....	5.15	1.90	8.20	1.73	10.03	3.62	8	7	1
June .....	4.51	.70	9.00	.48	12.80	2.64	7	6	1
July .....	3.16	.60	6.30	.23	10.84	3.48	5	4	1
August .....	3.39	.65	6.40	.34	9.66	5.79	5	4	1
September .....	3.70	.60	9.40	.41	11.31	4.34	6	4	1
October .....	3.46	1.05	5.90	.68	9.55	3.62	5	4	1
November .....	3.24	1.30	5.70	.18	8.45	2.75	6	4	1
December .....	2.74	.75	5.30	.39	8.50	5.70	5	3	1
Year .....	41.95	31.90	57.00	19.15	63.75				

<sup>1</sup> Less than 0.5.

The probability of the last specified freezing temperature in spring and the first in fall, at specified dates, is given in table 13. The average length of the growing season, in the interval between the last freezing temperature in spring and the first in fall, is 177 days. Table 14 gives the average number of days per month that have a maximum temperature of 32° or less, 50° or more, and 80° or more or has a minimum temperature of 0° or less, 32° or less, or 50° or less.

January is the coldest month in Dent County. It also is the month when the lowest temperature, 19° below zero, was recorded during the 30 years of record. Seldom, however, are periods of very low temperature prolonged. During almost every December, January, and February several periods occur that have temperatures in the 50's or 60's. In about only three of four Decembers or Januaries did the temperature fail to rise above 54° at least once. Seldom have temperatures fallen below zero in December or March, but temperatures of below zero are slightly more numerous in February and are likely in January. In 30 years about three Januaries had 5 or more days with a temperature below zero. Slightly more than half of the winters do not have a temperature of zero or below.

July is generally the hottest month and also is the month having the highest extremes in temperature. Temperatures of 90° or above have occurred in Dent County as early as the latter part of April and as late as October, but these high temperatures are most likely during June, July, August, and September. In about 6

years out of 10, July does not have a temperature of 100° or higher.

In midsummer, temperatures at night are a few degrees lower than those during the day. On an average of at least one night in July, the temperature falls to 50° or below.

Some of the moisture that falls as rain or snow evaporates, returns to the atmosphere, and is carried away by the wind. During the growing season, some of the water is transpired by plants. Evaporation and transpiration that occur together are called evapotranspiration. Estimates of evapotranspiration given in this section are called potential evapotranspiration and are based on actual measurements. Potential evapotranspiration is the maximum amount of water that can be returned to the atmosphere when soil moisture is at or above field capacity. This moisture is not available to plants. At times during almost every growing season, however, the level of soil moisture is low and the estimated potential evapotranspiration is not reached. Table 15 shows, for each month of the year, the average heating degree-days and also the number of degree-days that probably would be exceeded about 1 year in 10. Degree-days are accumulations of time-temperature units in which the unit of time is 1 day and the unit of temperature is in degrees Fahrenheit. The number of heating degree-days for a given day is equal to a base temperature of 65°, less the mean temperature for that day; the total number of heating degree-days for a month is the sum of all the daily values. The base temperature of 65° is the lowest

*temperature at Salem, Missouri*

Precipitation—Continued		Temperature						
Snowfall		Average daily			Two years in 10 will have at least 4 days with—		Extreme values	
Monthly average	Extreme value	Maximum	Minimum	Mean	Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—	Maximum	Minimum
<i>Inches</i>	<i>Inches</i>	<i>° F.</i>	<i>° F.</i>	<i>° F.</i>	<i>° F.</i>	<i>° F.</i>	<i>° F.</i>	<i>° F.</i>
2.5	10.6	43.8	22.9	33.0	64	3	79	-19
2.6	12.0	47.7	25.7	36.7	69	10	80	-17
2.7	20.5	55.7	32.4	44.0	75	17	85	-8
.1	1.5	66.8	43.4	55.6	83	28	92	18
0	0	76.4	52.6	64.5	88	38	94	29
0	0	85.1	61.7	73.6	98	49	105	39
0	0	90.0	65.2	77.6	103	56	111	44
0	0	88.9	64.0	76.5	100	52	112	39
0	0	81.4	55.5	68.5	74	40	104	30
0	0	71.0	45.0	58.0	85	31	93	19
.5	5.0	55.9	32.8	44.4	73	17	86	-2
1.6	7.0	45.4	25.7	35.6	64	8	73	-5
10.00	34.8							

daily mean temperature for which no home heating is considered necessary.

Figure 12 shows the precipitation and evapotranspiration pattern for an average year, a very dry year, and a very wet year at Salem. When the temperatures are normal, annual potential evapotranspiration at Salem is about 31 inches. Most of this occurs in the period April through October, as shown in the figure. Evapotranspiration reaches its peak when rainfall is lowest and temperatures are highest. This is in June, July, and August.

During an average year, in October through May, the plants are dormant and the total amount of precipitation exceeds the potential loss through evapotranspiration. These are the months when moisture in the topsoil is replenished. Normally, the soils throughout Dent County cannot store more than a small fraction of the excess precipitation in fall and winter. Part of this water is lost through runoff, and part becomes ground water that is released through the many springs in the area.

During spring, summer, and fall, a considerable amount of water evaporates from the surface of ponds. The exact amount of this loss varies from pond to pond and from year to year, but evaporation averages about 40 to 50 inches in a year. About 30 to 32 inches, or roughly three-fourths of the loss, occurs from May through October.

## Settlement and Population

The first settlements were established in Dent County along Spring Creek in 1840. Most of the early settlers were from the Southeastern States. In 1857, the State Legislature created Dent County with land from surrounding counties. The county was named for its first elected representative, Lewis Dent.

The United States census reports show that the population of Dent County was 10,936 in 1950 and 10,445 in 1960. The population of Salem was 3,611 in 1950 and 3,870 in 1960. Salem has more than 37 percent of the total population of the county.

## Water Supply

No rivers or major creeks run through Dent County, but the sources of the Current and Meramec Rivers, two of the larger streams, are in the Ozark region in the county. About 78 miles of perennial streams provide a continuous water supply. Small springs of various capacity are numerous and occur throughout the county. Some of these springs are dependable sources of water, even in dry periods. The largest spring in the county is Montauk Spring in the southwestern part of the county. This spring is the source of the Current River. Another large spring at Howes Mill, in the eastern part of the county, is one of the main sources of water for Huzzah Creek.

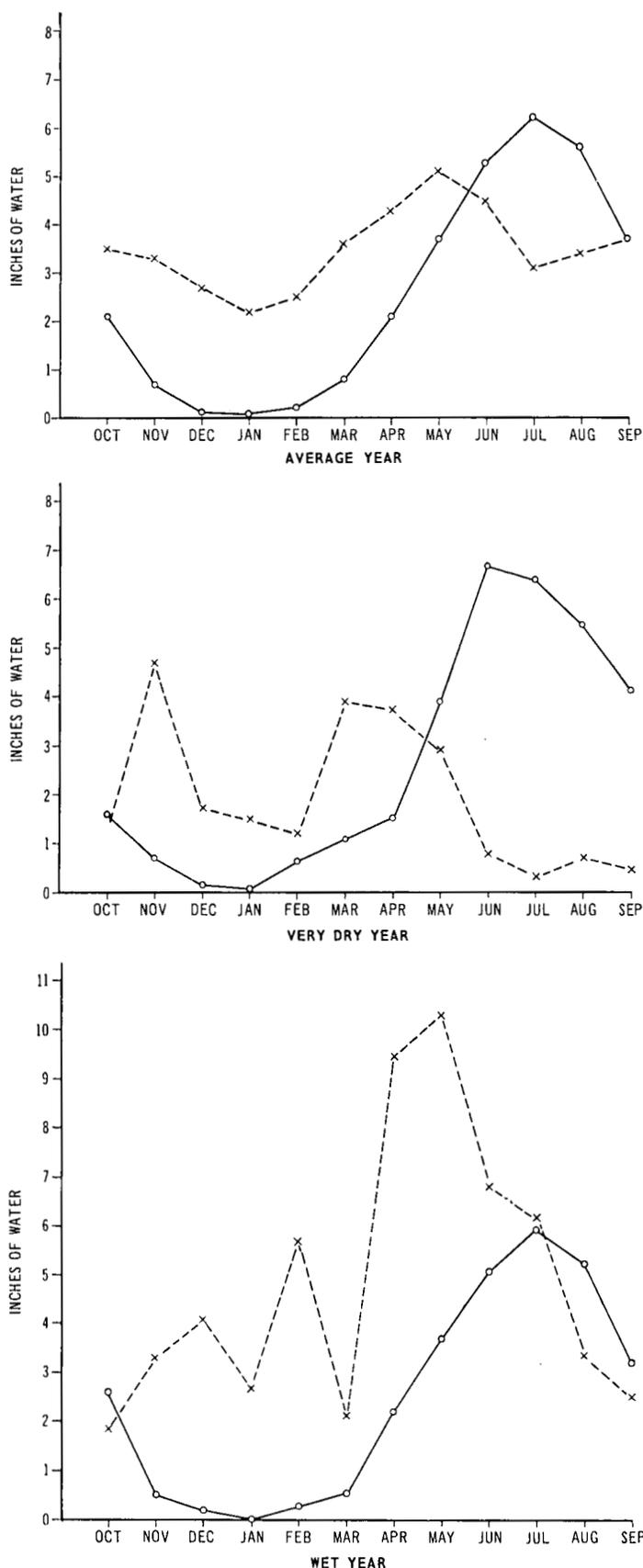


Figure 12.—Precipitation and evapotranspiration for an average year, a very dry year, and a wet year at Salem. Solid line represents evapotranspiration, and broken line precipitation.

Adequate supplies of water for farm and household uses can be obtained from moderately deep wells, but greater quantities are available from wells 1,000 feet deep or more.

Farm ponds are common throughout the county and supply most of the water used by livestock. In the county are several manmade lakes as much as 27 acres in size. They are used mainly for recreational purposes.

### Transportation, Industry, and Markets

Continental Trailways, a national bus system, connects Salem with St. Louis and Springfield. Two small bus companies provide service to Rolla, in Phelps County, to Jefferson City, in Cole County, and to St. Louis. A branch of the St. Louis-San Francisco Railway connects Salem with the main line at Cuba, in Crawford County. This railroad and several trucklines transport the heavy freight of Dent County.

The county has a lighted, hard-surfaced, 2,800-foot airstrip open 24 hours a day, but there are no commercial airlines.

Dent County has four State Routes—19, 32, 68, and 72. In rural areas the State and county maintain a network of all-weather roads.

Charcoal kilns produce about 12,000 tons of charcoal annually. A charcoal briquet plant is in Dent County. Also, many stave bolts are produced. Other significant industries in the county are a factory that makes women's shoes, one that makes sport coats for men and boys, and one that makes women's lingerie.

Most of the livestock of Dent County is marketed through two livestock sale barns.

### Farming Statistics

The farming of Dent County is centered around the production of feeder cattle and feeder pigs. In 1964, when a total of 266,789 acres, or about 55 percent of the county, was in farms, 150,641 acres, or about 31 percent of the county, was cleared. On only about 22,570 acres, or about 9 percent of the land in farms, were crops harvested. The harvested acreage is small, because the soils in extensive areas are not well suited to cultivation. In 1964, 41,078 acres, or about 15 percent of the land in

farms, was used only for pasture. The acreage used only for pasture is increasing because in some areas the soils formerly cultivated are marginal.

In this county in 1964, the area in corn for all purposes was 3,504 acres; wheat, 444 acres; and oats for grain,

TABLE 11.—Estimated amount of rainfall expected at Salem, Missouri, 1 year in 2, 1 year in 10, and 1 year in 100 in periods of 30 minutes, 60 minutes, and 24 hours

Length of period	One year in 2	One year in 10	One year in 100
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
30 minutes-----	1. 35	1. 95	2. 70
60 minutes-----	1. 65	2. 45	3. 40
24 hours-----	3. 70	5. 30	7. 45

TABLE 12.—Chance, in percent, of receiving at least 0.4, 1.0, 2.0, and 4.0 inches of precipitation during the 2-week periods from March 1 through October 10 at Salem, Missouri

Two-week periods	Percent of chance of receiving at least—			
	0.4 inch	1.0 inch	2.0 inches	4.0 inches
Mar. 1-14-----	96	70	25	1
Mar. 15-21-----	85	57	24	4
Mar. 22-28-----	95	74	39	7
Mar. 29-Apr. 11-----	85	63	36	11
Apr. 12-25-----	95	74	40	8
Apr. 26-May 9-----	96	82	54	17
May 10-23-----	84	64	39	14
May 24-June 6-----	88	76	55	25
June 7-20-----	77	57	34	11
June 21-July 4-----	71	46	21	4
July 5-18-----	87	62	28	4
July 19-Aug. 1-----	89	68	40	12
Aug. 2-15-----	78	57	34	12
Aug. 15-29-----	79	55	29	7
Aug. 30-Sept. 12-----	76	56	33	12
Sept. 13-26-----	84	66	35	7
Sept. 27-Oct. 10-----	72	51	28	9

TABLE 13.—Probability of last freezing temperatures in spring and first in fall at Salem, Mo.

Probability	Dates for given probability and temperature				
	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 21	April 1	April 11	April 20	May 4
2 years in 10 later than-----	March 14	March 24	April 4	April 15	April 29
5 years in 10 later than-----	March 3	March 11	March 24	April 5	April 19
Fall:					
1 year in 10 earlier than-----	November 13	November 5	October 26	October 12	September 29
2 years in 10 earlier than-----	November 18	November 10	October 30	October 18	October 4
5 years in 10 earlier than-----	November 29	November 19	November 8	October 28	October 14

TABLE 14.—Average number of days in each month that have specified maximum and minimum temperatures

Month	Average number of days per month that have—					
	Maximum temperature of—			Minimum temperature of—		
	32° F. or less	50° F. or more	90° F. or more	0° F. or less	32° F. or less	50° F. or less
January.....	6.5	10.4	0	1.6	25.5	30.7
February.....	3.3	12.8	0	.7	21.8	27.7
March.....	1.3	20.5	0	.2	16.5	28.8
April.....	0	27.7	.2	0	4.0	21.9
May.....	0	30.9	.7	0	.2	12.0
June.....	0	30.0	8.6	0	0	2.2
July.....	0	31.0	16.5	0	0	.8
August.....	0	31.0	15.3	0	0	1.4
September.....	0	30.0	5.8	0	.1	9.4
October.....	0	29.9	.3	0	3.3	21.7
November.....	.9	20.8	0	( <sup>1</sup> )	15.7	27.7
December.....	4.1	11.0	0	.2	23.6	30.7

<sup>1</sup> Less than 0.05 day.

TABLE 15.—Heating degree-days at Salem, Missouri

Month	Heating degree-days	In 1 year in 10, heating degree-days expected to be—	
		More than—	Less than—
August.....	3	-----	-----
September.....	58	98	18
October.....	245	344	146
November.....	621	743	499
December.....	912	1,062	762
January.....	991	1,200	781
February.....	799	978	620
March.....	651	867	435
April.....	306	410	201
May.....	102	155	50
June.....	13	-----	-----
Season.....	4,701	-----	-----

722 acres. Among the hay crops are oats, wheat, barley, rye, or other small grains cut for hay, 1,105 acres; lespedeza cut for hay, 1,236 acres; clover and timothy and mixtures cut for hay, 10,957 acres; and alfalfa and alfalfa mixtures cut for hay, 2,093 acres.

Most of the crops harvested in Dent County are fed to livestock. In 1964, there were 24,220 cattle and calves other than dairy on farms in the county. Also, there were 1,051 dairy cows, 9,639 hogs and pigs, 286 sheep and lambs, 4,065 goats and kids of all ages, and 16,817 chickens 4 months old and older.

In 1964 the number of turkeys and turkey fryers in Dent County was 7,964. The farmers sold 77,416 dozen eggs, 2,886,305 pounds of whole milk, 4,030 pounds of cream (butterfat), 1,729 pounds of wool, and 5,944 pounds of mohair.

In Dent County the number of farms is decreasing and the average-sized farm is increasing. The number of farms decreased from 1,423 in 1954 to 1,046 in 1964. The

average-sized farm increased from 201 acres in 1954 to 255 in 1964.

### Literature Cited

- (1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. 1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., illus.
- (2) BLACK, C. A. 1965. METHODS OF SOIL ANALYSIS. Amer. Soc. Agron. No. 9, 2 v., 1572 pp., illus.
- (3) KROTH, E. M., JAMISON, V. J., AND GROGGER, H. E. 1960. SOIL MOISTURE SURVEY OF SOME REPRESENTATIVE MISSOURI SOIL TYPES. U.S. Dept. Agr., ARS-41-34, 57 pp., illus.
- (4) McCORMICK, L. E. AND SMITH, RICHARD C. 1961. DIRECTORY OF SAWMILLS AND OTHER WOOD-USING PLANTS IN MISSOURI. Univ. Mo. Cir. 733, 56 pp., illus.
- (5) MISSOURI GEOLOGICAL SURVEY AND WATER RESOURCES DIVISION. 1961. GEOLOGIC MAP OF MISSOURI. 1 p.
- (6) 1961. STRATIGRAPHIC SUCCESSION IN MISSOURI. 185 pp., illus.
- (7) PLETCHER, P. W. AND McDERMOTT, R. E. 1957. INFLUENCE OF GEOLOGIC PARENT MATERIAL AND CLIMATE ON DISTRIBUTION OF SHORTLEAF PINE IN MISSOURI. Univ. Mo. Agr. Expt. Sta. Res. Bul. 625, 42 pp., illus.
- (8) SCHNUR, G. LUTHER. 1937. YIELD, STAND, AND VOLUME TABLES FOR EVEN-AGED UPLAND OAK FORESTS. U.S. Dept. Agr. Tech. Bul. 560, 87 pp., illus. (Reprinted 1961.)
- (9) SIMONSON, ROY W. 1962. SOIL CLASSIFICATION IN THE UNITED STATES. Sci. 137: 1027-1034.
- (10) SOIL SURVEY STAFF. 1951. SOIL SURVEY MANUAL. U.S. Dept. Agr. Handbk. 18, 503 pp., illus.
- (11) 1960. SOIL CLASSIFICATION, A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. U.S. Dept. Agr., 265 pp., illus. [Supplement issued in March 1967]
- (12) UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE AND UNIVERSITY OF MISSOURI EXPERIMENT STATION. 1961. TIMBER RESOURCES OF THE EASTERN OZARKS. Bul. 779, 74 pp., illus.
- (13) UNITED STATES DEPARTMENT OF AGRICULTURE. 1929. VOLUME, YIELD, AND STAND TABLES FOR SECOND-GROWTH SOUTHERN PINES. Misc. Pub. No. 50, 202 pp. (Out of print.)

- (14) WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS.  
1953. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech.  
Memo. 3-357, 2 v. and appendix, illus.
- (15) WOODRUFF, C. M.  
1948. TESTING SOILS FOR LIME REQUIREMENTS BY MEANS OF A  
BUFFERED SOLUTION AND THE GLASS ELECTRODE. Soil  
Sci. 66: 53-63.

## Glossary

- Alluvium.** Soil material, such as sand, silt, or clay, that has been deposited on land by streams.
- Aspect.** The direction toward which a slope faces. Synonym. Exposure.
- Available moisture capacity.** The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension. Classes as used in this survey are as follows: High, more than 6 inches; medium, 4 or 5 inches; low, less than 3 inches.
- 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.
- Chert.** A very dense, cryptocrystalline, flintlike form of silica that breaks with a splintery fracture. It resists decomposition and generally remains as inert angular fragments in the residual mass. Chert fragments are up to 3 inches in diameter.
- 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.
- Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.
- 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.
- Eluviation.** The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.
- Erosion.** The wearing away of the land surface by wind (sand-blast), running water, and other geological agents. In this soil survey, the erosion classes are slightly eroded if 6 inches or more of surface soil remains; moderately eroded if less than 6 inches of surface soil remains. The surface layer and subsoil are commonly mixed in moderately eroded soils.
- Fertility, soil.** The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.
- Float rock.** Pieces of sandstone rock, generally 4 to 6 inches thick, 2 to 4 feet wide, and 2 to 8 feet long, that occur in random pattern within the solum, generally in a horizontal plane.
- Flood plain.** Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.
- Fragipan.** A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.
- Gleyed soil.** A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.
- Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.
- 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 O 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.
- Illuviation.** The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into the B horizon from the A horizon above, the B horizon is called an illuvial horizon.
- Loess.** A fine-grained eolian deposit consisting dominantly of silt-sized particles.
- Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.
- Mottled.** 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 soil drainage.** Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

*Excessively drained* soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

*Somewhat excessively drained* soils are also very permeable and are free from mottling throughout their profile.

*Well-drained* soils are nearly free from mottling and are commonly of intermediate texture.

*Moderately well drained* soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

*Imperfectly or somewhat poorly drained* soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below depths of 6 to 16 inches, in the lower A horizon and in the B and C horizons.

*Poorly drained* soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

*Very poorly drained* soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

**Parent material (soil).** The horizon of weathered rock or partly weathered soil material from which soil has formed.

**Permeability.** The quality of a soil horizon that enables water or air to move through it. 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 relatively weak acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

**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:

<i>pH</i>		<i>pH</i>	
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

**Residual material.** Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but in many places is the material in which a soil formed.

**Sand.** Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

**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.

**Slope.** Classes of slope used in this survey are—

	<i>Percent of slope</i>
Level	0 to 2
Nearly level	2 to 5
Gently sloping	5 to 9
Sloping	9 to 14
Moderately steep	14 to 20
Steep	20 to 30
Very steep	More than 30

**Soil depth.** In this survey, the following classes are used:

	<i>Inches</i>
Very shallow	0 to 10
Shallow	10 to 20
Moderately deep	20 to 36
Deep	More than 36

**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 characteristics 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 (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

**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."



GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which it belongs. To learn about the management of a woodland suitability group or wildlife group, read the description of the group and also the introduction to the section in which the group is described. Other information is given in tables as follows:

Acreage and extent, table 1, p. 7.  
 Estimated yields, table 2, p. 29.  
 Woodland suitability groups of soils,  
 table 3, p. 32.

Engineering uses of the soils, tables  
 4, 5, and 6, pp. 40 through 49.  
 Limitations of soils used for recreational  
 sites, table 7, p. 52.

Map symbol	Mapping unit	Page	Symbol	Page	Wildlife suitability group		Woodland suitability group	
					Number	Page	Number	Page
AsA	Ashton silt loam, 0 to 2 percent slopes-----	7	I-1	25	6	34	3	36
AsB	Ashton silt loam, 2 to 5 percent slopes-----	8	IIe-1	25	6	34	3	36
AsC	Ashton silt loam, 5 to 9 percent slopes-----	8	IIIe-1	26	6	34	3	36
At	Atkins loam-----	8	IIIw-1	26	7	34	2	36
BaB	Bado silt loam, 2 to 5 percent slopes-----	9	IIIe-5	26	4	34	8	37
CcC	Clarksville cherty silt loam, 2 to 9 percent slopes-----	10	IVs-6	27	1	31	10	38
CcD	Clarksville cherty silt loam, 9 to 14 percent slopes-----	10	VIs-6	28	1	31	10	38
CcF	Clarksville cherty silt loam, 14 to 30 percent slopes-----	10	VIIIs-6	28	1	31	10	38
CcG	Clarksville cherty silt loam, 30 to 50 percent slopes-----	10	VIIIs-6	28	1	31	10	38
CfF	Clarksville-Baxter cherty silt loams, 12 to 30 percent slopes-----	10	VIIIs-6	28	1	31	10	38
CfG	Clarksville-Baxter cherty silt loams, 30 to 50 percent slopes-----	11	VIIIs-6	28	1	31	10	38
CkC	Coulstone and Clarksville cherty soils, 2 to 9 percent slopes-----	11	IVs-6	27	1	31	10	38
CkD	Coulstone and Clarksville cherty soils, 9 to 14 percent slopes-----	12	VIIs-6	28	1	31	10	38
CkF	Coulstone and Clarksville cherty soils, 14 to 30 percent slopes-----	12	VIIIs-6	28	1	31	10	38
CkG	Coulstone and Clarksville cherty soils, 30 to 50 percent slopes-----	12	VIIIs-6	28	1	31	10	38
Ek	Elkins silt loam-----	13	IIw-1	25	7	34	1	36
Et	Elsah cherty loam-----	13	IIIIs-1	26	5	34	5	37
Ev	Elsah very cherty loam-----	13	IVs-6	27	5	34	9	37
Gd	Gladden loam-----	14	IIIs-1	25	6	34	5	37
LbB	Lebanon silt loam, 2 to 5 percent slopes-----	15	IIIe-2	26	2	32	6	37
LbC	Lebanon silt loam, 5 to 9 percent slopes-----	15	IVe-2	27	2	32	6	37
LcB	Lebanon cherty silt loam, 2 to 9 percent slopes-----	15	IVe-3	27	2	32	6	37
LhB	Lebanon and Hobson silt loams, 2 to 5 percent slopes-----	16	IIIe-2	26	2	32	6	37
LhB2	Lebanon and Hobson silt loams, 2 to 5 percent slopes, eroded--	16	IVe-2	27	2	32	6	37
LhC	Lebanon and Hobson silt loams, 5 to 9 percent slopes-----	16	IVe-2	27	2	32	6	37
LhC2	Lebanon and Hobson silt loams, 5 to 9 percent slopes, eroded--	16	IVe-2	27	2	32	6	37
LhD	Lebanon and Hobson silt loams, 9 to 14 percent slopes-----	17	IVe-2	27	2	32	6	37
LhD2	Lebanon and Hobson silt loams, 9 to 14 percent slopes, eroded--	17	VIe-2	28	2	32	7	37
MoA	Moniteau silt loam, 0 to 2 percent slopes-----	17	IIIw-3	26	4	34	4	37
MoB	Moniteau silt loam, 2 to 5 percent slopes-----	18	IIIe-5	26	4	34	8	37
NcB	Nixa-Clarksville cherty loams, 2 to 5 percent slopes-----	18	IVe-3	27	2	32	6	37
NcC	Nixa-Clarksville cherty loams, 5 to 9 percent slopes-----	19	IVe-3	27	2	32	6	37
NcD	Nixa-Clarksville cherty loams, 9 to 14 percent slopes-----	19	VIe-3	28	2	32	7	37
NcE	Nixa-Clarksville cherty loams, 14 to 19 percent slopes-----	19	VIIe-3	28	2	32	7	37
Po	Pope sandy loam-----	20	IIIIs-4	27	6	34	5	37
RaB	Razort loam, 1 to 3 percent slopes-----	21	IIIs-1	25	6	34	5	37
RcB	Razort cherty loam, 1 to 3 percent slopes-----	20	IIIIs-1	26	5	34	5	37
Rh	Riverwash-----	21	VIIIs-4	28	8	35	--	--
Rk	Rock land-----	21	VIIIs-6	28	3	33	10	38
Sa	Sandy alluvial land-----	21	IVs-4	27	5	34	9	37
Sh	Sharon silt loam-----	22	I-1	25	6	34	3	36
VcC	Viraton cherty silt loam, 5 to 9 percent slopes-----	22	IVe-3	27	1	31	6	37
VcC2	Viraton cherty silt loam, 5 to 9 percent slopes, eroded-----	22	VIe-3	28	1	31	7	37
VcD	Viraton cherty silt loam, 9 to 14 percent slopes-----	23	VIe-3	28	1	31	7	37
VcE	Viraton cherty silt loam, 14 to 19 percent slopes-----	23	VIIe-3	28	1	31	7	37
VrC	Viraton silt loam, red subsoil variant, 3 to 9 percent slopes-----	23	IVe-2	27	1	31	6	37
VrD	Viraton silt loam, red subsoil variant, 9 to 16 percent slopes-----	23	VIe-2	28	1	31	7	37
We	Westerville silt loam-----	24	IIw-1	25	7	34	1	36

# Accessibility Statement

---

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at [ServiceDesk-FTC@ftc.usda.gov](mailto:ServiceDesk-FTC@ftc.usda.gov). For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

## **Nondiscrimination Policy**

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

## **To File an Employment Complaint**

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (<http://directives.sc.egov.usda.gov/33081.wba>) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at [http://www.ascr.usda.gov/complaint\\_filing\\_file.html](http://www.ascr.usda.gov/complaint_filing_file.html).

## **To File a Program Complaint**

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at [http://www.ascr.usda.gov/complaint\\_filing\\_cust.html](http://www.ascr.usda.gov/complaint_filing_cust.html) or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to [program.intake@usda.gov](mailto:program.intake@usda.gov).

## **Persons with Disabilities**

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

---

**Supplemental Nutrition Assistance Program**

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (<http://directives.sc.egov.usda.gov/33085.wba>).

**All Other Inquires**

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (<http://directives.sc.egov.usda.gov/33086.wba>).