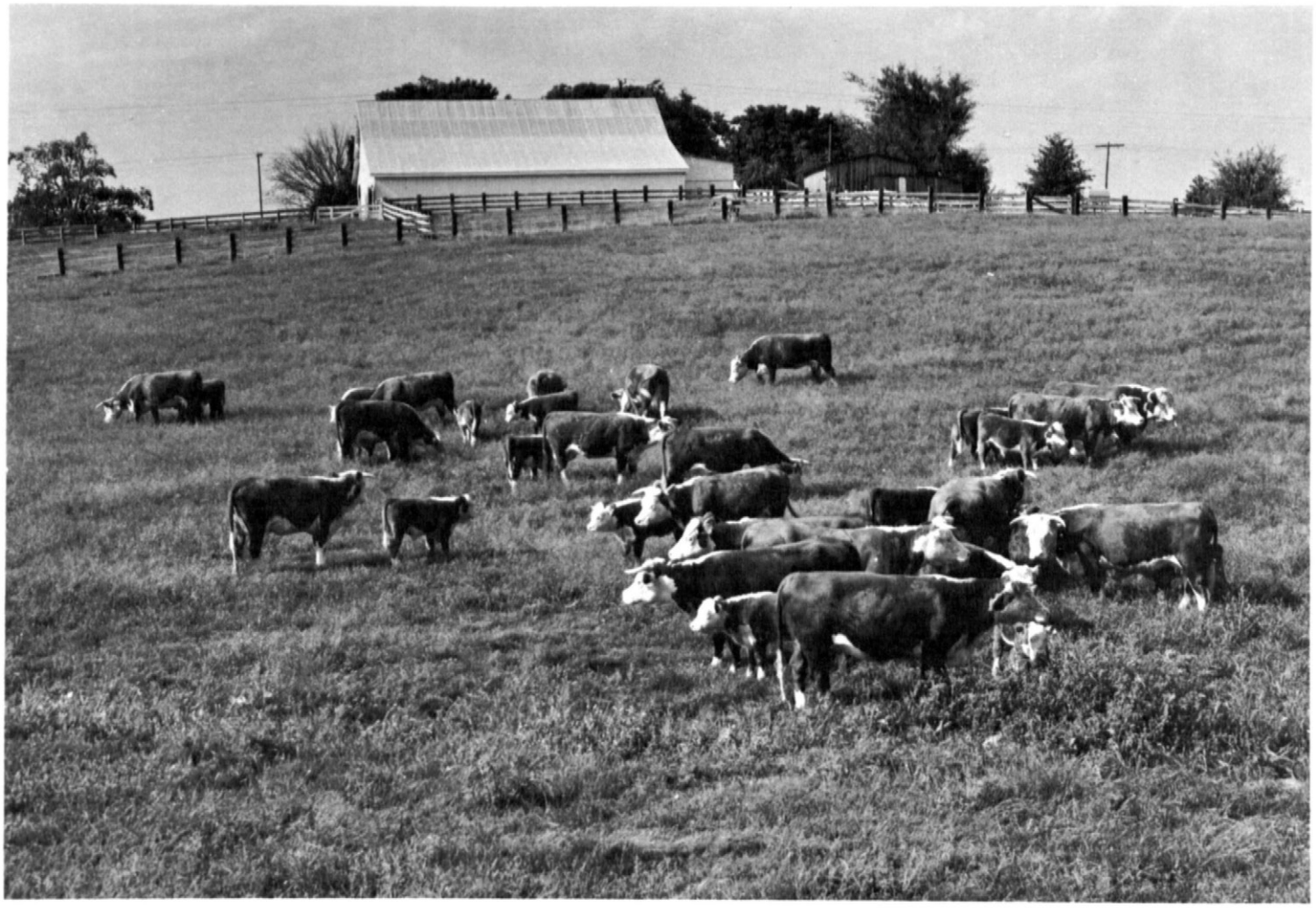
Issued February 1967

SOIL SURVEY

Henderson County, Kentucky



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
KENTUCKY AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1955–63. Soil names and descriptions were approved in 1964. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1962–64. This survey was made cooperatively by the Soil Conservation Service and the Kentucky Agricultural Experiment Station; it is part of the technical assistance furnished to the Henderson County Soil Conservation District.

HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Henderson County contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All the soils in Henderson County are shown on the detailed map at the back of this report. 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 this report. This guide lists all of the soils in 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, and wildlife group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay on the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the section that describes the soils and from the section that discusses management of soils for cultivated crops and pasture.

Foresters and others can refer to the section "Use of the Soils for Woodland," where the soils in 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 the Soils for Wildlife."

Engineers and builders will find under "Engineering Applications" tables that give 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 the Soils."

Students, teachers, and others will find information about soils and their management in various sections of this report.

Newcomers in Henderson 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."

Cover Picture—Hereford cattle on pasture of alfalfa and orchardgrass. The deep, well-drained Memphis soils in this area are well suited to corn, soybeans, and tobacco, as well as to pasture.

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Contents

NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued February 1967

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF HENDERSON COUNTY, KENTUCKY

REPORT BY HENRY T. CONVERSE, JR., AND FRANK R. COX, JR., SOIL CONSERVATION SERVICE

FIELD SURVEY BY HENRY T. CONVERSE, JR., FRANK R. COX, JR., EULLAS JACOBS, ROBERT C. BRYAN, AND JAMES C. ROSS, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE KENTUCKY AGRICULTURAL EXPERIMENT STATION

HENDERSON COUNTY is in the northwestern part of Kentucky (fig. 1). The Ohio River runs along the northern edge for almost 60 miles. The old low-water mark on the north bank of the river is the northern boundary of the county and is also the State boundary. Because the river channel shifts from time to time, some small parts of the county are on the Indiana side of the river. For example, James C. Ellis Park, a horse racing track on Green River Island, is detached from the main body of the county. The river channel ran north of this island but shifted to the south in 1811.

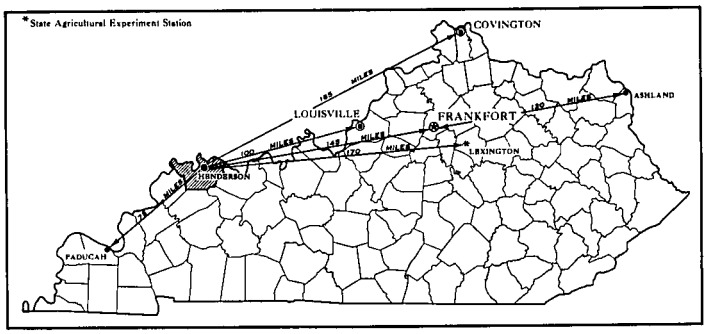

Figure 1.—**Location of Henderson County in Kentucky.**

The main body of the county measures about 28 miles from east to west and about 16 miles from north to south. The area covered is 440 square miles, or 281,600 acres.

Henderson is the county seat. It is in the north-central part of the county, overlooking the Ohio River.

Henderson County makes up the northern part of the Western coal region of Kentucky. The relief is characterized by valleys and low hills that edge the wide flood plain of the Ohio River in the north and the flood plain of the Green River in the east.

The soils vary greatly across the county. Most are either medium or high in natural fertility. The soils on the uplands are acid in reaction and are rather low in content of organic matter; most are well drained or moderately well drained. Those soils in the wide valleys are dark colored, are high in content of organic matter, and are very fertile. The soils on stream terraces and those on the bottom lands are acid or neutral in reaction and, for the most part, are moderate in content of organic matter. The soils on terraces range from very poorly drained to excessively drained. Those on the bottom lands are mostly poorly drained or somewhat poorly drained, except near the Ohio River, where well-drained and excessively drained soils are common.

Agriculture predominates in the county. Farms vary considerably in size but average 187 acres. Corn and soybeans are the main crops and are extensively grown on the broad bottoms along the rivers and on the stream terraces. Hay and some small grain are grown on most farms. Hog and beef-cattle production is important on many farms in the uplands. Fairly large tracts on the wet bottom lands and the rougher areas along the Green River are wooded. On the uplands, most wooded areas are small.

How This Soil Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Henderson County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. Throughout 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 for study. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the parent material that has not been changed much by leaching or by roots of plants.

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 uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important distinguishing 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. Mem-

phis and Uniontown, 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 natural characteristics.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Memphis silt loam and Memphis silty clay loam are two soil types in the Memphis series. The difference in texture of their surface layer is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases. The name of a soil phase indicates a feature that affects management. For example, Loring silt loam, 2 to 6 percent slopes, is one of several phases of Loring silt loam, a soil type that ranges from level to strongly sloping.

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

In preparing some detailed maps, the soil scientists have the problem of delineating an area where two or more kinds of soils occur in such an intricate pattern and in individual areas so small in size that they cannot be shown separately on the soil map. Therefore, such an area is shown as one mapping unit and is called a complex. Ordinarily, a complex is named for the major soils in it, for example, Litz-Muskingum silt loams.

Occasionally, two or more similar kinds of soils that do not occur in regular geographic association are shown as one mapping unit because separating the soils would have little practical significance. Such a mapping unit is called an undifferentiated soil group. It is named in terms of its constituent soils and connected by "and." Dekoven and Wakeland silt loams is an undifferentiated soil group in Henderson County.

Also, on most soil maps, areas are shown that are so sandy, so shallow, so frequently worked by wind and water, or so disturbed by man that they are not identifiable as soils. These areas are given descriptive names, for example, Gullied land, Made land, or Riverwash. This kind of mapping unit is called a land type.

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 such a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil survey reports. The soil scientists set up trial groups based on the yield and practice tables and other data. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and of their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this report shows, in color, the soil associations in Henderson County. 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 not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Described in the pages following are the seven soil associations in Henderson County.

1. Huntington-Egam-Newark association

Brown, nearly level, dominantly well-drained, silty soils on the flood plain of the Ohio River

This association forms a belt 1 to 3 miles wide across the northern part of the county. In this association long, low ridges 200 to 300 feet wide run parallel to the Ohio River. Between the ridges lie flats 20 to 50 feet wide. The flats are only a few feet lower than the ridges. Some swampy areas are included in this association.

Huntington soils make up about 60 percent of this association, Egam soils 20 percent, Newark soils 15 percent, and minor soils make up the rest. Huntington soils are brown, silty, and well drained and occur mostly on the higher part of the ridges. Egam soils are brown, moderately fine textured, and well drained or moderately well drained and occur on the lower part of the ridges, more distant from the river. Newark soils occur on the flats. They are brown, silty, and somewhat poorly drained; are mottled with gray and brown below a depth of 10 inches; and are gray below a depth of 18 inches. Of the minor

soils, the sandy Bruno soils and Riverwash are the most extensive and occur mostly in the Horse Shoe Bend section; Lindside and Melvin soils occur throughout the association.

Most of this association is flooded yearly by the Ohio River. Several of the roads are cut off if the water of this river rises to 37 or 38 feet, and most of the ridges are flooded if it rises to 45 feet at the Evansville gauge (fig. 2). Winter floodwaters deposit sand in some places, and when the current jumps the channel and flows inland across a river loop, sand is left on the highest ridges. Low areas generally are ponded in spring, and planting in these areas may be delayed for as long as a month.

***Figure 2.*—Part of this road, in the Huntington-Egam-Newark association, is covered with floodwaters from the Ohio River. Floodwaters leave deposits of sand in this area.**

Except during summer, few people have lived in this area since the 1937 flood. Most of the landowners live elsewhere on higher ground.

Most of this association is cropped annually to corn and soybeans. Yields vary, though the yield potential is high if the soils are well managed. Winter flooding limits the growing of green manure crops. The lack of a crop to plow under and the rapid weed growth during the crop season tend to reduce yields.

Farms in this area are large, or about 325 acres in size. Some fields parallel to the river are a mile long.

2. Ginat-Melvin association

Brown or gray, nearly level or gently sloping, dominantly poorly drained, silty soils on the flood plain of the Ohio River

This association is in the northern part of the county. It is an area of wet flats separated by gently sloping ridges (fig. 3). The ridges rise 4 or 5 feet above the flats. The flats are parallel to each other and roughly parallel to the Ohio River. They are up to 500 feet wide. Few of the ridges are more than 200 feet wide.

Ginat and Melvin soils, both of which are poorly drained, occupy the flats and make up about 60 percent of this association. Sciotoville and Wheeling soils, which are better drained, occupy the ridges and make up about 25 percent of the area. Newark and Weinbach soils, which are somewhat poorly drained, occupy small areas in intermediate positions. In the western part, from Doriott Lake to the Union County line, narrow swampy sloughs are between the ridges. These make up about 10 percent of this association.

Melvin soils are subject to flooding. Nevertheless, most of this association is suited to intensive cultivation. About 70 percent is used for corn and soybeans. Other acreage is used for hay, pasture, tobacco, grain sorghum, and small grain. Some areas, made up mostly of poorly drained soils, are wooded. Some of the acreage is taken up by farmsteads. Most of the farms in this association are less than 200 acres in size, but a few are 500 to 1,000 acres in size. Many of the farmers do not live on their farms.

Most of the corn, soybeans, grain sorghum, and small grain is sold at harvest. Little is kept as feed for hogs and beef cattle.

The relatively well drained ridges are suitable for growing tobacco and are good sites for farmsteads. The wet soils have a high potential for wood crops, but if culti-

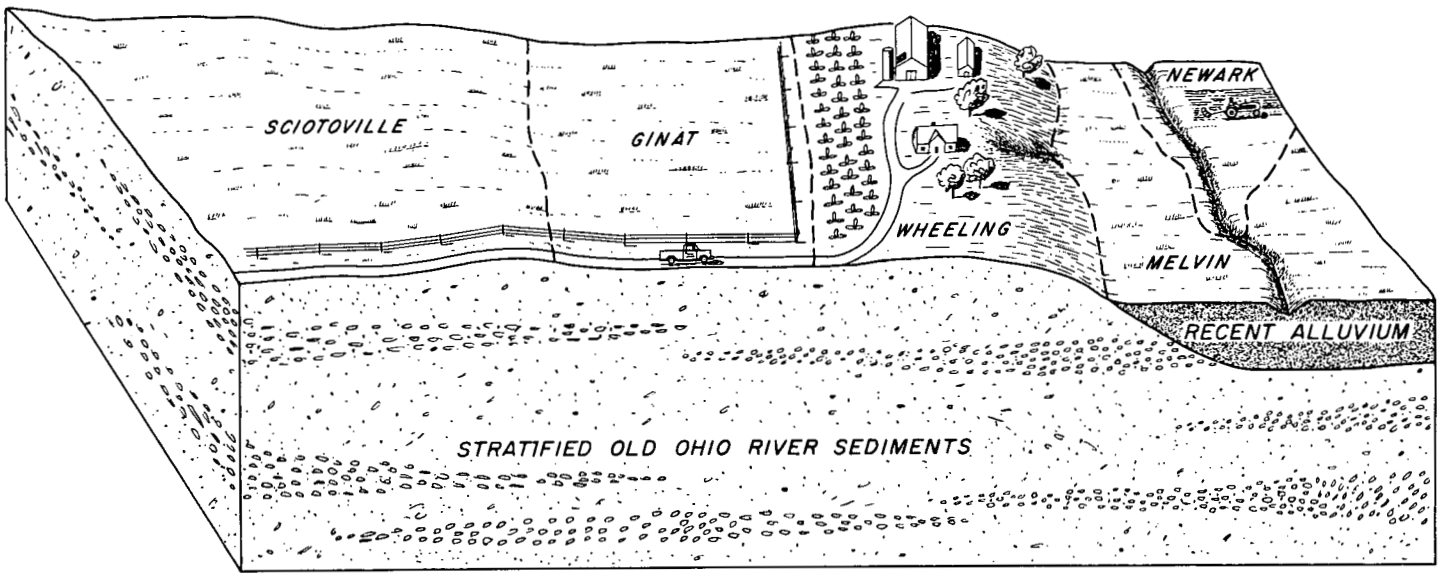

***Figure 3.*—Parent material, position, and pattern of soils in the Ginat-Melvin association.**

vated, they need drainage to produce good yields. The swampy sloughs are suitable for cypress, but toxic water in some places kills vegetation. Many ducks and geese feed in and near these cypress swamps.

3. *Uniontown-Dekoven-Henshaw association*

Very dark grayish-brown to brown, level or nearly level, very poorly drained to well-drained, silty soils on terraces and bottom lands along creeks

This is an area of level terraces and bottoms along Canoe Creek, Highland Creek, and Lick Creek. The terraces are up to 2 miles wide, and the bottoms range from narrow to wide. The area that extends from Geneva to Henderson is representative of this association.

Uniontown soils make up about 25 percent of this association, Dekoven soils 22 percent, Henshaw soils 20 percent, and minor soils make up the rest. Minor soils include the Adler, Birds, Collins, Falaya, Loring, Patton, and Wakeland.

Mostly Uniontown, Henshaw, and Patton soils are on the terraces. Of these, Uniontown soils are the best drained; they occur in slightly raised areas or on slopes adjacent to the bottom lands (fig. 4). Henshaw soils are in wide, level areas; and Patton soils are in level or slightly depressed areas.

Dekoven soils, which are dark colored and very poorly drained, occupy most of the wide bottoms. Other bottomland soils are the Wakeland, Adler, Birds, and Falaya.

This association has been cleared of trees and is used mostly for corn and soybeans. Some parts are used for milo, small grain, tobacco, and truck crops. Most of the farms are general farms, but a few produce only corn and soybeans. Farms average about 175 acres in size, but many are as large as 300 acres.

Almost all of this association is suited to intensive cultivation, although correcting wetness is a major problem in most places. Tile drainage increases yields in the somewhat poorly drained to very poorly drained areas. Some of the bottom lands are subject to flooding, mostly by runoff from higher areas but also, in a few low places, by backwater from the Ohio River. A total of about 40 percent of this association is subject to flooding. Floods generally occur in winter or in spring, however, when no crops are on the land. The soils on terraces are above flood level.

4. *Loring-Grenada association*

Brown, nearly level to strongly sloping, well drained and moderately well drained soils of the loess uplands

This association is the most extensive in Henderson County. It is characterized by rolling ridges and broad flats (fig. 5). The ridgetops are wide and gently sloping, and the side slopes are gentle or short and strong. Some toe slopes, or terraces, and some bottom lands are included. The bottom lands are narrower than those along the main streams.

Loring soils make up 35 percent of this association, Grenada soils 20 percent, Memphis soils 15 percent, and Uniontown soils 10 percent. Falaya, Waverly, Collins, Dekoven, and Wakeland make up the rest. The soils of this association, for the most part, formed in loess that is 25 to 50 feet thick. The underlying rock is sandstone and, to a lesser extent, shale and siltstone.

Loring and Memphis soils are on the ridges. Loring soils are brown and have a fragipan at a depth of about

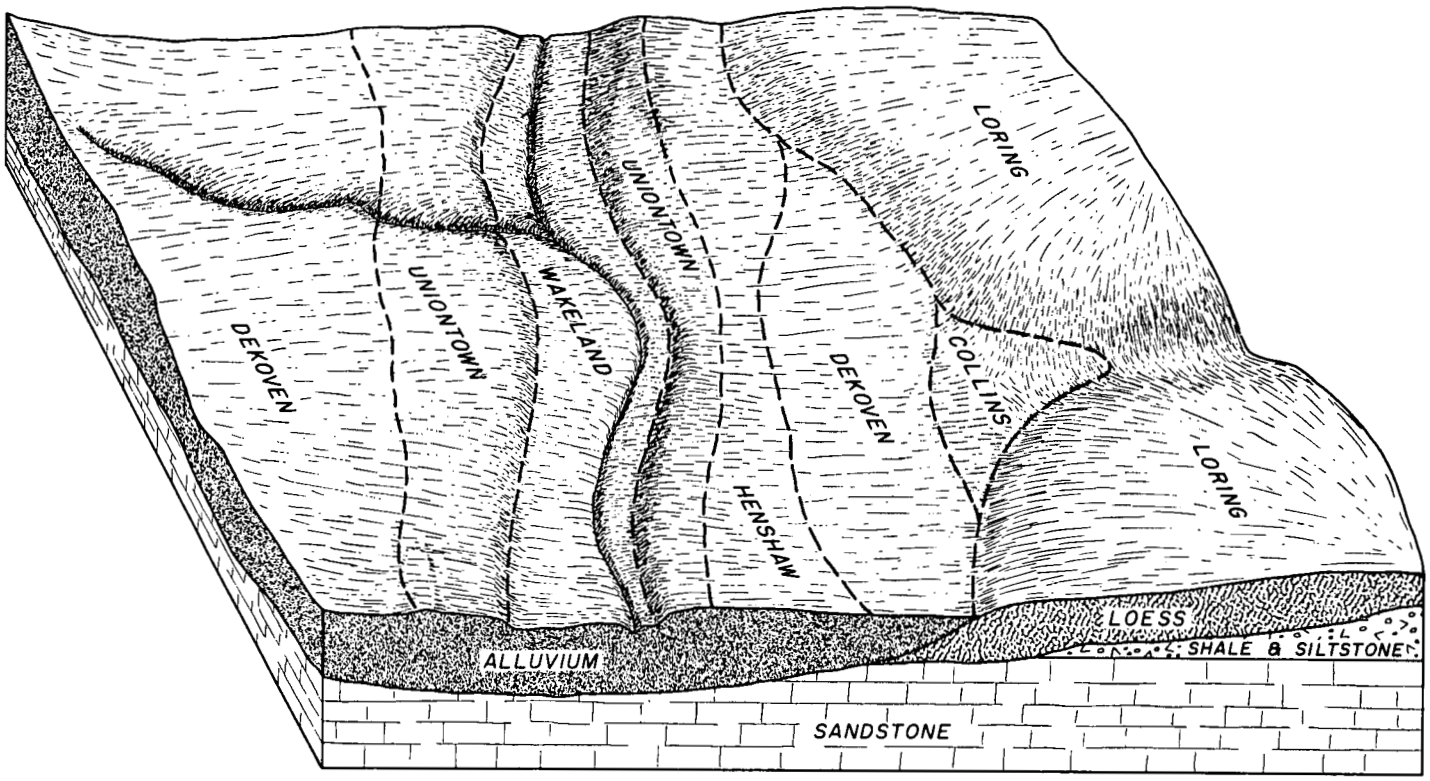

Figure 4.—**Parent material, position, and pattern of soils in the Uniontown-Dekoven-Henshaw association.**

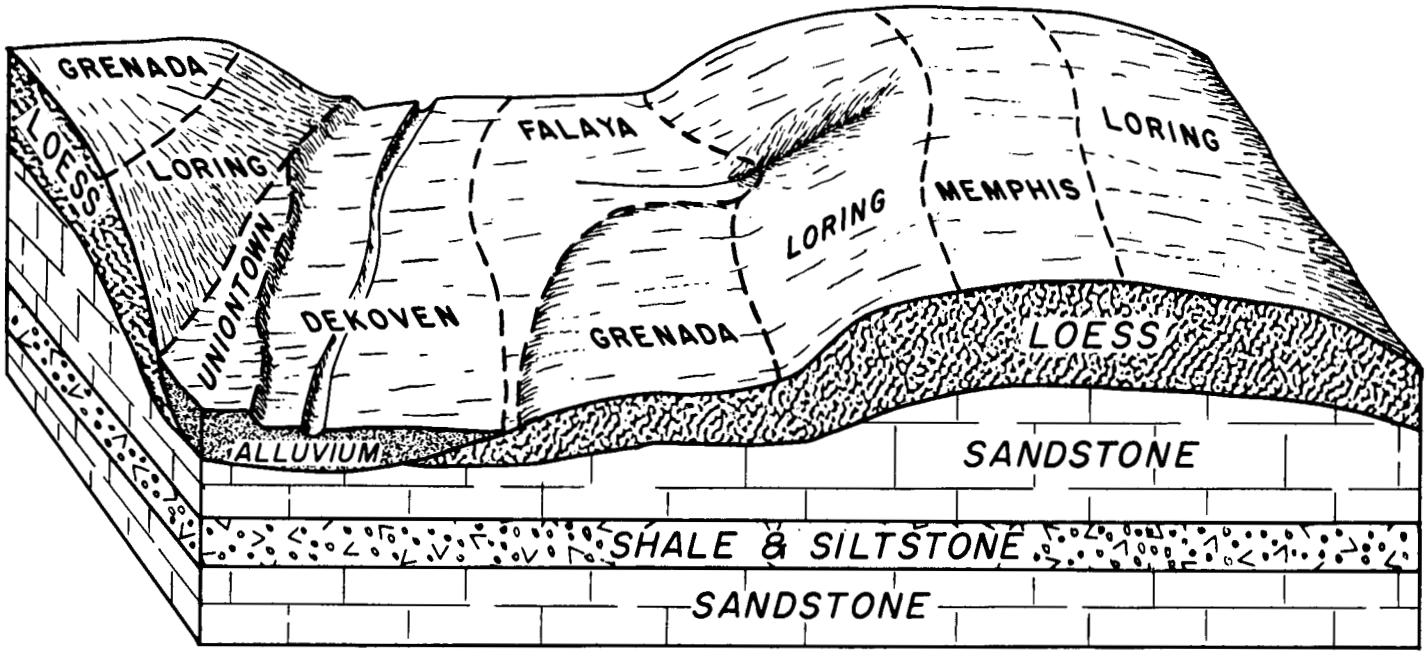

Figure 5.—**Parent material, position, and pattern of soils in the Loring-Grenada association.**

30 inches. The well-drained Memphis soils also are brown, but they have no fragipan. Grenada soils are on the broader flats. These soils are moderately well drained and have a fragipan at a depth of about 22 inches. Uniontown soils are on terraces, and the somewhat poorly drained Falaya soils are on much of the bottom land. Waverly, Collins, Dekoven, and Wakeland soils are on the narrowest of the bottom lands.

This association is well suited both to general farming and to specialized farming; most of it is cultivated. The gently sloping and sloping areas and the wider bottom lands are used for general farming. Some small and scattered areas are in tobacco, but the main crops are corn, soybeans, and small grain. At one time, more than 10,000 acres was in peaches and apples, but now orchards take up no more than 250 acres, and these are on the ridges occupied by Loring and Memphis soils. Most of the strongly sloping areas are sodded with fescue. The small acreage of Waverly soils is mostly in Kentucky fescue. The areas of woodland are 1 to 3 acres in size.

Farms in this association average 195 acres in size, but many are as large as, or larger than, 350 acres. Farms are steadily increasing in size. Except in the southern part where farms are small, landowners generally do not live on their farms.

5. *Memphis-Wakeland association*

Brown, strongly sloping to steep, dominantly well-drained, silty soils on bluffs, terraces, and bottom lands

In this association, steep bluffs rim the uplands and overlook level terraces along the Ohio and Green Rivers (fig. 6). The bluffs are breached by creeks running into the rivers. The areas along the creeks are strongly sloping. Some nearly level ridgetops also are a part of this association.

Memphis soils make up about 60 percent of this association. Wakeland soils make up most of the rest, but some areas of Loring, Grenada, Sciotoville, Huntington, Uniontown, Dekoven, Adler, and Birds soils also are in this association.

Memphis soils are on the bluffs. These are brown, silty, well-drained soils that developed from loess. They are as much as 40 to 50 feet deep in some places. The dominant soils on the bottom lands are the Wakeland, which are brown, silty, somewhat poorly drained soils. Other soils on the bottom lands are the Dekoven, the Adler, the Birds, and the Huntington. Loring soils are on the uplands, and Sciotoville and Uniontown soils are on the terraces.

The bottom lands are cropped annually to corn (fig. 7) and soybeans, but much of the bluff area is still wooded. Some sloping areas are grassed and make excellent pasture. Some strongly sloping areas and a few short, steep slopes also are grassed. Most of the steep slopes, however, are suitable only for trees. Tree growth is rapid.

Much of this association consists of beef cattle farms. The farms average 200 acres in size, but the size varies considerably.

6. *Loring-Zanesville-Wellston association*

Brown, mostly gently sloping to strongly sloping, well drained and moderately well drained soils that developed primarily from loess or from loess over sandstone

This association occurs in the southeastern part of the county. One section is along the Green River south of Hebbardsville, and the other is southwest of Niagara. The relief is dominantly gently sloping to strongly sloping. Slopes generally are longer than elsewhere in the county, and the soils are shallower, except possibly on the ridgetops where the soils are moderately deep. Severely eroded spots and idle brushy areas are common.

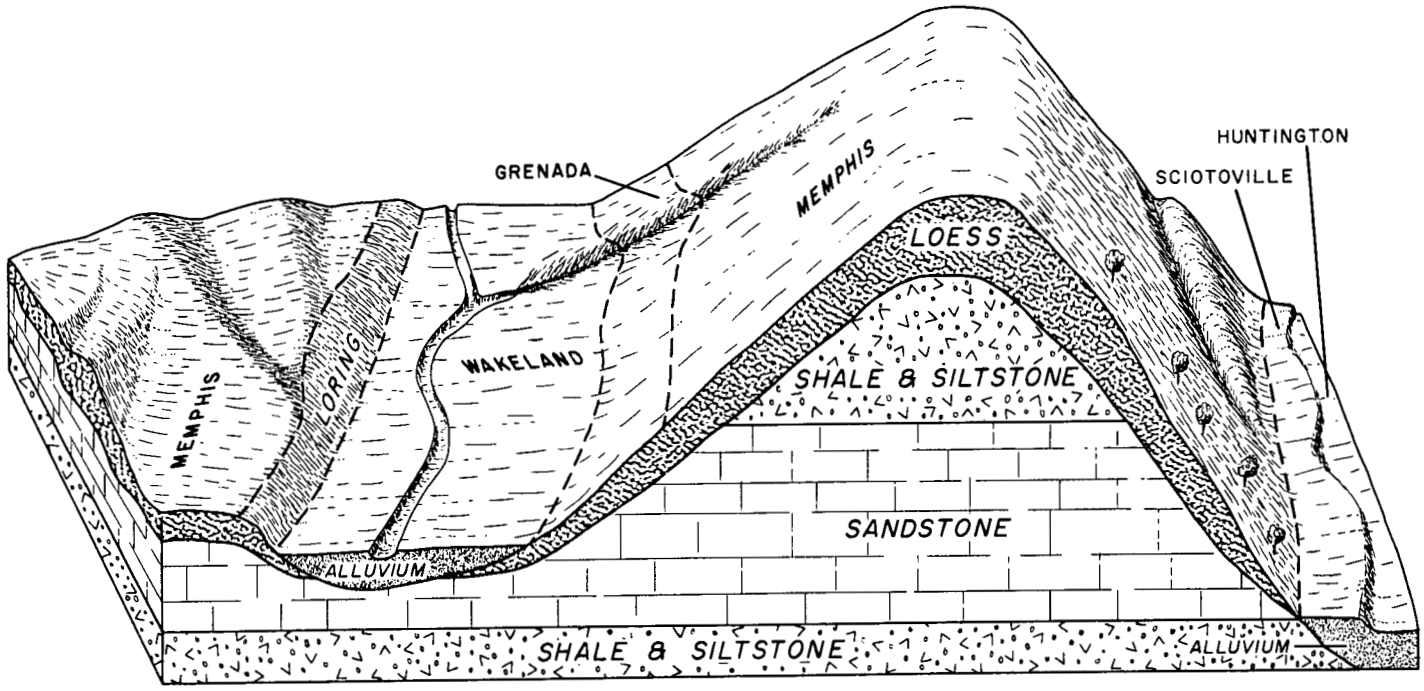

Figure 6.—**Parent material, position, and pattern of soils in the Memphis-Wakeland association.**

Loring soils make up about 36 percent of this association, Zanesville soils about 12 percent, Wellston soils about 8 percent, and minor soils make up the rest. The Gilpin, Litz, Collins, and Falaya are some of the minor soils.

Loring soils are on narrow, winding, gently sloping ridgetops (fig. 8). These soils developed from loess and are well drained and moderately well drained. Zanesville soils are on slopes steeper than the ridgetops. These soils developed from a thin mantle of loess overlying sandstone. The brown, well-drained Wellston soils are mostly on slopes of 12 to 20 percent; they are eroded. Gilpin and Litz soils, on steep and moderately steep slopes, developed from a thin layer of loess over sandstone. Collins and Falaya soils occupy most of the narrow bottoms.

Much of this association has been cultivated in the past, but now only about a third is farmed. Abandoned farmland is reverting to broomsedge, briars, and trees. Some of the steepest slopes have never been cultivated. These are in hardwood trees.

Figure 7.—**Corn on Wakeland silt loam and, in the background, a grassed field on Memphis silt loam. This area is within the Memphis-Wakeland association.**

The areas that are still farmed are mostly the ridgetops and the bottom lands. Crops include corn, tobacco, hay, and pasture. The farms, for the most part, are the smallest in the county and are mainly owner operated.

Much of this association is suited to pasture. The steepest and most eroded areas are suitable only for trees.

7. *Markland-Sharkey-Newark association*

Brown or very dark gray, level, well-drained to very poorly drained, clayey or silty soils on terraces and bottom lands of the Green River

This association is in the southeastern part of the county. It consists of broad flats along the Green River and Cash Creek. These flats resemble the terraces along the Ohio River.

Markland soils make up about 30 percent of this association, Sharkey soils about 25 percent, Newark soils about 18 percent, and minor soils make up the rest. Of the minor soils, the most extensive are the Robertsville, which make up 6 percent of the area, and the McGary, which make up 5 percent.

Markland soils are fine textured and well drained or moderately well drained; they occur near the edge of the broad terraces, or flats. Sharkey soils are dark colored, fine textured, and very poorly drained and generally are in a position lower than that of Markland soils. Adjacent to Sharkey soils, in an area locally known as Post Oak Land, are the gray, wet McGary soils. Newark soils are mottled gray and brown, are silty, and are somewhat poorly drained. They occupy long, narrow flats along the Green River. Robertsville soils are gray and poorly

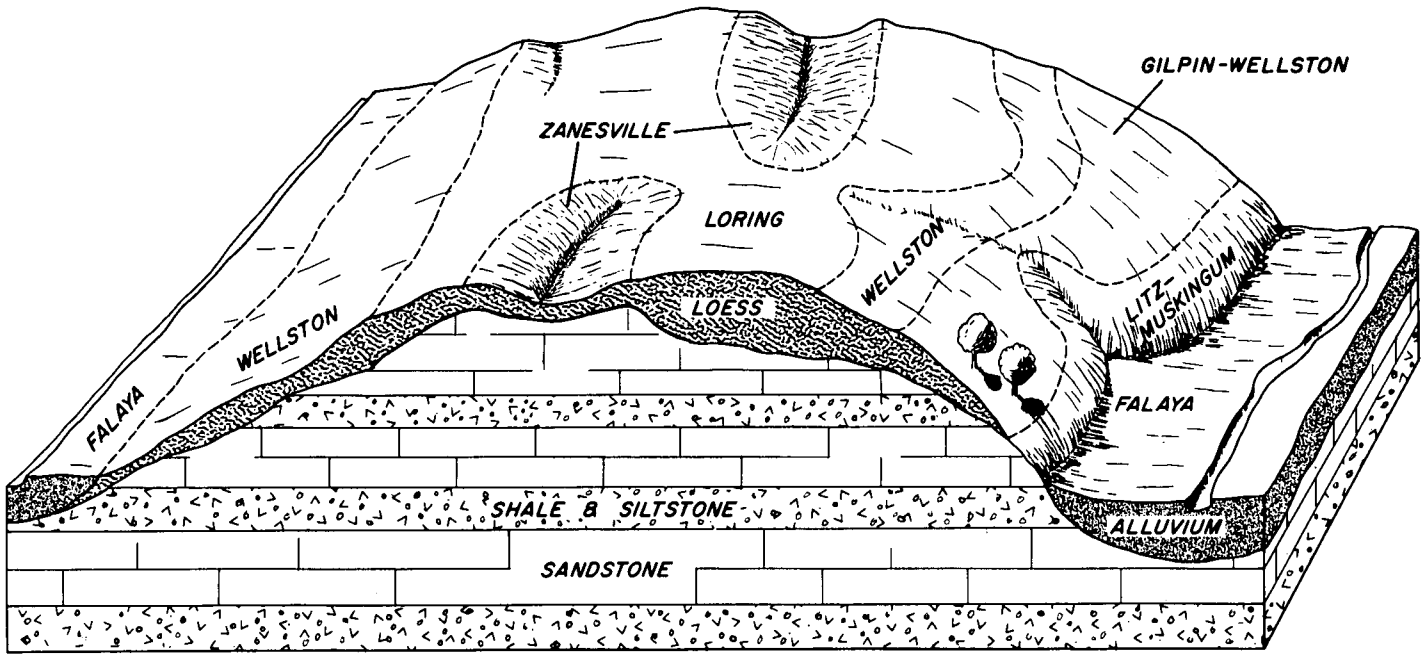

Figure 8.—**Parent material, position, and pattern of soils in the Loring-Zanesville-Wellston association.**

drained and have a fragipan. These soils also occur on the terraces along the Green River.

Most of this association is cultivated and row cropped. The lower lying areas are mostly wooded. Farms, on the average, are about 100 acres in size. In this area, few people live on their farms.

The better drained areas are well suited to general farming. Soybeans and corn are the major crops, and a little tobacco is grown. The wetter, more clayey areas are specially suited to Kentucky 31 fescue and have a good potential for wood crops.

Descriptions of the Soils

This section provides fairly detailed information about the soils in Henderson County. General information about the soils can be found in the section "General Soil Map," where broad patterns of soils are described. Detailed technical information can be found in the section "Formation, Morphology, and Classification of the Soils."

The procedure in this section is first to describe each soil series, and then the individual soils, or mapping units, in that series. To get full information on any one soil, it is necessary to read the description of that soil and also the description of the soil series to which it belongs.

A profile is described for each soil series, and this profile is considered representative, or typical, for all the soils in that series. If the profile of a given soil differs somewhat from the representative profile, the differences are apparent in the name of the soil, or they are pointed out in the description of that soil.

In parentheses following the name of each soil is a symbol that identifies the soil on the detailed soil map that is in the back of this report. The description of each soil ends with a reference to the capability unit and the woodland suitability group in which it has been placed. The capability units and the woodland groups are discussed in other sections of this report.

This section includes a table (table 1) that gives the approximate acreage and proportionate extent of the individual soils. The soil map in the back of this report shows the location and distribution of the soils, and the Glossary defines many of the technical terms used in describing soils.

Adler Series

The soils in this series are silty, moderately well drained, and nearly neutral in reaction. They formed in sediment that washed from upland soils of loessal origin. The main layers of a typical profile are—

0 to 20 inches, dark yellowish-brown, friable silt loam.
20 to 28 inches, brown silt loam; noticeable light brownish-gray mottles and a few dark-colored concretions.
28 to 35 inches, mottled olive-brown, brownish-gray, and yellowish-brown silt loam.

These soils are on bottoms in the lower reaches of the larger secondary drains where the valleys have widened out. Generally they are at slightly higher elevations than the associated Wakeland and Birds soils, both of which are less well drained. The slope ranges from 0 to 4 percent but is mostly 0 to 2 percent.

Adler soils are moderately high in natural fertility and have a very high moisture-supplying capacity. They are deep and are easily penetrated by roots. These soils are easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. They are not subject to erosion.

Though subject to flooding, Adler soils are farmed intensively. If well managed, they are good producers of all the locally grown crops. Crops respond well to fertilizer.

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

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Adler silt loam	1,636	0.6	Memphis silt loam, 12 to 20 percent slopes, eroded	696	0.3
Ashton silt loam	2,015	.7	Memphis silt loam, 20 to 30 percent slopes	872	.3
Birds silty clay loam	310	.1	Memphis silt loam, 30 to 50 percent slopes	769	.3
Birds silt loam	1,658	.6	Memphis silty clay loam, 2 to 6 percent slopes, severely eroded	909	.3
Breaks and Alluvial land	2,013	.7	Memphis silty clay loam, 6 to 12 percent slopes, severely eroded	5,684	2.0
Bruno loamy fine sand, 0 to 4 percent slopes	1,830	.7	Memphis silty clay loam, 12 to 25 percent slopes, severely eroded	3,636	1.3
Bruno loamy fine sand, 4 to 10 percent slopes	314	.1	Morganfield silt loam	330	.1
Calloway silt loam, 0 to 2 percent slopes	901	.3	Newark silt loam	2,552	.9
Calloway silt loam, 2 to 6 percent slopes	574	.2	Newark silty clay loam	2,246	.8
Captina silt loam, 0 to 2 percent slopes	826	.3	Patton silt loam	1,129	.4
Captina silt loam, 2 to 6 percent slopes	677	.2	Patton silt loam, overwash	171	.1
Collins silt loam	2,380	.9	Patton silty clay loam	911	.3
Dekoven silt loam	4,872	1.7	Riverwash	670	.2
Dekoven silty clay loam	398	.1	Robertsville silt loam	1,754	.6
Dekoven and Wakeland silt loams	8,342	3.0	Sciotoville fine sandy loam, 0 to 2 percent slopes	268	.1
Egam silt loam	343	.1	Sciotoville fine sandy loam, 2 to 6 percent slopes	199	.1
Egam silty clay loam	8,759	3.1	Sciotoville silt loam, 0 to 2 percent slopes	6,163	2.2
Elk silt loam, 0 to 2 percent slopes	338	.1	Sciotoville silt loam, 2 to 6 percent slopes	1,954	.7
Elk silt loam, 2 to 6 percent slopes	309	.1	Sciotoville silt loam, 2 to 6 percent slopes, eroded	601	.2
Falaya silt loam	22,647	8.0	Sequatchie loam, 0 to 2 percent slopes	689	.2
Gilpin-Wellston silt loams, 20 to 30 percent slopes	665	.2	Sequatchie loam, 2 to 6 percent slopes	1,227	.4
Ginat silt loam	6,088	2.2	Sharkey silty clay	2,238	.8
Ginat silty clay loam	1,915	.7	Sharkey silty clay loam, overwash	1,493	.5
Grenada silt loam, 0 to 2 percent slopes	1,172	.4	Swamp	2,596	.9
Grenada silt loam, 2 to 6 percent slopes	9,097	3.2	Taft silt loam	1,361	.5
Grenada silt loam, 2 to 6 percent slopes, eroded	2,499	.9	Uniontown silt loam, 0 to 2 percent slopes	3,511	1.3
Grenada silt loam, 6 to 12 percent slopes, eroded	733	.3	Uniontown silt loam, 2 to 6 percent slopes	5,975	2.1
Grenada silt loam, 6 to 12 percent slopes, severely eroded	350	.1	Uniontown silt loam, 2 to 6 percent slopes, eroded	1,814	.6
Gullied land	1,013	.4	Uniontown silt loam, 6 to 12 percent slopes, eroded	322	.1
Henshaw silt loam	8,747	3.1	Uniontown silty clay loam, 2 to 6 percent slopes, severely eroded	282	.1
Huntington fine sandy loam, 0 to 4 percent slopes	5,050	1.8	Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded	453	.2
Huntington silt loam, 0 to 4 percent slopes	10,971	3.9	Uniontown soils, 12 to 35 percent slopes	415	.2
Huntington silt loam, 4 to 16 percent slopes	550	.2	Wakeland silt loam	8,019	2.8
Lakin loamy fine sand, 2 to 6 percent slopes	266	.1	Waverly silt loam	4,896	1.7
Lindside silt loam	2,856	1.0	Weinbach silt loam	5,675	2.0
Lindside silty clay loam	1,351	.5	Wellston silt loam, 12 to 20 percent slopes, eroded	806	.3
Litz-Muskingum silt loams, 30 to 50 percent slopes	231	.1	Wellston silty clay loam, 6 to 12 percent slopes, severely eroded	242	.1
Loring silt loam, 0 to 2 percent slopes	268	.1	Wellston silty clay loam, 12 to 20 percent slopes, severely eroded	589	.2
Loring silt loam, 2 to 6 percent slopes	6,730	2.4	Wheeling silt loam, 0 to 2 percent slopes	4,550	1.6
Loring silt loam, 2 to 6 percent slopes, eroded	6,356	2.3	Wheeling silt loam, 2 to 6 percent slopes	1,915	.7
Loring silt loam, 6 to 12 percent slopes, eroded	10,425	3.7	Wheeling silt loam, 2 to 6 percent slopes, eroded	808	.3
Loring silt loam, 12 to 20 percent slopes, eroded	578	.2	Wheeling silt loam, 6 to 12 percent slopes, eroded	341	.1
Loring silty clay loam, 2 to 6 percent slopes, severely eroded	2,774	1.0	Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded	391	.1
Loring silty clay loam, 6 to 12 percent slopes, severely eroded	12,702	4.5	Wheeling soils, 12 to 30 percent slopes	439	.2
Loring silty clay loam, 12 to 20 percent slopes, severely eroded	3,382	1.2	Zanesville silt loam, 6 to 12 percent slopes, eroded	416	.2
Made land	315	.1	Zanesville silt loam, 6 to 12 percent slopes, severely eroded	872	.3
Markland silt loam, 2 to 6 percent slopes	245	.1	Zanesville silt loam, 12 to 20 percent slopes, eroded	642	.2
Markland silty clay, 6 to 12 percent slopes, severely eroded	145	.1	Zanesville silt loam, 12 to 20 percent slopes, severely eroded	1,453	.5
Markland silty clay loam, 2 to 6 percent slopes, eroded	255	.1	Total	281,600	100.0
Markland silty clay loam, 6 to 12 percent slopes, eroded	153	.1			
Markland soils, 12 to 35 percent slopes	318	.1			
McGary silt loam	569	.2			
Melvin silt loam	1,379	.5			
Melvin silty clay loam	7,702	2.7			
Memphis silt loam, 2 to 6 percent slopes	12,704	4.5			
Memphis silt loam, 2 to 6 percent slopes, eroded	10,085	3.6			
Memphis silt loam, 6 to 12 percent slopes, eroded	3,875	1.4			

Adler silt loam (Ad).—This is a moderately well drained soil on bottom lands that are mostly along the lower reaches of drains in the central and northern parts of the loess uplands. It is nearly neutral in reaction. The 20-inch surface layer is dark-brown, friable silt loam. It is underlain by an 8-inch layer of dark-brown, friable silt loam that has some fine light brownish-gray mottles and a few dark-brown concretions. Below this is mottled light olive-brown, gray, and yellowish-brown silt loam. In a few areas, nearly black silt loam to silty clay loam is at a depth of 20 to 30 inches.

This soil is naturally fertile. Furthermore, it utilizes fertilizer well and seldom needs lime. It has a very high moisture-supplying capacity; it is deep and is easily penetrated by roots. This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. It is not subject to erosion.

If well managed, this soil can be cultivated intensively and is well suited to most crops commonly grown in this county. Tile drainage helps to increase yields because this soil is slightly wet. (Capability unit I–2; woodland suitability group 2)

Ashton Series

The soils in this series are deep, well drained, and weakly developed. They formed in sediment of mixed origin. The main layers of a typical profile are—

0 to 10 inches, dark-brown, very friable silt loam.
10 to 18 inches, dark-brown, friable light silty clay loam; subangular blocky structure; neutral in reaction.
18 to 40 inches, brown, firm to friable light silty clay loam; subangular blocky structure; slightly acid or medium acid.
40 to 50 inches, brown, friable light silty clay loam or silt loam.

Ashton soils occupy low, narrow benches on the flood plain of the Ohio and Green Rivers. The benches are roughly parallel to the river channel. These soils generally are adjacent to and are intermediate in development between Wheeling soils on terraces and Huntington soils on bottom lands. They are subject to flooding but are flooded much less frequently than the Huntington soils. The slope is mainly 0 to 4 percent.

Generally, Ashton soils do not need lime. They are high in natural fertility and have a very high moisture-supplying capacity. They are deep and are easy to till. Erosion is not a problem.

Ashton soils are not extensive in Henderson County but are agriculturally important. They are used, to a great extent, for corn and soybeans and, if well managed, produce favorable yields. Perennials and winter cover crops are suited to these soils but are seldom grown because of the risk of flooding. Because floods usually occur in winter or early in spring, they rarely damage corn or soybeans.

Ashton silt loam (As).—This is a deep, well-drained soil on low benches, or terraces. The benches generally lie between bottom lands and higher terraces. The surface layer of this soil is dark-brown, very friable silt loam and is 7 to 10 inches thick. The upper part of the subsoil is dark-brown, friable light silty clay loam and is 6 to 8 inches thick. The lower part of the subsoil is brown, firm to friable light silty clay loam or silt loam and is 22 to 24 inches thick. In some places the surface layer consists of loam, and the subsoil is stratified silt loam, clay loam, and fine sandy loam. The reaction range is medium acid to neutral.

The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Roots and moisture easily penetrate the soil material. The moisture-supplying capacity is very high. Natural fertility is high, but crops respond well to fertilizer. Lime ordinarily is not needed.

Erosion is not a problem. Therefore, this soil is well suited to intensive cultivation and is used almost continuously for corn and soybeans. Yields are favorable if management is good. Winter cover crops seldom are planted because this soil is subject to flooding in winter. (Capability unit I–3; woodland suitability group 7)

Birds Series

The soils in this series are silty, poorly drained, and nearly neutral in reaction. They formed in sediment that washed from the loess uplands. The main layers of a typical profile are—

0 to 9 inches, grayish-brown, friable silt loam.
9 to 18 inches, grayish-brown, friable or firm light silty clay loam; few fine yellowish-brown mottles.
18 to 36 inches, dark-gray to light brownish-gray, firm silt loam; noticeable yellowish-brown mottles.

Birds soils occur chiefly in the central and northern parts of the uplands. They occupy bottom land in the lower reaches of major secondary drains, away from the drains where the valley has widened. In places they are lower than the stream channel. The slope is mostly less than 2 percent.

If they are drained, Birds soils are easy to till and are easily penetrated by roots. Also, their moisture-supplying capacity is very high. These soils are moderately low in natural fertility, and they are subject to flooding.

These soils, for the most part, have been cleared and drained. They are used mainly for soybeans and corn, though they are good for grasses and legumes. Yields of all the suited crops are favorable if good management is applied.

Birds silty clay loam (Bc).—This is a poorly drained soil that occurs in the northern part of the county, in the wider valleys where calcareous alluvium was deposited. It occupies the lowest bottoms, which are away from the stream channels. The plow layer is grayish-brown silty clay loam 6 to 8 inches thick. It is sticky when wet. The subsoil is gray, mottled light silty clay loam and extends to a depth of about 35 inches. Below that is a layer of silt loam, silt, or silty clay loam. In an area of a few acres, this soil has a layer of black silt loam at a depth of 20 to 40 inches.

The plow layer will clod or crust if plowed when too wet. If the high water table is lowered by artificial drainage, roots and water can easily penetrate the soil material. The moisture-supplying capacity of this soil is high. Natural fertility is moderately low, but crops respond well to fertilizer.

This soil is not subject to erosion but is limited mainly by poor drainage, floods, and excess surface water. If drained, it is moderately well suited to most of the commonly grown crops but is best for corn and soybeans. In

undrained areas, water-tolerant plants grow moderately well and hardwood trees grow very well. (Capability unit IIIw–5; woodland suitability group 3)

Birds silt loam (Bd).—This is a nearly neutral, poorly drained, mostly level soil that occurs in the central and northern parts of the uplands. It occupies low bottoms of major secondary drains where the valley has widened and is away from the water course. The surface layer is grayish-brown, friable silt loam 8 to 10 inches thick. The subsurface layer is dominantly gray, mottled with yellowish-brown, light silty clay loam or silt loam. This layer increases in firmness with depth. In a few areas, 3 to 4 inches of brown silt loam overwash covers the surface layer; and in some places a nearly black layer is at a depth of 20 to 30 inches.

The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Roots easily penetrate the subsoil if drainage has lowered the ground water level. The moisture-supplying capacity is very high. Natural fertility is moderately low, but crops respond extremely well to fertilizer.

This soil has a high potential for wood crops and is excellent for Kentucky 31 fescue, Ladino clover, and Kobe lespedeza. If drained and otherwise well managed, it is good for soybeans, corn, grain sorghum, and hay. It can be cultivated intensively because it is not subject to erosion. (Capability unit IIIw–5; woodland suitability group 3)

Breaks and Alluvial Land

Breaks and Alluvial land (Bk) is a miscellaneous land type that consists mainly of mixed, undifferentiated sediment on steep banks mostly along the Ohio and Green Rivers. Soil characteristics vary within a small area. In one place the sediment is silty, and in another it is sandy. Slope gradient is uniform in some places; and in other places the river current has undermined the bank and left a cliff. The greater part of the acreage is in trees, which are the best use. Trees help to reduce bank cutting and to slow the overflow current so that sand is deposited on the river bank instead of on productive bottom lands. (Capability unit VIIw–1; woodland suitability group 12)

Bruno Series

This series consists of deep, excessively drained, sandy soils on bottom lands. These relatively young soils formed in water-deposited, sandy sediment that washed from uplands of limestone, sandstone, and shale. The main layers of a representative profile are—

0 to 10 inches, dark-brown, very friable loamy fine sand.
10 to 30 inches, brown, loose loamy fine sand.
30 to 50 inches, brown, very friable fine sandy loam.

Bruno soils occur mostly on the flood plain along the Ohio River. They are near the river channel. Most of the acreage is nearly level.

Natural fertility is moderately low in these soils, but moderate yields can be obtained by using fertilizer and turning under green-manure crops. Ordinarily, lime is not required. Roots easily penetrate the soil material, but moisture is not always sufficient for plant growth, because the moisture-supplying capacity is moderately low. Tractors lose traction in the sandy material and, consequently, pull heavy tillage implements with difficulty.

Considerable acreage is in corn and soybeans, but because these soils are subject to flooding some areas are in hardwood trees or are being planted to hardwood trees in order to control scouring. Many areas are becoming infested with johnsongrass. Consequently, yields of row crops are reduced, and some formerly cultivated fields are being used for hay and pasture.

Bruno loamy fine sand, 0 to 4 percent slopes (BrA).—This sandy soil is near the Ohio River and is subject to annual flooding. It formed in sandy sediment that was deposited by the river. The uppermost 30 inches is brown loamy fine sand. Below that the texture varies, and in some places thin strata of silt loam lie between the dominant sandy layers. A few small irregular areas, in which the surface layer is silty or sandy, were mapped with this soil.

In some places where the river loops, this soil is silty below a depth of about 20 inches.

Plant roots readily penetrate and water rapidly infiltrates the deep soil material. Crop yields are noticeably reduced in some years because not enough moisture is retained by the soil. Natural fertility is moderately low, but moderate yields can be obtained if fertilizer is applied. Lime is not needed.

Most of the soil is used for corn and soybeans; some is in hay, pasture, or hardwood trees. Perennial crops, if grown, generally are damaged by floods. Erosion is not a problem, but sand deposition during flood periods is a problem. Some areas are infested with johnsongrass and therefore are used for hay and pasture. (Capability unit IIIs–1; woodland suitability group 1)

Bruno loamy fine sand, 4 to 10 percent slopes (BrC).—This sandy soil is on bottom lands near the Ohio River and is subject to annual flooding. It formed in sediment that was deposited by the river. The uppermost 30 inches is brown loamy fine sand. Below that the texture ranges from sandy to silty. Mapped with this soil were a few small areas where the surface layer is silty or sandy and some other areas where the loamy fine sand is underlain at a depth of 20 to 30 inches largely by silty material.

This soil is somewhat droughty, and plant growth is retarded in some years because of insufficient moisture. Natural fertility is moderately low, but crops respond moderately well to fertilizer. Plant roots and water easily penetrate the soil material.

Crop yields are moderate on this soil. The most commonly grown crops are corn and soybeans. Some areas are in woods consisting mainly of willows and cottonwoods. Many areas are infested with johnsongrass. Drought-resistant grasses and legumes make good hay and pasture on this soil, and the potential for wood crops is high. More trees along the river bank would help to reduce scouring, to impede the deposition of sand and debris, and to retard the infestation by johnsongrass. The erosion hazard is moderate. (Capability unit IVs–2; woodland suitability group 1)

Calloway Series

This series is made up of somewhat poorly drained, strongly acid soils of the loess uplands. These soils have a

fragipan. The main layers of a representative profile are—

0 to 12 inches, brown, very friable silt loam; few, fine, light brownish-gray mottles and few, small, black concretions. (Mottles are more abundant in the lowermost 5 inches.)
12 to 20 inches, yellowish-brown, friable silt loam; common, fine, distinct, grayish mottles; subangular blocky structure; strongly acid.
20 to 32 inches, mottled yellowish-brown, light brownish-gray, and brown silty clay loam; firm, compact, and brittle; many, soft, black concretions. (Fragipan)

Calloway soils occur chiefly in the central part of the county. They are on flat ridgetops and on the gently sloping edges of the ridgetops adjacent to the better drained Grenada and Loring soils of the uplands. Some are on level terraces. The slope range is 0 to 6 percent.

The moisture-supplying capacity of Calloway soils is moderately high. Natural fertility is moderately low, and crop response to fertilizer is fair. Moisture and roots can penetrate the soil material easily down to the fragipan.

Calloway soils are fair producers of shallow-rooted crops that can tolerate some wetness. Most of the acreage is used for pasture, lespedeza, or corn. The erosion hazard is slight or moderate, and a seasonal high water table delays planting in some years.

Calloway silt loam, 0 to 2 percent slopes (CaA).—This soil is on flat ridgetops in the loess uplands and on terraces; it is somewhat poorly drained and has a fragipan. It has a 7- to 12-inch surface layer of brown, friable silt loam and a 6- to 10-inch subsoil of yellowish-brown, friable silt loam. The dense and brittle fragipan of silty clay loam is immediately below the subsoil. Mottles, mostly gray in color, occur throughout the profile.

This soil is easy to till and can be worked throughout a fairly wide range of moisture content without clodding or crusting. It is strongly acid and moderately low in natural fertility, but crops respond fairly well to lime and fertilizer. The moisture-supplying capacity is moderately high, but in a dry season crop yields may be reduced because of insufficient moisture. Roots and moisture easily penetrate the soil material down to the fragipan.

If heavily fertilized and well managed, this soil produces moderate yields of shallow-rooted crops. It is a good soil for pasture but is not suited to alfalfa. Planting is delayed in some years because of slow runoff and a seasonal high water table. After a prolonged rain, crops may drown in the saucer-shaped areas. (Capability unit IIIw–1; woodland suitability group 9)

Calloway silt loam, 2 to 6 percent slopes (CaB).—This is a somewhat poorly drained soil at the edge of flat ridgetops in the loess uplands and on terraces. It has a fragipan. The surface layer is brown, friable silt loam 6 to 10 inches thick. Fine mottles and small black concretions are noticeable in this layer. The subsoil is yellowish-brown, friable silt loam. It is 6 to 10 inches thick and has subangular blocky structure. Gray mottles and some small black concretions are noticeable in this layer also. The fragipan, which occurs just below the subsoil, is yellowish-brown and brownish-gray silty clay loam. This dense, brittle layer is 10 to 20 inches thick and contains many soft black concretions. This soil is eroded in a few small areas.

The plow layer is easy to till throughout a fairly wide range of moisture content. Roots and moisture easily penetrate the soil material down to the fragipan. The moisture-supplying capacity is moderately high, but crop yields are often reduced because of a lack of moisture. This soil is strongly acid and moderately low in natural fertility, but crops respond fairly well to lime and fertilizer.

If heavily fertilized and well managed, this soil produces moderate yields of shallow-rooted crops. Eroded areas need organic matter and extra heavy amounts of fertilizer. Yields of corn and small grain are moderate in a favorable season; otherwise they are low. Kentucky 31 fescue produces good pasture on this soil, but alfalfa is not a suitable crop. The erosion hazard is moderate in a cultivated field. (Capability unit IIIw–1; woodland suitability group 9)

Captina Series

The soils in this series are moderately well drained. They developed in Green River sediment of mixed origin and have a fragipan at a depth of about 2 feet. The main layers of a representative profile are—

0 to 7 inches, dark yellowish-brown, very friable silt loam.
7 to 26 inches, yellowish-brown, friable silty clay loam that grades to fine silt loam; pale-brown mottles in lower half.
26 to 38 inches, mottled gray and brown silt loam; compact and brittle. (Fragipan)

Captina soils are on low narrow ridges near and roughly parallel to the Green River. The slope is mostly 0 to 4 percent but ranges from 0 to 6 percent. Some areas are flooded when the river reaches its high-water mark.

The plow layer of these soils is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Moisture and roots easily penetrate the layers above the fragipan. Natural fertility is moderate or moderately high, and the reaction is medium acid. The response of crops to fertilizer and lime, however, is good. The moisture-supplying capacity is moderately high, but some plants wilt during a long dry spell.

Though their acreage is small, Captina soils are important in the county because they are good for soybeans and corn.

Captina silt loam, 0 to 2 percent slopes (CnA).—This is a moderately well drained soil on long low ridges that run parallel to the Green River. It is flooded occasionally when the river reaches its highest flood level. The plow layer of this soil is dark yellowish-brown, very friable silt loam, and the subsoil is yellowish-brown, friable silty clay loam. A mottled brown and gray, compact fragipan is at a depth of about 2 feet.

The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Moisture and roots easily penetrate the layers above the fragipan, but the fragipan impedes further penetration. Natural fertility and the moisture-supplying capacity are moderately high.

If it is fertilized, limed, and otherwise well managed, this soil produces moderate yields of most of the commonly grown crops. Alfalfa is short lived on this soil; normally the stand dies after 2 years. Erosion generally is not a problem, but in some years floods damage winter annuals. (Capability unit IIw–1; woodland suitability group 10)

Captina silt loam, 2 to 6 percent slopes (CnB).—This is a moderately well drained soil on terraces along the Green

River. It has a plow layer of yellowish-brown, friable silt loam; a subsoil of yellowish-brown, friable silty clay loam; and a mottled gray and brown, compact, brittle fragipan at a depth of about 2 feet. In a few places, about half of the original surface layer has been removed by erosion.

The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. The moisture-supplying capacity is moderately high, and natural fertility is moderate. The response of crops to lime and fertilizer is good. The fragipan restricts roots to the uppermost 2 feet of soil material, and it impedes the movement of water.

This is a minor soil in the county. Under good management, it produces only moderate yields of such crops as corn and beans. Alfalfa is short lived on this soil; normally the stand dies after about 2 years. The erosion hazard is moderate or moderately low in cultivated fields. (Capability unit IIe–6; woodland suitability group 10)

Collins Series

This series consists of moderately well drained, silty soils that formed in sediment washed from the loess uplands. The main layers of a representative profile are—

0 to 18 inches, brown to dark yellowish-brown, very friable silt loam; medium acid.
18 to 22 inches, dark yellowish-brown, friable silt loam; noticeable pale-brown mottles; medium acid.
22 to 27 inches, light yellowish-brown, friable silt loam; common gray and dark-brown mottles; slightly acid.
27 to 35 inches, black, firm silty clay loam streaked with dark brown; mildly alkaline.

Collins soils are mostly on bottoms along main drains in the southern part of the county. The slope range is 0 to 3 percent, but in a few areas, at the head of narrow draws, it is 0 to 5 percent. Adjacent to Collins soils are Falaya soils, which also are on bottom lands, and Memphis and Loring soils, which are on uplands.

Because they are not subject to erosion, Collins soils can be farmed intensively. If well managed, they produce favorable yields of all the commonly grown general farm crops. Wetness is a slight limitation, but most wet areas can be drained by a tile drainage system. Crops are damaged occasionally by stream overflow.

Collins silt loam (Co).—This is a moderately well drained soil on bottom lands that are along primary drains mostly in the southern part of the county. The slope range is 0 to 3 percent, for the most part, but is 3 to 5 percent in some places. The uppermost 22 inches of this soil is brown to dark yellowish-brown, very friable silt loam that is medium acid. Brownish-gray mottles are noticeable at a depth of 18 to 28 inches. A layer of mildly alkaline, black silty clay loam commonly occurs at a depth of about 27 to 30 inches.

The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Roots can penetrate easily and water can infiltrate readily to a depth of several feet. The moisture-supplying capacity is very high, and crops seldom are damaged because of a lack of moisture. Natural fertility is moderate, and the reaction is medium acid. Crop response to lime and fertilizer, however, is good.

Because it is not subject to erosion, this soil can be cultivated intensively. Though slightly wet, it produces good yields of all the commonly grown crops, but it must be well managed. Artificial drainage can help to increase yields of some crops. The good tilth and deep root zone of this soil make it well suited to tobacco and vegetables. (Capability unit I–2; woodland suitability group 2)

Dekoven Series

This series consists of dark-colored, very poorly drained soils that formed in sediment derived from alkaline loess. Two soil types, silt loam and silty clay loam, were mapped in Henderson County. A typical profile of the silt loam type is as follows—

0 to 16 inches, nearly black, friable silt loam.
16 to 26 inches, dark grayish-brown, friable silt loam; light olive-brown mottles.
26 to 40 inches, mottled dark grayish-brown and olive-brown, firm silty clay loam.

Dekoven soils occur mainly in the northern and central parts of the county on wide, level bottoms that are subject to flooding. Generally they are adjacent to the deep soils of the loess uplands. Their total acreage is large.

If adequately drained, the Dekoven are among the most fertile soils in the county, and therefore they are agriculturally important. Moisture and roots move easily down through the soil material. The moisture-supplying capacity is very high. Lime is not needed, because these soils are neutral or mildly alkaline.

Dekoven soils are nearly all cultivated. They are well suited to corn, soybeans, and most grasses and produce favorable yields of these crops in areas that have been drained. Crops that cannot withstand slight wetness are not suitable.

Dekoven silt loam (De).—This characteristically dark-colored soil is on wide bottoms in the northern and central parts of the county. It formed in loess sediment. It consists of nearly black, friable silt loam to a depth of about 16 to 26 inches. Below that is mottled gray and olive-brown, firm silty clay loam. Lime concretions occur at a depth of about 4 or 5 feet in some areas.

This soil is high in natural fertility and generally does not need lime. It has a very high moisture-supplying capacity and a deep root zone. The friable surface layer can be tilled easily throughout a wide range of moisture content without clodding or crusting. Water moves through the soil material at a satisfactory rate, but a seasonal high water table is near the surface during wet seasons unless adequate drainage is provided.

This soil is not subject to erosion but is limited mainly by poor drainage. It is suited to intensive cultivation, and if fertilized and otherwise well managed it produces favorable yields of most of the commonly grown crops. It is especially well suited to corn, soybeans, and sod crops. (Capability unit IIw–5; woodland suitability group 3)

Dekoven silty clay loam (Dk).—This is a very poorly drained soil on wide bottoms in the northern and central parts of the county. Its surface layer of sticky silty clay loam, characteristically dark colored, is about 20 inches thick. Below the surface layer is mottled gray and olive-brown, firm silty clay loam.

This soil is high in natural fertility and generally does not need lime. It has a high moisture-supplying capacity and a deep root zone. Because of its moderately fine texture, it can be plowed successfully only within a limited

range of moisture content. This soil is easily drained of excess water by artificial means. During a wet season, if the soil is not adequately drained, the water table rises almost to the surface.

This soil is not subject to erosion and thus can be cultivated intensively. It is well suited to corn, soybeans, milo, and sod crops and produces favorable yields of these crops. Water-tolerant trees grow extremely well. (Capability unit IIw–5; woodland suitability group 3)

Dekoven and Wakeland silt loams (Dw).—These are wet soils on the broad, flat bottom lands in the north-central part of the county. These soils do not occur in a uniform pattern; the Dekoven soil makes up the greater part of the acreage. Both soils, however, have a surface layer of brown, friable silt loam. The surface layer of the Dekoven soil is 6 to 15 inches thick, and that of the Wakeland soil is 15 to 20 inches thick. Underlying the surface layer in both soils is a layer, about 20 inches thick, of very dark gray, medium-textured material. At a depth of about 30 inches or more, both soils have a layer of mottled gray and olive-brown silt loam.

The Dekoven soil differs from a typical Dekoven soil in that its surface layer is brown instead of very dark gray. The Wakeland soil differs from a typical Wakeland soil in having a very dark gray layer at a depth of 15 to 20 inches, and in some places it has concretions of calcium carbonate at a depth of about 5 or 6 feet.

These soils are moderate or high in natural fertility and have a very high moisture-supplying capacity. Their friable surface layer can be tilled easily throughout a wide range of moisture content. Roots penetrate the soil material easily to a normal depth, and water infiltrates readily. Surface runoff is slow, however, and during a wet season the water table is near the surface unless the soils are drained by ditches or by a tile drainage system. The surface layer of these soils is acid, and the underlying layers are neutral.

Continuous cultivation is possible on these soils because they are not subject to erosion. Drainage could increase yields of corn, soybeans, and other of the commonly grown crops. In some years, low yields of alfalfa and other crops that are not tolerant of wetness can be expected. Perennials and winter crops are sometimes damaged by flooding. (Capability unit IIw–4; woodland suitability group 3)

Egam Series

This series consists of deep, well drained and moderately well drained soils that formed in sediment derived from mixed parent materials, including limestone. Two soil types, silty clay loam and silt loam, were mapped in Henderson County. A typical profile of the silty clay loam type is as follows—

0 to 18 inches, dark-brown, friable silty clay loam.
18 to 27 inches, very dark grayish-brown, firm, compact silty clay loam; angular blocky structure.
27 to 40 inches, dark yellowish-brown, firm, compact silty clay loam; angular blocky structure.

Egam soils occur in the northern part of the county on the flood plain of the Ohio River. Generally they are on low ridges parallel to the river and thus are subject to flooding.

These soils do not need lime. Roots and moisture penetrate the soil material to a depth suitable for good plant growth. The moisture-supplying capacity is high.

Egam soils are important in the county because they are productive. Most are used for intensive cultivation of annual crops; a few are in woods because of the flooding hazard. If properly fertilized and otherwise well managed, these soils produce favorable yields of corn and soybeans.

Egam silt loam (0 to 3 percent slopes) (Ea).—This is a well drained and moderately well drained, nonacid soil on bottom lands of the Ohio River. It is of minor extent in the county. It has a 20-inch surface layer of dark-brown, very friable silt loam, underlain by an 8- to 10-inch layer of very dark grayish-brown, firm, compact silty clay loam. This layer, in turn, is underlain by dark-brown, compact silty clay loam.

This soil can be tilled throughout a wide range of moisture content. It is moderately high in natural fertility and does not need lime. It has a high moisture-supplying capacity. Roots and moisture easily penetrate the surface layer, but the movement of air and water is retarded in the underlying compact layers. Crops respond well to fertilizer, especially potash.

Because it is not subject to erosion, this soil can be cultivated intensively. It is suited to all the locally grown crops, but winter and spring floods preclude its use for winter cover crops. Yields of corn and soybeans generally are favorable. Some areas are scoured by floods. (Capability unit I–1; woodland suitability group 2)

Egam silty clay loam (Ec).—This is a well drained and moderately well drained, nonacid soil on low, level ridges within 1 to 2 miles from the Ohio River. Its acreage is extensive. The surface layer is dark-brown, somewhat friable silty clay loam and is about 20 inches thick. It is underlain by dark-colored, firm, compact silty clay loam.

This soil is moderately high in natural fertility and does not need lime. It has a high moisture-supplying capacity. Roots and moisture penetrate the soil material to a depth suitable for good growth of plants. Crops respond well to fertilizer. The plow layer, because of its texture, is somewhat difficult to cultivate, but not to the extent that crop yields are greatly reduced. The range of moisture content within which the plow layer can be worked without crusting or clodding is somewhat narrow.

This soil is not subject to erosion but is subject to some scouring by floods. The floods restrict its use to summer annuals and trees. Yields of corn and soybeans generally are favorable. (Capability unit IIs–3; woodland suitability group 2)

Elk Series

This series consists of deep, well-drained soils that developed in alluvium washed from soils chiefly of limestone origin. The main layers of a representative profile are—

0 to 8 inches, dark-brown, very friable silt loam.
8 to 40 inches, brown, friable silty clay loam; subangular blocky structure.
40 to 50 inches, yellowish-brown, friable silty clay loam.

In Henderson County, Elk soils occur in the eastern part on low ridges roughly parallel to the Green River. The slope generally is less than 6 percent.

These soils have a very high moisture-supplying capacity. Roots can penetrate easily and water can move downward readily to a depth of more than 4 feet. The

very friable surface layer can be tilled easily throughout a wide range of moisture content without clodding or crusting. Though natural fertility is high, crops respond well to fertilizer. The soils are acid and need lime.

A few areas are still in native hardwoods, but most of the acreage is used for corn and soybeans. Yields are favorable. Elk soils are subject to overflow when the Green River is at its highest flood level.

Elk silt loam, 0 to 2 percent slopes (EkA).—This is a well-drained soil that developed from sediment chiefly of limestone origin. It is on the flood plain of the Green River. The plow layer is a dark-brown, friable silt loam. The subsoil is a brown silty clay loam and is less friable than the plow layer.

This soil has a deep root zone and can be worked throughout a wide range of moisture content without clodding or crusting. It is strongly acid and is high in natural fertility. The response of crops to lime and fertilizer is good. The moisture-supplying capacity is very high.

Because it is not subject to erosion, this soil can be cultivated intensively. It is suited to all the locally grown crops, but winter and spring floods preclude its use for perennial or winter crops. If fertilized and otherwise well managed, this soil is highly productive. It is an exceptionally good soil for pasture or hardwood trees. (Capability unit I–3; woodland suitability group 7)

Elk silt loam, 2 to 6 percent slopes (EkB).—This is a well-drained soil that developed from sediment chiefly of limestone origin. It lies on low ridges roughly parallel to the Green River. The surface layer is dark-brown, friable silt loam. The subsoil is brown silty clay loam and is less friable than the surface layer. In a few places, erosion has removed some of the original surface layer, and material from the subsoil has been mixed with the surface layer. Also, in a few places the slope is as much as 8 or 9 percent.

This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. It has a deep root zone, and water moves readily through it. The moisture-supplying capacity is very high. The reaction is strongly acid, but the response to lime is good; and though natural fertility is high, crops respond well to fertilizer.

This soil is suited to all the summer annual crops commonly grown in this county. Yields are favorable if fertilizer is applied and if the soil is otherwise well managed. Perennial grasses and legumes will grow on this soil, but these may be damaged somewhat by the infrequent floods. Surface runoff is medium, and erosion is a moderate or moderately low hazard. Controlling erosion is difficult in places because of the scouring and drifts caused by floodwater. (Capability unit IIe–1; woodland suitability group 7)

Falaya Series

This series consists of somewhat poorly drained soils that formed in sediment derived from acid loess. The main layers of a representative profile are—

0 to 7 inches, yellowish-brown, friable silt loam; strongly acid.
7 to 12 inches, yellowish-brown, friable silt loam; noticeable mottles of light brownish gray; strongly acid.
12 to 35 inches, grayish-brown silt loam mottled with gray and brown.

Falaya soils occur on bottoms along narrow drains, mainly in the southern part of the county. They are adjacent to soils on the loess uplands. The slope range is mostly 0 to 4 percent. In some places, Falaya soils are adjacent to Waverly soils, which are more poorly drained and occur in lower lying areas. In other places, they are adjacent to Collins soils, which are better drained.

Natural fertility is moderate in Falaya soils, and the reaction is strongly acid. The response of crops to fertilizer and lime, however, is good. The moisture-supplying capacity is very high. Water and roots penetrate the soil material easily. Artificial drainage is needed because of a seasonal high water table. If adequately drained, these soils can be tilled easily throughout a wide range of moisture content.

Falaya soils are used mostly for soybeans, corn, and milo. They can be cropped continuously because they are not subject to erosion, but they must be drained and well managed if they are to produce good yields. Either a tile system or a ditch system can effectively reduce wetness. Floods damage crops in some years. These soils, without being drained, are excellent for pasture and trees.

Falaya silt loam (Fa).—This is a yellowish-brown, somewhat poorly drained soil that formed in sediment derived from acid loess. It is mostly level, but the slope range is 0 to 4 percent. This soil occurs in the southern part of the county and is important agriculturally. The surface layer is yellowish-brown, friable silt loam and is 5 to 7 inches thick. The subsurface layer is yellowish-brown, friable silt loam with noticeable fine mottles of light brownish gray. This layer is strongly acid. It is underlain, at a depth of 12 to 14 inches, by grayish-brown silt loam mottled with gray. In a few places a dark-colored layer that is commonly neutral in reaction occurs at a depth of 20 to 30 inches.

The plow layer is in good tilth and can easily be kept that way. It can be worked throughout a wide range of moisture content without crusting. Roots and water penetrate the soil material easily if the seasonal high water table has been lowered. The moisture-supplying capacity is very high, the reaction is strongly acid, and the natural fertility is moderate. Fertilizer, lime, and drainage are needed for favorable yields.

If the wetness is corrected, this soil can be cultivated intensively, for it is not subject to erosion. If drained and well managed, it produces favorable yields of soybeans, corn, sorghum, and hay. Without drainage, it is excellent for pasture, especially Kentucky 31 fescue, and for trees. (Capability unit IIw–4; woodland suitability group 3)

Gilpin Series

This series consists of well-drained soils that formed in sandstone and shale residuum. The soils are covered by a thin mantle of windblown material. The main layers of a typical profile are—

0 to 6 inches, brown, very friable silt loam; very strongly acid.
6 to 12 inches, yellowish-brown, very friable silt loam; very strongly acid.
12 to 20 inches, brown, friable silty clay loam; very strongly acid.

20 to 24 inches +, brown, friable clay loam; very strongly acid. (This layer contains fragments of sandstone and shale, and it grades to bedrock of sandstone and shale.)

Gilpin soils are of minor importance in Henderson County. They occupy moderately steep slopes along the Green River, in the southeastern part of the county.

These soils can be tilled fairly easily throughout a wide range of moisture content. They have a moderately high moisture-supplying capacity, are moderately low in natural fertility, and are very strongly acid. Plants respond well to fertilizer and lime, and moisture and roots penetrate to a moderate depth.

Some of the acreage has been used for general farm crops, but much of this is now in bushes and small trees. A large part of the acreage is wooded and pastured.

In Henderson County, Gilpin soils occur with Wellston soils in such an intricate pattern that they could not be mapped separately. Therefore, they were mapped with Wellston soils as one mapping unit.

Gilpin-Wellston silt loams, 20 to 30 percent slopes (GeE).—This is a complex made up of well-drained soils that formed in residuum of sandstone and shale. These soils are covered by a thin mantle of loess. They occupy moderately steep slopes in the hilly southeastern section of the county, near the Green River. Gilpin soils make up about 65 percent of this complex, and Wellston soils make up the rest. Both soils have a surface layer of brown, very friable silt loam that is very strongly acid. The subsoil of Gilpin silt loam is yellowish-brown, firm silty clay loam. At a depth of about 15 inches, it is underlain by a friable clay loam that contains some fragments of sandstone and shale. Bedrock is at a depth of 20 to 26 inches. The subsoil of Wellston silt loam is 6 to 12 inches thicker than that of Gilpin silt loam. The Wellston soil is deeper to bedrock. In a small area both of these soils are eroded, and their subsoil is exposed. In a few places the subsoil is only 7 or 8 inches thick.

The moisture-supplying capacity of these soils is moderately high, natural fertility is moderate or moderately low, and the reaction is very strongly acid. Crops respond well to lime and fertilizer. Moisture and roots penetrate easily to a moderate depth. These soils are easy to till and can be worked throughout a wide range of moisture content without clodding or crusting.

Because of the severe erosion hazard, these soils are not suited to cultivated crops. But if they are adequately fertilized and limed, they are good for pasture. Also, these soils are well suited to trees. A large part of the acreage is wooded. (Capability unit VIe–1; woodland suitability group 11)

Ginat Series

This series is made up of level, poorly drained soils that developed in mixed sediment deposited by the Ohio River. These soils are dominantly gray and have a brittle, compact fragipan. The main layers of a representative profile are—

0 to 8 inches, brown, very friable silt loam.
8 to 28 inches, gray, friable silt loam mottled with brown; grades to silty clay loam in the lowermost 4 inches.
28 to 40 inches, mottled gray and brown, brittle, compact silty clay loam.

Ginat soils are extensive in the northern part of the county. They occupy broad flats that are 3 to 6 feet above the present flood plain of the Ohio River.

The moisture-supplying capacity of these soils is moderately low. The organic-matter content is low, natural fertility is moderately low, and the reaction is strongly acid. Crop response to lime and fertilizer is fair.

These soils are best suited to water-tolerant plants because they are wet and subject to infrequent flooding. The wetness hinders tillage. Most of the acreage is in soybeans, hay, or pasture. Yields are only fair but can be increased if the soils are drained. Open ditches can effectively reduce wetness.

Ginat silt loam (Gn).—This is a poorly drained soil on broad flats above the flood plain of the Ohio River. It is an extensive soil in Henderson County. The plow layer is brown, very friable silt loam, and the subsoil is gray, friable silt loam with brown mottles. A fragipan is at a depth of about 28 inches. It consists of firm, compact, mottled gray and brown silty clay loam.

This soil can be tilled throughout a fairly wide range of moisture content without crusting or clodding. It has a shallow root zone and a moderately low moisture-supplying capacity. It is strongly acid and moderately low in natural fertility. The response of crops to fertilizer and lime is fair.

Erosion is not a hazard on this soil, but wetness is a limitation, and the fragipan impedes the movement of roots and water. Crops that tolerate wetness are the most suitable. Pasture and hardwoods make excellent growth, but soybeans grow only fairly well, even after the soil has been drained. (Capability unit IVw–1; woodland suitability group 3)

Ginat silty clay loam (Go).—This is a poorly drained soil on terraces just above the flood plain of the Ohio River. Though not extensive in this county, it is an important soil. The plow layer is brown, sticky silty clay loam. The subsoil is gray, plastic silty clay loam with brown mottles. Immediately below the subsoil is firm, compact, mottled gray and brown silty clay loam—a fragipan.

Because of its clayey texture, this soil can be worked only within a narrow range of moisture content without crusting or clodding. It has a shallow root zone and a moderately low moisture-supplying capacity. It is strongly acid and moderately low in natural fertility. Crop response to lime and fertilizer is only fair.

Erosion is not a hazard on this soil, but wetness is a limitation. Roots, water, and air move slowly through this soil. Crops that tolerate wetness are the most suitable. Good yields of Kentucky 31 fescue and of hardwood trees can be obtained, and fair yields of soybeans can be obtained if surface drainage is provided. (Capability unit IVw–1; woodland suitability group 3)

Grenada Series

The Grenada series consists of moderately well drained soils that have a fragipan. These soils developed in loess. The main layers of a typical profile are—

0 to 9 inches, brown, very friable silt loam; strongly acid.
9 to 22 inches, yellowish-brown, firm, heavy silt loam; angular blocky structure; few concretions and pale-brown mottles at a depth of 18 inches.

22 to 38 inches, mottled yellowish-brown and gray, brittle, compact silty clay loam (upper part) and fine silt loam (lower part).

Grenada soils occur on uplands in the central part of the county. They occupy broad areas where the slope is mostly 1 to 6 percent, though it ranges from 0 to 12 percent. These soils are adjacent to Loring, Memphis, and Uniontown soils. They are not so well drained as Loring soils, and they have a denser and less deep fragipan. They are not so well drained as Uniontown soils, which do not have a fragipan.

Natural fertility is moderately low in Grenada soils, and the reaction is strongly acid. The response of crops to fertilizer and lime, however, is good. The moisture-supplying capacity is moderately high, except in severely eroded places. Water and roots penetrate the soil material easily down to the fragipan, but this layer impedes further penetration. Grenada soils can be tilled easily throughout a wide range of moisture content without clodding or crusting.

In some places, erosion is not a hazard, but in other places, it is a severe one. Nevertheless, nearly all the Grenada soils are used for general farm crops. Yields are good if the soils are well managed. Deep-rooted crops are short lived because the fragipan restricts the depth of the root zone.

Grenada silt loam, 0 to 2 percent slopes (GrA).—This is a moderately well drained soil that developed in loess. It has a plow layer of brown, very friable silt loam and a subsoil of yellowish-brown, firm, heavy silt loam. A brittle, compact fragipan is at a depth of 20 to 30 inches.

About 270 acres of this soil, in and near the city of Henderson, is taken up by homesites, public buildings, hard-surface parking lots, and playgrounds. In much of this acreage, the original soil features have been greatly altered by leveling, grading, and filling.

This soil is easy to till and does not clod or crust. It has a moderately high moisture-supplying capacity. It is strongly acid and moderately low in natural fertility, but crops respond well to lime and fertilizer.

Because the root zone is only moderately deep, this soil is best suited to shallow-rooted crops or to specialty crops. It produces moderate yields of general crops. In a dry year, however, yields are reduced because of insufficient moisture. Trees and Kentucky 31 fescue grow well on this soil. Alfalfa, however, is short lived because the fragipan restricts root growth. Eroision is not a hazard.

This soil has severe limitations for use as a septic tank drainage field. (Capability unit IIw–1; woodland suitability group 10)

Grenada silt loam, 2 to 6 percent slopes (GrB).—This is a moderately well drained soil that developed in loess. It has a plow layer of brown, very friable silt loam and a subsoil of yellowish-brown, firm, heavy silt loam. A brittle, compact fragipan is at a depth of 22 to 28 inches.

Parts of this soil, in and near the city of Henderson, have been developed for urban use. In much of this acreage, the original soil features have been altered by leveling.

Except for some small wet spots, this soil is easy to till and does not clod or crust. It has a moderately high moisture-supplying capacity. It is strongly acid and moderately low in natural fertility, but crops respond well to lime and fertilizer.

Because the root zone is only moderately deep, this soil is best suited to shallow-rooted crops or to specialty crops. It produces moderate yields of general crops. In a dry year, however, yields are reduced because of insufficient moisture. Trees and Kentucky 31 fescue grow well on this soil. Alfalfa is short lived because the fragipan restricts root growth. Erosion is a moderate or moderately low hazard.

This soil has severe limitations for use as a septic tank drainage field because the movement of water is restricted. (Capability unit IIe–6; woodland suitability group 10)

Grenada silt loam, 2 to 6 percent slopes, eroded (GrB2).—This is a moderately well drained soil that developed in loess. Some of the original surface layer has washed away. Consequently, in plowed areas the upper part of the subsoil has been mixed with the remaining original surface layer. In spots the subsoil is exposed. The subsoil consists of yellowish-brown, firm, heavy silt loam. A brittle, compact fragipan is at a depth of 18 to 24 inches.

This soil has a moderately high moisture-supplying capacity. It is strongly acid, low in organic-matter content, and moderately low in natural fertility. Crops, however, respond well to lime and fertilizer. This soil is not difficult to till, but because of the low organic-matter content and the heavy-textured material in the plow layer, it can be worked without clodding or crusting only within a narrow range of moisture content.

Because the fragipan restricts water and root penetration, this soil is best suited to shallow-rooted crops or to specialty crops. It produces moderate yields of general crops. In a dry year, however, yields are reduced because of insufficient moisture. Trees and pasture grasses grow well on this soil, but alfalfa is short lived. Erosion is a moderate or moderately low hazard in cultivated areas. (Capability unit IIe–6; woodland suitability group 10)

Grenada silt loam, 6 to 12 percent slopes, eroded (GrC2).—This is a moderately well drained soil that developed in loess. Only a small acreage of this soil is not eroded. In most places some of the original surface layer has washed away, and the plow layer is a mixture of the original surface layer and former subsoil. The subsoil is exposed in spots, and rills occur in some places. The subsoil is a yellowish-brown, firm, heavy silt loam. Its structure is angular blocky. Mottled gray and yellowish-brown, brittle, compact silty clay loam is at a depth of 16 to 20 inches. This layer is a fragipan.

Except for some small wet spots, this soil is easy to till but can be worked only within a narrow range of moisture content; otherwise it will clod or crust. It has a moderately high moisture-supplying capacity. Erosion has lowered the content of organic matter. Natural fertility is moderately low, and the reaction is strongly acid, but the response of crops to fertilizer and lime is good.

Erosion is a moderate or severe hazard in cultivated areas. Therefore, if this soil is used for row crops, runoff must be controlled in order to minimize the erosion hazard. Because the fragipan restricts water and root penetration, this soil is best suited to shallow-rooted crops or to specialty crops. Trees and pasture grasses grow well on this soil, but alfalfa is short lived. Yields of general crops are moderate, but in a dry year they are reduced by insufficient moisture. (Capability unit IIIe–8; woodland suitability group 10)

Grenada silt loam, 6 to 12 percent slopes, severely eroded (GrC3).—This is a moderately well drained soil that developed in loess. Except for a few places where the slope is less than 6 percent, this soil occupies sloping areas in the central part of the county. Most of the original surface layer has washed away. Thus, the plow layer consists mostly of former subsoil. The subsoil is a yellowish-brown, firm, heavy silt loam that has angular blocky structure. A brittle, compact fragipan is at a depth of about 16 to 18 inches. Some shallow gullies have formed, and the fragipan is exposed in a few severely eroded spots. Seepage is noticeable in some places.

The root zone of this soil generally is less than 20 inches deep, and thus the moisture-supplying capacity is low. The fragipan resists water penetration and thereby increases the hazard of runoff and erosion. Erosion has lowered the content of organic matter and reduced natural fertility. Fertilizer therefore is needed. Lime also is needed because this soil is strongly acid. Tillage is somewhat difficult because of the heavy texture of the plow layer. In most places the plow layer tends to clod or crust.

If cultivated, this soil is subject to moderate to severe erosion, so runoff must be controlled to reduce this hazard. Yields of general farm crops are fair at best. Yields of Kentucky 31 fescue and of sericea lespedeza are good if the soil is fertilized and well managed. In a dry year, yields are reduced because of insufficient moisture. Alfalfa is short lived because the fragipan restricts root growth, and trees grow only moderately well. Shallow-rooted crops or specialty crops are the most suitable for this soil. (Capability unit IVe–14; woodland suitability group 8)

Gullied Land

Gullied land (Gu) is a miscellaneous land type consisting of small severely eroded areas of the uplands. More than 20 percent of this land type is cut by deep gullies. The soil material in some of the gullies is alkaline, but the exposed parent material is acid.

The original soil remains only in spots between the gullies. Its identity is obscure, because erosion has destroyed most of the soil characteristics.

Gullied land may occur on any slope but is most likely to occur on 6 to 20 percent slopes that have been improperly managed. It is best suited to pine trees, but if gully erosion is controlled and large amounts of fertilizer are applied, this land type can be used, to a limited extent, for pasture. (Capability unit VIIe–4; woodland suitability group 12)

Henshaw Series

The Henshaw series consists of level, silty, somewhat poorly drained soils that developed in sediment washed from the loess uplands. The main layers of a typical profile are—

0 to 16 inches, brown, very friable silt loam; few brownish-gray mottles in the lower part; strongly acid.
16 to 26 inches, mottled yellowish-brown and gray, firm silty clay loam; blocky structure; medium acid.
26 to 50 inches, yellowish-brown, somewhat friable silt loam; grayish-brown and gray mottles; slightly acid to neutral.

Henshaw soils are on terraces in the broad valleys south of the Ohio River. They are mostly level, but some are on a slope of up to 4 percent. They are extensive in this county and are agriculturally important.

The moisture-supplying capacity of these soils is high, and natural fertility is moderate. The response of crops to lime and fertilizer is good. Root and water penetration is adequate. The plow layer is easily worked throughout a wide range of moisture content without clodding or crusting.

These soils are not subject to erosion and thus can be cultivated intensively. Wetness, however, is a limitation, and flooding, though infrequent, can be a problem. If adequately drained, these soils are suited to most of the locally grown crops. Most of the acreage is used for general farming.

Henshaw silt loam (He).—This is a somewhat poorly drained soil on wide, level terraces near the major streams. It developed in old slackwater sediment that washed from the loess uplands. The surface layer is brown, very friable silt loam about 16 inches thick. The subsoil is mottled yellowish-brown and gray, firm silty clay loam. It is underlain, at a depth of about 2 feet, by yellowish-brown, somewhat friable silt loam. The surface layer is strongly acid, the subsoil is medium acid to neutral, and the layer below the subsoil is commonly neutral but is alkaline or weakly calcareous in places.

A few acres of this soil are part of an urban area. The original soil features there have been altered somewhat.

The moisture-supplying capacity of this soil is high, and natural fertility is moderate. The response of crops to lime and fertilizer is good. Root and water penetration is adequate. The plow layer is easily worked throughout a wide range of moisture content without crusting or clodding, except in a few spots where the silty material has washed away leaving clayey material at or near the surface.

This is an agriculturally important soil. It is suited to all the locally grown crops, and it can be cultivated intensively because, except in a few areas, it is not subject to erosion. Wetness, however, is a limitation, and drainage is needed for most crops. Corn, soybeans, hay, and pasture do very well if the soil is fertilized and otherwise well managed. (Capability unit IIw–4; woodland suitability group 9)

Huntington Series

This series consists of well-drained, nonacid soils that formed in sediment from the Ohio and Green Rivers. These soils occur mostly on the higher parts of the flood plain near the river channels. Two soil types, silt loam and fine sandy loam, were mapped in Henderson County. A typical profile of the silt loam type is as follows—

0 to 8 inches, dark-brown, friable silt loam.
8 to 18 inches, dark-brown, friable silt loam to silty clay loam.
18 to 42 inches, brown, friable silt loam.

In some places there are thin strata having a texture different from that dominant in the profile.

Huntington soils are adjacent to the moderately well drained Lindside soils and the more compact Egam soils. They are high or moderately high in natural fertility and have a very high or high moisture-supplying capacity. Generally, crops on these soils respond well to fertilizer, but in a few areas the response has been only fair, probably because repeated plowing to the same depth with heavy

equipment has compacted the soil. These soils generally do not need lime. They are easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. They are easily infiltrated by moisture and penetrated by roots.

In Henderson County, Huntington soils are extensive and are agriculturally important. They are well suited to all farm crops but can have winter cover to only limited extent because of floods. Flooding during the growing season is uncommon.

Huntington fine sandy loam, 0 to 4 percent slopes (HnA).—This is a well-drained, slightly sandy soil on wide bottoms along the Ohio River and, to a lesser extent, along the Green River. The plow layer of this soil is dark-brown fine sandy loam. The subsoil is brown, nearly neutral, friable fine sandy loam to loam and is about 2 feet thick. Below a depth of 20 inches is loam, silt loam, or, in a few places, loamy sand. In some places, thin layers of loam, silt loam, and loamy sand occur throughout the profile.

This soil has a deep root zone and a high moisture-supplying capacity. It is neutral and generally does not need lime. Normally it does not clod or crust when plowed, but cultivation is difficult in places where a high content of sand in the surface layer causes tractors and other power machines to lose traction. Crop response to fertilizer is good.

Yields of corn and soybeans are favorable if management is good. Annual winter floods restrict the growing of winter cover. Floodwaters cause minor scouring and deposition in some places. Hardwood trees, which are suited to this soil, can prevent scouring in some areas. Johnsongrass spreads easily, and its control is a serious problem in places. (Capability unit I–1; woodland suitability group 2)

Huntington silt loam, 0 to 4 percent slopes (HsA).—This is a well-drained soil on wide bottoms along the Ohio River and, to a lesser extent, along the Green River. The dominant slope is less than 3 percent. The plow layer is dark-brown, friable silt loam, and the subsoil is dark-brown, nearly neutral, friable silt loam. Below a depth of 20 inches is loam or, in a few places, loamy fine sand. In some places there are thin strata having a texture different from that dominant in the profile.

Figure 9.—An area of Huntington silt loam drying out after being flooded by the Ohio River. Overflows often leave new sediment in areas such as this.

Generally, this soil is high in natural fertility and has a very high moisture-supplying capacity. In most places it is nearly neutral and does not need lime. The response to fertilizer varies. Moisture and roots easily penetrate this deep soil. The plow layer rarely clods or crusts when tilled. In some places, however, sediment left by winter floods forms a thin crust that reduces soil aeration.

This soil is suited to all the locally grown crops but can have winter cover to only limited extent because of floods. It is not subject to erosion and therefore can be cultivated intensively. Corn and soybeans are highly suitable crops if management is good. Alfalfa and other deep-rooted perennials are suitable in areas that are not subject to annual winter flooding. Floodwaters cause minor scouring and deposition (fig. 9) and help to spread johnsongrass. Hardwood trees, which are suited to this soil, can prevent scouring in some areas. (Capability unit I–1; woodland suitability group 2)

Huntington silt loam, 4 to 16 percent slopes (HsC).—This is a well-drained soil on bottom lands of the Ohio and Green Rivers. Though widely scattered, it is of minor extent in the county. It occupies short slopes on the sides of sloughs and drains. Its dark-brown, friable silt loam is fairly uniform, but in some places, thin layers of fine sandy loam or silty clay loam occur throughout the profile. A few acres of a soil that has a surface layer of fine sandy loam are included in the mapped areas of this soil.

This soil has a deep root zone and a very high moisture-supplying capacity. It is neutral in reaction so does not need lime, and it is high in natural fertility. Crops respond well to fertilizer. The plow layer is easy to till.

This soil is suited to all the locally grown crops, but some areas are subject to winter flooding. Yields of perennials and winter cover crops, therefore, are not good in years of heavy flooding. Yields of corn and soybeans generally are favorable if management is good. The floodwaters cause scouring and deposition in some places. Hardwood trees, which are well suited to this soil, can prevent some scouring. Erosion is a slight to moderate hazard in cultivated fields. (Capability unit IIe–8; woodland suitability group 2)

Lakin Series

This series consists of excessively drained, sandy soils that developed in mixed alluvium from the Ohio River. The main layers of a typical profile are—

0 to 7 inches, yellowish-brown, loose loamy fine sand.
7 to 18 inches, strong-brown, loose loamy fine sand.
18 to 40 inches, yellowish-brown, loose fine sand.

Lakin soils are of minor extent in this county. They occupy low, gently sloping ridges. Most of the acreage is used for general farming, but crop yields are fair.

The moisture-supplying capacity of these soils is moderately low, and natural fertility is moderately low. The response of crops to lime and fertilizer is good. Roots easily penetrate the soil material. The plow layer is easily tilled throughout a wide range of moisture content, but cultivation is difficult because the high content of sand causes tractors and other power machines to lose traction. Erosion is only a slight hazard because water enters the soil readily and moves downward rapidly. Winter floods, though infrequent, are a hazard.

Lakin loamy fine sand, 2 to 6 percent slopes (LaB).—This is an excessively drained, sandy soil on low ridges above the Ohio River flood plain. In a few areas, the slope is less than 2 percent, and in some areas that are moderately eroded the slope is as much as 8 percent. This soil is of minor extent in Henderson County. The plow layer is yellowish-brown, loose loamy fine sand, and the subsoil is strong-brown, loose loamy fine sand. Below the subsoil, at a depth of about 18 inches, is yellowish-brown, loose fine sand.

The moisture-supplying capacity of this soil is moderately low, natural fertility is moderately low, and the reaction is strongly acid. The response of crops to lime and fertilizer is good. Small and somewhat frequent applications of fertilizer give best returns because excessive leaching causes rapid loss of nutrients. The plow layer is easy to till and does not clod or crust. Erosion is only a slight hazard because water enters the soil readily and moves downward rapidly.

This soil is suited to general farm crops, but yields are only fair. (Capability unit IIIs–1; woodland suitability group 1)

Lindside Series

The Lindside series consists of deep, moderately well drained, alluvial soils that formed in limy sediment of mixed origin. The main layers of a representative profile are—

0 to 16 inches, brown, very friable silt loam; slightly acid.
16 to 28 inches, brown, friable silt loam; few faint mottles of grayish brown.
28 to 40 inches, mottled yellowish-brown and gray silt loam.

These soils are agriculturally important in Henderson County. They occur on bottom lands along the Ohio and Green Rivers, generally adjacent to the well-drained Huntington soils and the somewhat poorly drained Newark soils. Lindside soils are high in natural fertility and have a high or very high moisture-supplying capacity. Crops respond well to fertilizer and do not need lime. Water and roots easily penetrate the soil material to a favorable depth.

Lindside soils are well suited to row crops, to hardwood trees, and to pasture. They are subject to winter flooding, however, and therefore are restricted to corn, soybeans, or other summer annuals.

Lindside silt loam (0 to 4 percent slopes) (ld).—This is a deep, moderately well drained soil on bottoms along the Ohio and Green Rivers. The surface layer is brown, friable silt loam about 16 inches thick. The layer below that is slightly acid, friable silt loam. It is brown with a few faint mottles of grayish brown. At a depth of about 28 inches is a layer of mottled yellowish-brown and light-gray silt loam. Within this layer, in some places, are stratified layers of loam, fine sandy loam, and silty clay loam. In a few areas, the surface layer is fine sandy loam.

This is an important agricultural soil. It is high in natural fertility and has a high or very high moisture-supplying capacity. Crop response to fertilizer is good. Lime is not needed. Moisture and roots easily penetrate the soil material to a favorable depth. The plow layer is easy to till and does not crust or clod. Winter floods, however, leave a thin layer of sediment on the surface.

This soil is suited to all the locally grown crops but can have winter cover or perennials to only limited extent because of floods. It is not subject to erosion and thus can be cultivated intensively. Yields of corn or other summer annuals are favorable if management is good. (Capability unit I–2; woodland suitability group 2)

Lindside silty clay loam (le).—This is a deep, moderately well drained soil on bottoms along the Ohio and Green Rivers. The dominant slope is 0 to 3 percent. The surface layer is about 16 inches thick and consists of dark-brown, sticky silty clay loam. The layer below that consists of sticky silty clay loam also, but it is brown with some fine mottles of pale brown. This layer is underlain, at a depth of about 28 inches, by mottled yellowish-brown and gray, sticky silty clay loam. Within this lowermost layer, in some places, is stratified silt loam, loam, and fine sandy loam.

This soil is not extensive but is important agriculturally. It is high in natural fertility and has a high moisture-supplying capacity. Crops respond well to fertilizer. Water and roots easily penetrate the soil material to a favorable depth. This soil crusts or clods easily if plowed when its moisture content is not favorable.

This soil is suited to all the locally grown crops but can be used for winter cover or perennials to only limited extent because of floods. It is not subject to erosion and therefore can be cultivated intensively. Yields of corn or other summer annuals are favorable if management is good. (Capability unit IIs–3; woodland suitability group 2)

Litz Series

This series consists of somewhat excessively drained soils that formed in sandstone and shale residuum. These soils are covered by a thin mantle of windblown material. The main layers of a typical profile are—

0 to 4 inches, brown, very friable silt loam; strongly acid.
4 to 10 inches, strong-brown, friable silty clay loam; strongly acid.
10 to 15 inches, strong-brown, friable fine sandy loam; strongly acid.
15 inches+, loose fragments of sandstone and shale.

Litz soils are not extensive. They occupy steep slopes in the hilly southeastern section of the county, near the Green River. Most of the acreage is wooded. The stands of hardwood trees are good.

These soils are shallow to moderately deep. They have a moderately low moisture-supplying capacity, are moderately low in natural fertility, and are strongly acid. Crop response to lime and fertilizer is good.

In Henderson County, Litz soils occur with Muskingum soils in such an intricate pattern that they could not be mapped separately. Therefore, they were mapped with Muskingum soils as one mapping unit.

Litz-Muskingum silt loams, 30 to 50 percent slopes (LmF).—This is a complex made up of soils that formed in sandstone and shale residuum. These soils are covered by a thin mantle of loess. They occupy steep slopes in the hilly southeastern section of the county, near the Green River. Litz silt loam makes up about two-thirds of this complex, and Muskingum silt loam makes up the rest. Both soils have a surface layer of brown, very friable, strongly acid silt loam. The subsoil of Litz silt loam is

strong-brown, friable silty clay loam, and that of Muskingum silt loam is yellowish-brown, friable silt loam. The Litz soil is not so deep as the Muskingum soil, but it has a more strongly developed subsoil.

The moisture-supplying capacity of these soils is moderately low, and natural fertility is moderately low. The reaction is strongly acid. Moisture and roots penetrate easily to a depth ranging from 18 to 30 inches.

These soils are too steep for cultivation and for better than fair pasture. They are well suited to trees. (Capability unit VIIe–2; woodland suitability group 11) (Additional information about Muskingum silt loam is given in the description of the Muskingum series.)

Loring Series

The Loring series consists of well drained and moderately well drained soils that have a weak fragipan at a depth of about 26 to 42 inches. These soils developed in loess. The main layers of a representative profile are—

0 to 9 inches, brown or dark-brown, very friable silt loam; strongly acid.
9 to 28 inches, brown, slightly sticky silty clay loam; subangular blocky structure; strongly acid.
28 to 36 inches, yellowish-brown silty clay loam mottled with light yellowish brown; strongly acid; somewhat firm, brittle, and compact; few small black concretions; pale-gray silt is noticeable between the peds.
36 to 46 inches, yellowish-brown silt loam mottled with pale brown and brownish gray; compact and brittle.

Loring soils occur on broad ridgetops and on side slopes throughout the loess uplands, except the bluff sections. The slope ranges from 0 to 20 percent. These soils are generally adjacent to Memphis and Grenada soils. They differ from the well-drained Memphis in having a fragipan, and from the Grenada in having better drainage and a weaker and deeper fragipan.

Natural fertility is moderate or moderately low in Loring soils, and the reaction is strongly acid. The response of crops to fertilizer and lime, however, is good. The moisture-supplying capacity is high or moderately high. Water and roots penetrate the soil material easily down to the fragipan, but this layer impedes further penetration. These soils are easy to till and can be worked throughout a wide range of moisture content without crusting.

Loring soils are important in this county. They are used mainly for corn, soybeans, tobacco, hay, and pasture. Some are used for strawberries or other specialty crops, and a few have been planted to pecan trees. Yields of all crops are good if careful management is practiced.

Loring silt loam, 0 to 2 percent slopes (LnA).—This is a well drained and moderately well drained soil of the loess uplands in the central and southern parts of the county. It occupies small areas on smooth ridgetops. The surface layer is a smooth, floury, dark-brown silt loam and is about 10 inches thick. The subsoil is a brown silty clay loam. It is underlain, at a depth ranging from 26 to 42 inches, by a somewhat compact fragipan of mottled silt loam. The fragipan is deepest in flat areas.

This soil can be worked throughout a wide range of moisture content without clodding or crusting. It has a high moisture-supplying capacity. It is strongly acid and only moderate in natural fertility, but crops respond exceptionally well to lime and fertilizer. The fragipan restricts movement of water and limits the depth of the root zone.

Under good management, most of the common farm crops grow well on this soil. Alfalfa is not a suitable crop because the fragipan restricts root growth and a seasonal water table causes wetness. Erosion is not a problem, so intensive cultivation is possible. (Capability unit I–3; woodland suitability group 7)

Loring silt loam, 2 to 6 percent slopes (LnB).—This is a well drained and moderately well drained soil of the loess uplands. The surface layer is dark-brown, friable silt loam and is 6 to 9 inches thick. The subsoil is brown or reddish-brown, slightly sticky silty clay loam. It is underlain, at a depth ranging from 26 to 36 inches, by yellowish-brown, compact silt loam or silty clay loam mottled with light yellowish brown and gray. This layer is a fragipan; it ranges from 10 to 18 inches in thickness. Generally, the silty parent material is acid in reaction, but in some places it is neutral. The depth to the underlying sandstone ranges from 5 feet, near the southeastern edge of the county, to 50 feet, in the northern part.

This soil is easy to till and can be worked throughout a wide range of moisture content without crusting or clodding. It has a high moisture-supplying capacity. It is strongly acid and only moderate in natural fertility, but crops respond exceptionally well to lime and fertilizer. Water and roots penetrate the soil material easily down to the fragipan, but this layer impedes further penetration.

If fertilized and otherwise well managed, this soil can produce better than average yields of all the commonly grown crops. It is well suited to specialty crops; many acres are planted to fruit trees. In cultivated fields, some attention needs to be given to erosion control. (Capability unit IIe–10; woodland suitability group 7)

Loring silt loam, 2 to 6 percent slopes, eroded (LnB2).—This is a well drained and moderately well drained soil of the loess uplands. The gradient averages slightly higher than that of the uneroded phase (Loring silt loam, 2 to 6 percent slopes). This soil occurs in close association with Memphis and Grenada soils.

The surface layer of this soil is brown silt loam. It is a mixture of the original surface layer and former subsoil, for about 2 to 4 inches of the original surface layer has washed away. In small scattered areas the subsoil is exposed. The subsoil is brown or reddish-brown, firm silty clay loam. It is underlain, at a depth ranging from 24 to 30 inches, by mottled light yellowish-brown and brownish-gray, somewhat compact silty clay loam or silt loam. This layer is a fragipan.

In most places, the plow layer of this soil has a slightly higher content of clay than that of the uneroded phase. Consequently, this soil tends to crust or clod if worked when too wet. It has a high moisture-supplying capacity. Erosion has lowered the content of organic matter, and therefore the yield potential is low. Natural fertility is moderate, and the reaction is strongly acid, but crop response to fertilizer and lime is good.

Most of the acreage is cleared and is used for cultivated crops, hay, and pasture. All the commonly grown crops are suitable, except alfalfa, which is a deep-rooted plant. The fragipan restricts the root growth of such plants. Because this soil is subject to erosion if cultivated, applicable erosion control measures are needed. (Capability unit IIe–10; woodland suitability group 7)

Loring silt loam, 6 to 12 percent slopes, eroded (LnC2).—This is a well drained and moderately well drained soil on ridgetops or benches of the loess uplands in the southern part of the county. It occurs as large areas and is important agriculturally.

About 3 to 5 inches of the original surface layer has washed away. Therefore, the plow layer consists partly of former subsoil. In spots the subsoil is exposed. The surface layer is brown silt loam. The subsoil is brown, firm silty clay loam. It has a redder hue than the surface layer. Underlying the 20-inch subsoil is a mottled, weakly developed but brittle fragipan of silty clay loam. Seepy spots are common near the foot of the slope. A few acres of this soil are not eroded.

This soil is moderate in natural fertility and is strongly acid, but the response of crops to fertilizer and lime is good. The moisture-supplying capacity is high. The organic-matter content is low. The plow layer, when wet, is slightly sticky and tends to clod or crust if tilled. Root and water penetration is impeded by the fragipan.

Some areas are wooded, but most of the acreage is cleared. Use is about equally divided between cultivated crops and pasture or hay. A few acres are part of an urban area. Alfalfa and other deep-rooted perennials die after about 3 or 4 years because the fragipan restricts the depth of the root zone. All the other locally grown crops, however, are suitable. Yields are better than average if the soil is limed and fertilized and otherwise well managed. Rains during the growing season may be intense, and erosion is a moderate or severe hazard in cultivated fields. Therefore, runoff must be controlled to reduce this hazard. (Capability unit IIIe–2; woodland suitability group 7)

Loring silt loam, 12 to 20 percent slopes, eroded (LnD2).—This strongly sloping soil is well drained and moderately well drained. It occurs in the loess hills in the southern part of the county. Erosion has removed 2 to 5 inches of the original surface layer. Consequently, in plowed areas the upper part of the subsoil is mixed with the surface layer. The surface layer is brown silt loam. The subsoil is reddish-brown, firm silty clay loam and is about 18 inches thick. It is exposed in spots. Immediately below the subsoil is a weakly developed but brittle fragipan that is mottled brown and gray. In some areas, sandstone outcrops near the foot of the slope, where the loess parent material is thin. Seepy spots occur along the lower part of some slopes. A few acres of this soil are not eroded.

This soil has a high moisture-supplying capacity. It is strongly acid, low in organic-matter content, and moderate in natural fertility. Crops respond well to lime and fertilizer. The plow layer is fairly easy to till but tends to crust if plowed when too wet. Root and water penetration is impeded by the fragipan.

Because runoff is rapid and the hazard of erosion is severe, this soil is not suited to row crops. A large acreage is cleared and is used mostly for pasture and hay. A lesser acreage is wooded, and a few acres are idle. Yields of pasture and hay are better than average if management is good. The growth potential of trees is good. (Capability unit VIe–7; woodland suitability group 7)

Loring silty clay loam, 2 to 6 percent slopes, severely eroded (LoB3).—This is a well drained and moderately well drained soil of the loess uplands in the central and southern parts of the county. It occupies small areas on gentle slope breaks. In more than half the acreage, 75 percent or more of the original surface layer has washed away, and consequently the plow layer consists mostly of former subsoil. The subsoil is brown, firm silty clay loam. It is about 15 to 18 inches thick and overlies a weakly developed but brittle fragipan of mottled light yellowish-brown and brownish-gray silty clay loam. Some spots are eroded almost to the fragipan.

Because of its texture, the plow layer is somewhat difficult to work; it clods and crusts easily. The fragipan slows the penetration of roots and water. The moisture-supplying capacity is moderately high. This soil is strongly acid, very low in organic-matter content, and moderately low in natural fertility. The response of crops to lime and fertilizer, however, is good.

Most of the acreage either is cultivated or is idle. If management is good and adequate amounts of fertilizer are applied, moderate yields of most of the commonly grown crops can be obtained. Alfalfa is not suitable, but some pasture grasses grow well. Where row crops are grown, some erosion control measures are needed. (Capability unit IIIe–12; woodland suitability group 8)

Loring silty clay loam, 6 to 12 percent slopes, severely eroded (LoC3).—This is a well drained and moderately well drained soil of the loess uplands in the central and southern parts of the county. It occurs on long, narrow ridgetops. Nearly all of the original surface layer has been removed by erosion, and consequently the plow layer consists mostly of former subsoil. The present surface layer is sticky silty clay loam; and the subsoil is brown, firm silty clay loam. A weakly developed but brittle fragipan is at a depth of about 22 inches. In spots the fragipan is exposed at the surface, and shallow gullies have formed in some areas.

The plow layer is somewhat difficult to till; it clods or crusts if worked when slightly wet. The fragipan slows the penetration of roots and water. The moisture-supplying capacity is moderately low. The organic-matter content is very low, and natural fertility is moderately low. Crops respond fairly well to lime and fertilizer.

All of the acreage has been cultivated at one time, but now much of it is pastured. A small acreage is idle. Some parts are still cultivated and others have reverted to woods. If fertilized and well managed, this soil is good for pasture. It is fair for most of the locally grown cash crops. Because erosion is a hazard in cultivated areas, washing is excessive if adequate erosion control measures are not used. (Capability unit IVe–14; woodland suitability group 8)

Loring silty clay loam, 12 to 20 percent slopes, severely eroded (LoD3).—This is a well drained and moderately well drained soil of the loess uplands in the southeastern part of the county. Throughout most of the area, the surface layer consists chiefly of brown, sticky silty clay loam, which is former subsoil. The surface layer is underlain by brown silty clay loam that has a slightly reddish cast. A weakly developed fragipan of silty clay loam is at a depth of about 20 inches. In spots the fragipan is exposed at the surface, and gullies or old gully scars are noticeable. The loess parent material is thin in a few places, and some outcrops of sandstone occur near the foot of the slope.

Because of its texture, the plow layer is difficult to till. The fragipan slows the penetration of roots and water. The moisture-supplying capacity is moderately low. The organic-matter content is very low, and natural fertility is moderately low. Crops respond fairly well to lime and fertilizer.

All of the acreage has been cultivated at one time, but now much of it is idle because of the severe erosion hazard. Some areas are pastured and others have reverted to woods. Yields of pasture and hay are moderate. (Capability unit VIe–2; woodland suitability group 8)

Made Land

Made land (Ma) is a miscellaneous land type that consists of areas, such as drive-in theatres, ball parks, school grounds, coal mines, and borrow pits, where the original soil profile has been altered or destroyed by man. This land type is not used for agriculture. (Woodland suitability group 12)

Markland Series

The Markland series consists of well drained and moderately well drained soils that developed in calcareous slack-water clay. These soils are along the edge of the flood plain of the Green River and the Ohio River. Though of minor extent, they are locally important. The main layers of a representative profile are—

0 to 8 inches, brown, very friable silt loam; strongly acid.
8 to 30 inches, dark yellowish-brown, plastic silty clay mottled with olive brown.
30 to 40 inches, dark grayish-brown, plastic silty clay mottled with olive brown; angular blocky structure; neutral reaction; weakly calcareous in lower part. Thin silty strata occur below a depth of 3 feet.

Markland soils are subject to infrequent flooding. They have a moderately low to high moisture-supplying capacity. They are moderately low in natural fertility and are strongly acid, but crops respond to lime and fertilizer. The root zone is moderately deep, and water moves moderately slowly through the subsoil. The friable plow layer can be worked throughout a wide range of moisture content.

These are fairly good soils for Kentucky 31 fescue and moderate for hardwood trees.

Markland silt loam, 2 to 6 percent slopes (MdB).—This is a well drained and moderately well drained soil that developed in calcareous slack-water clay. It occurs along the edge of the flood plain of the Green River and the Ohio River. The plow layer is a brown, very friable silt loam. The subsoil is a dark yellowish-brown, plastic silty clay streaked with olive brown. Its structure is angular blocky. The reaction is neutral below a depth of 30 to 40 inches. Lime concretions and thin strata of weakly calcareous silt commonly occur in the lower part. A few acres of this soil are level.

This soil has a high moisture-supplying capacity. It is moderately low in natural fertility and is strongly acid, but crops respond to lime and fertilizer. The root zone is moderately deep, and water moves moderately slowly through the subsoil.

Though of minor extent, this soil is locally important. It is suited to all the commonly grown crops, and most of it is cultivated. If management is good, moderate yields of corn, soybeans, pasture, and hay can be obtained. Erosion is a moderate hazard in cultivated fields, and therefore erosion control measures are needed. (Capability unit IIIe–14; woodland suitability group 5)

Markland silty clay, 6 to 12 percent slopes, severely eroded (MeC3).—This is a well drained and moderately well drained soil that developed in slack-water clay. It is on short, severely eroded breaks along the margin of the flood plain of the major streams. The plow layer and subsoil both consist of a very sticky, somewhat plastic silty clay. The original surface layer has been washed away throughout most of the area. In some places, part of the subsoil has been removed. A few scattered places are gullied. Lime concretions, which generally occur at a depth of about 3 feet, are at the surface in some places.

Surface runoff is rapid, and water moves moderately slowly through the soil material. The moisture-supplying capacity is moderately low. The reaction is strongly acid in the upper part and neutral below a depth of about 2 feet. Natural fertility is moderately low, and the organic-matter content is very low. Crop response to lime and fertilizer is fair. Tillage is difficult because the plow layer is sticky and plastic when wet and hard when dry.

This soil is of minor extent in Henderson County, and it occurs in small areas. It is not suitable for cultivated crops, because it is a low-yielding soil and is subject to moderately severe erosion. Grasses and legumes help to increase the content of organic matter and to control erosion. Yields of pasture and hay are fair. Sweetclover grows naturally in most places, and trees grow fairly well. (Capability unit VIe–3; woodland suitability group 4)

Markland silty clay loam, 2 to 6 percent slopes, eroded (MhB2).—This is a well drained and moderately well drained soil that formed in calcareous slack-water clay. It occupies small areas on terraces along the edge of the flood plain of the Green River and the Ohio River. Throughout most areas, 30 to 60 percent of the original surface layer has washed away; and in spots all of the surface layer has been removed, and the subsoil is at the surface. The plow layer is a brown, sticky silty clay loam, and the subsoil is a dark yellowish-brown, plastic silty clay that gets hard when dry. The reaction is neutral below a depth of 30 to 40 inches; lime nodules and thin strata of weakly developed, calcareous silt loam commonly occur at this depth.

This soil has a moderately high moisture-supplying capacity, is moderately low in natural fertility, and is low in content of organic matter. It is strongly acid in the uppermost 30 to 40 inches. It needs lime and fertilizer. The root zone is moderately deep, but the clayey material is not ideal for root growth. Water movement is moderately slow through the subsoil. Tillage is somewhat difficult, and the soil material tends to clod easily.

Yields of all the commonly grown cash crops are low. Yields of pasture and hay are moderate if lime and fertilizer are used. Hardwood trees grow fairly well. Erosion is a moderate hazard in cultivated fields. If cultivated, this soil needs a cropping system and specific conservation practices that can help to control erosion and to increase the content of organic matter. (Capability unit IIIe–14; woodland suitability group 5)

Markland silty clay loam, 6 to 12 percent slopes, eroded (MhC2).—This is a well drained and moderately well drained soil that formed in calcareous slack-water

clay. It is a minor soil occupying small areas on terraces along the Ohio and Green Rivers. The plow layer is a brown, sticky silty clay loam; it consists of the original surface layer and former subsoil because much of the original surface layer has washed away. The subsoil is a dark yellowish-brown, plastic silty clay that is hard when dry. Most areas include spots where the subsoil is exposed and spots where shallow gullies have formed. The reaction is strongly acid to a depth of 30 to 40 inches. Below that it is neutral. Lime concretions and thin strata of calcareous silt loam occur in the neutral zone. A few acres of a similar soil on this same gradient, but uneroded, are included in the mapped areas of this soil.

The moisture-supplying capacity is moderately high. Natural fertility is moderately low, and the organic-matter content is low. Crop response to lime and fertilizer is fair. The root zone is moderately deep, but the clayey material is fairly difficult to penetrate. Water movement is moderately slow through the subsoil. Tillage is somewhat difficult, and the soil material tends to clod.

This soil is well suited to pasture and hay and fairly well suited to hardwood trees. It is suited to cultivated crops also but should be cultivated only occasionally because it is subject to moderately severe erosion. If cultivated, this soil needs a suitable cropping system and conservation practices that can help to control erosion and to increase the content of organic matter. (Capability unit IVe–8; woodland suitability group 5)

Markland soils, 12 to 35 percent slopes (MkE).—This soil is of minor extent in the county. It occupies short breaks on terraces along the major tributaries of the Ohio River. The surface layer is mostly brown but ranges from silt loam to silty clay loam. The subsoil is dark yellowish-brown silty clay mottled slightly with grayish brown. In spots, erosion has exposed the subsoil. The surface layer and upper part of the subsoil are strongly acid. Below that the soil material is neutral or is weakly calcareous; lime concretions are interspersed throughout this lower zone. A few blufflike places are included in the mapped areas of this soil.

Surface runoff is rapid, and water movement through the soil is moderately slow. The root zone is moderately deep. The moisture-supplying capacity and natural fertility are moderately low. The response of crops to fertilizer and lime is fair.

This soil is subject to severe erosion and therefore is not suited to cultivated crops. It is a good soil for hardwood trees, and if well managed, it is fair for pasture and hay. The steepest and the severely eroded areas are best suited to trees. (Capability unit VIe–1; woodland suitability group 5)

McGary Series

The McGary series consists of somewhat poorly drained soils that developed in slack-water clay deposited by the Ohio River. The main layers of a typical profile are—

0 to 6 inches, grayish-brown, very friable silt loam; strongly acid.
6 to 29 inches, light olive-brown silty clay with gray mottles; plastic when wet, very hard when dry; medium acid or slightly acid.
29 inches+, mottled olive-brown and gray silty clay containing soft dark-colored concretions; very plastic when wet; neutral or mildly alkaline; generally calcareous below a depth of 4 feet.

McGary soils occur on level terraces along streams in the southeastern part of the county. They are of minor extent and are associated with the somewhat poorly drained Henshaw soils and the well drained and moderately well drained Markland soils.

The moisture-supplying capacity of McGary soils is moderately high, but the root zone is shallow. Natural fertility is moderately low, and the reaction is strongly acid. The response of crops to fertilizer and lime is fair. The plow layer is fairly easy to till and can be worked throughout a wide range of moisture content. These soils are subject to infrequent flooding.

Most of the acreage has been cleared and is used for corn, soybeans, and pasture. If management is good, yields of shallow-rooted crops are moderate. The potential for wood crops is moderate.

McGary silt loam (0 to 2 percent slopes) (Ml).—This is a somewhat poorly drained soil that developed in clay sediment. It occurs on terraces along the Green River and other tributaries of the Ohio River. The surface layer is grayish-brown, very friable silt loam. The subsoil is light olive-brown silty clay with gray mottles. The mottles increase with depth. The silty clay is plastic when wet and hard when dry. Generally, it is calcareous at a depth of about 48 inches. In a few small areas, the surface layer and subsoil are strongly acid, and the soil material below that is calcareous.

The moisture-supplying capacity is moderately high, but the fine-textured subsoil slows root penetration and water movement. The content of organic matter is low, and natural fertility is moderately low. The response of crops to fertilizer and lime is fair.

This soil is suited to cultivation, but the range of suitable plants is limited. If adequately drained and fertilized, it produces moderate yields of shallow-rooted crops. It is a good soil for water-tolerant grasses and legumes. (Capability unit IIIw–1; woodland suitability group 6)

Melvin Series

The Melvin series consists of poorly drained soils that formed in mixed alluvium deposited by the Green and Ohio Rivers. Two soil types, silt loam and silty clay loam, were mapped in Henderson County. A typical profile of the silty clay loam type is as follows—

0 to 24 inches, gray, sticky silty clay loam mottled with brown; medium acid.
24 to 40 inches, light-gray, very sticky silty clay loam with a few mottles of brown; medium acid.

Melvin soils are extensive in the northern and eastern parts of the county. They occur on level bottoms along the Ohio and Green Rivers but away from the channel. They are associated with the better drained Lindside soils of the bottoms and the poorly drained Ginat and Robertsville soils of the stream terraces.

The moisture-supplying capacity of Melvin soils is high or very high. Natural fertility is moderately low, and the reaction is medium acid to nearly neutral. Crops respond well to fertilizer, but lime generally is not needed. Roots and water readily penetrate the soil material, but a seasonal high water table hinders root growth if artificial drainage is not provided. Moderate yields of soybeans and corn can be obtained from a drained field. Water-

tolerant grasses and legumes produce good pasture or hay. Melvin soils are subject to flooding.

Melvin silt loam (Mm).—This is a level, poorly drained soil on bottoms along the Ohio and Green Rivers. It occurs in long, narrow, low areas. The plow layer is dark grayish-brown, medium acid, friable silt loam that has a few small brown mottles. The subsoil is gray, friable silt loam that has many brown mottles. In some places it is silty clay loam in the lower part. Stratified silt loam, silty clay, and fine sandy loam occur below a depth of 50 inches in some profiles.

The plow layer is easily tilled throughout a wide range of moisture content without crusting. The moisture-supplying capacity is very high. Natural fertility is moderately low, and the organic-matter content is low. Crops respond well to fertilizer. Lime generally is not needed. Roots and water readily penetrate the soil material, but a seasonal high water table impedes root growth if internal drainage is not provided.

Most of the acreage is cultivated and pastured. A small acreage remains wooded. If fertilized, this soil produces moderate yields of soybeans and corn. It is a good soil for pasture and for hardwood trees. (Capability unit IIIw–5; woodland suitability group 3)

Melvin silty clay loam (Mn).—This is a poorly drained, medium acid soil that occurs in low areas along the Ohio and Green Rivers. The surface layer is a dark grayish-brown, sticky silty clay loam with a few brown mottles. The subsoil is gray, very sticky silty clay loam. Brown mottles are common in the upper part of the subsoil, and they increase with depth. Stratified silt loam, clay, and fine sandy loam occur below a depth of 50 inches in many places.

The moisture-supplying capacity is high. Natural fertility is moderately low, and the organic-matter content is low. Crop response to fertilizer is good. Lime generally is not needed. Water movement through the subsoil is moderately slow, and root penetration is greatly restricted by a seasonal high water table if adequate drainage is not provided. The plow layer is difficult to work and tends to clod or crust if tilled when wet.

This is an extensive soil, especially along the bottoms of the Ohio River. Approximately half of the acreage is wooded. The cleared acreage is used mostly for soybeans, pasture, and hay. Yields of soybeans and corn are moderate. Drainage is necessary for cultivated crops but not for pasture and hay. Drainage, however, increases the varieties of grasses and legumes that can be grown. Wetland species of hardwood trees grow exceptionally well on this soil. (Capability unit IIIw–5; woodland suitability group 3)

Memphis Series

This series consists of deep, well-drained, silty soils of the loess uplands. The main layers of a representative profile are—

0 to 12 inches, dark-brown, very friable silt loam; strongly acid.
12 to 34 inches, brown with a slight reddish cast, firm silty clay loam; subangular blocky structure; medium acid or strongly acid.
34 to 50 inches, brown, friable silt loam; few pale-brown mottles. In many places, reaction is neutral below a depth of 40 inches.

Memphis soils are extensive on broad ridges and side slopes. Their slope range is 2 to 50 percent. Generally, these soils are adjacent to Loring soils. The depth to the underlying sandstone ranges from 5 feet, toward the southeast, to 50 feet, in areas bordering the Ohio River flood plain.

Memphis soils are easily worked throughout a wide range of moisture content without clodding or crusting. They are moderate or moderately low in natural fertility and are strongly acid. Crops generally respond well to lime and fertilizer. The moisture-supplying capacity is high or very high. Water and roots easily penetrate the deep soil material.

Most of the steep areas are wooded. The rest of the acreage is used mainly for corn, soybeans, tobacco, pasture, and hay. Good crop yields are obtained under management that includes the use of fertilizer and lime. Memphis soils are well suited to deep-rooted crops and to specialty crops.

Memphis silt loam, 2 to 6 percent slopes (MoB).—This is a deep, well-drained soil of the loess uplands. It is gently sloping mostly, but a few areas are nearly level. The surface layer is dark-brown, friable silt loam; it is 8 to 12 inches thick. The subsoil consists of slightly sticky silty clay loam that is brown with a slight reddish cast. It is underlain, at a depth of about 30 to 40 inches, by silt loam. In some places the silty parent material is neutral in reaction. About 400 acres of this soil is in urban areas where the original profile characteristics have been changed to varying degrees.

The plow layer is easy to till and can be worked throughout a wide range of moisture content without crusting or clodding. Roots and water easily penetrate deep into the subsoil. The moisture-supplying capacity is very high. Natural fertility is moderate, and the reaction is strongly acid. Crops respond well to lime and fertilizer.

Most of the acreage, excluding that in urban areas, is cultivated; some is in pasture or hay. All the locally grown general crops, especially the deep-rooted ones, as well as specialty crops, are suitable. Yields are favorable under management that includes the use of fertilizer and lime. If cultivated, this soil has a moderate or moderately low erosion hazard. Therefore, adequate erosion control measures are needed. (Capability unit IIe–1; woodland suitability group 7)

Memphis silt loam, 2 to 6 percent slopes, eroded (MoB2).—This is a deep, well-drained soil of the loess uplands. Some of the original surface layer has washed away. Consequently, the plow layer consists partly of former subsoil. The surface layer is brown, friable silt loam; it is 5 to 8 inches thick. The subsoil consists of slightly sticky silty clay loam that is dark brown with a slight reddish cast. It is underlain at a depth of about 40 inches by silt loam that, in places, is neutral in reaction. A few areas of some similar soils on stream terraces near Henderson are included in the mapped areas of this soil.

The plow layer is fairly easy to till and can be tilled throughout a moderate range of moisture content without crusting or clodding. Roots and water easily penetrate deep into the subsoil. The moisture-supplying capacity is very high. Natural fertility is moderate, the reaction

is strongly acid, and the organic-matter content is low. Crops respond well to lime and fertilizer.

Most of the acreage is cultivated or is used for pasture and hay. All the locally grown crops, including orchard crops and other specialty crops, are suitable. Yields are better than average if the soil is fertilized and otherwise well managed. Erosion is a moderate or moderately low hazard in cultivated fields. Consequently, if this soil is cultivated, it needs a suitable cropping system and conservation management to minimize this hazard. (Capability unit IIe–1; woodland suitability group 7)

Memphis silt loam, 6 to 12 percent slopes, eroded (MoC2).—This is a deep, well-drained soil of the loess uplands. It occurs on ridgetops in the southern part of the county and on bluffs in the northern part. The surface layer is about 6 to 8 inches of brown, somewhat friable silt loam. About 30 to 50 percent of the original surface layer has been removed by erosion. Consequently, in plowing, some subsoil has been mixed with the surface layer. In spots, all of the original surface layer has washed away and the subsoil is exposed. The subsoil consists of firm silty clay loam that is brown with a slight reddish cast. It is underlain at a depth of about 40 inches by silt loam. In some places the silty parent material is neutral in reaction instead of acid. A few areas of this soil are not eroded, and some of this soil is part of an urban area where the soil features have been altered by construction.

This soil cannot be tilled without crusting or clodding throughout so wide a range of moisture content as the uneroded phase. The moisture-supplying capacity of this soil is very high. Natural fertility is moderate, and the content of organic matter is low. Crops respond well to fertilizer and lime. Roots and water easily penerate deep into the subsoil.

This soil is fairly extensive, and nearly all of it is cultivated or is used for pasture and hay. All the locally grown crops are suitable, and yields generally are better than average if the soil is fertilized and otherwise well managed. Erosion is a moderate or severe hazard in cultivated areas. Therefore, if this soil is cultivated, it needs a suitable cropping system and specific conservation practices that can help to control erosion. (Capability unit IIIe–2; woodland suitability group 7)

Memphis silt loam, 12 to 20 percent slopes, eroded (MoD2).—This is a deep, well-drained soil that formed in loess. Except in a few acres that are not eroded, 40 to 60 percent of the original surface layer has washed away. Consequently, in plowed areas the upper part of the subsoil has been mixed with the remaining surface layer. In spots, all of the original surface layer has washed away, and the subsoil is exposed. Some areas are gullied, but the cuts are shallow. The surface layer consists of 4 to 6 inches of brown silt loam mixed with yellowish-brown subsoil. The subsoil consists of sticky silty clay loam that is brown with a reddish cast. At a depth of about 48 inches, it is underlain by silt loam that likely is neutral in reaction instead of acid.

This soil is easy to till and can be worked throughout a moderately wide range of moisture content without crusting or clodding. The moisture-supplying capacity is very high, and roots and water easily penetrate deep into the subsoil. Natural fertility is moderate, the content of organic matter is low, and the reaction is strongly acid. Crops respond well to fertilizer and lime.

All of the acreage has been cleared. A large part, formerly orchardland, is idle, and some is used for pasture and hay. A small part is cultivated, though cultivated areas are subject to severe erosion. Hay and pasture yields are better than average if the soil is heavily fertilized and well managed. The growth potential of trees is good. (Capability unit VIe–7; woodland suitability group 7)

Memphis silt loam, 20 to 30 percent slopes (MoE).—This is a deep, well-drained soil that formed in loess. About 25 percent of its acreage is eroded. The surface layer is 6 to 8 inches thick and consists of brown, very friable silt loam. The subsoil extends to a depth of about 40 inches and consists of sticky silty clay loam that is brown with a slight reddish cast. It is underlain by silt loam. In some places this silty parent material is neutral in reaction instead of acid. A soil that has a weakly developed fragipan at a depth of about 28 inches is included with mapped areas of this soil.

This soil can be worked throughout a wide range of moisture content without clodding or crusting. The moisture-supplying capacity is very high, and roots and water easily penetrate deep into the subsoil. Natural fertility is moderate, and the reaction is strongly acid. Crops respond well to fertilizer and lime.

Cultivation is not practical, because the slope is steep and the erosion hazard is severe. The greater part of the acreage is wooded, and most of the rest is pastured. This soil is well suited to pasture. If adequately fertilized, limed, and otherwise well managed, it produces better than average yields of all the locally grown grasses and legumes. It is a good soil for trees. (Capability unit VIe–1; woodland suitability group 7)

Memphis silt loam, 30 to 50 percent slopes (MoF).—This is a well-drained soil that formed in loess. The surface layer is 5 to 7 inches thick and consists of brown, friable silt loam. The subsoil extends to a depth of about 40 inches and consists of sticky silty clay loam that is brown with a slight reddish cast. It is underlain by silt loam that likely is neutral in reaction instead of strongly acid like the solum. Sandstone and, in a few places, limestone outcrop at the foot of some slopes.

The moisture-supplying capacity of this soil is high, and natural fertility is moderate. Roots and water easily penetrate deep into the subsoil.

Cultivation is not practical, because the slope is too steep and the erosion hazard too severe. Use for pasture is limited to range-type grazing. Trees are the best use, and most of the acreage is wooded. (Capability unit VIIe–1; woodland suitability group 7)

Memphis silty clay loam, 2 to 6 percent slopes, severely eroded (MpB3).—This is a deep, well-drained soil that formed in loess. Throughout most of the area, nearly all of the original surface layer has washed away. Consequently, the present surface layer of brown, sticky silty clay loam consists mostly of former subsoil. The subsoil is slightly finer textured and has a red hue. At a depth of about 36 inches, it is underlain by silt loam that in places is neutral in reaction instead of acid like the solum. Old gully scars are evident in many places.

The sticky plow layer is difficult to till and tends to clod or crust. Root and water penetration is favorable. The low content of organic matter has adversely affected natural fertility and the moisture-supplying capacity. Crops respond well to lime and fertilizer.

If fertilized and otherwise well managed, this soil can produce moderate yields of all the locally grown row crops. It is good for pasture and hay; for alfalfa, however, it needs heavy applications of fertilizer. Conservation practices that can effectively control runoff and erosion are needed in cultivated areas because erosion is a moderate hazard. (Capability unit IIIe-12; woodland suitability group 8)

Memphis silty clay loam, 6 to 12 percent slopes, severely eroded (MpC3).—This is a deep, well-drained soil of the loess uplands. It occurs mainly in the southern part of the county and on the bluffs to the north. Much of the original surface layer has washed away, and a brown, slightly sticky silty clay loam makes up the present surface layer. The subsoil consists of sticky and slightly plastic silty clay loam that is brown with a slight reddish cast. It is underlain at a depth of about 36 inches by silt loam parent material. In some places, this material is neutral instead of acid like the solum. Some areas are gullied, and in spots the parent material is exposed.

The sticky plow layer is difficult to till and tends to crust or clod. The moisture-supplying capacity is high, and roots and water easily penetrate the deep subsoil. Natural fertility is moderately low, and the organic-matter content is very low. Crop response to fertilizer and lime is limited.

Most of this soil is cleared and is used for cultivation or for pasture and hay. If this soil is well managed and adequately fertilized, moderate yields of most of the locally grown crops can be obtained. Because erosion is a hazard in cultivated areas, erosion control practices are required to help prevent further damage to the soil. (Capability unit IVe–9; woodland suitability group 8)

Memphis silty clay loam, 12 to 25 percent slopes, severely eroded (MpD3).—This is a deep, well-drained soil of the loess uplands. Erosion has removed most of the original surface layer and left a brown, slightly sticky silty clay loam as the surface layer. The subsoil is sticky, strongly acid silty clay loam that is brown with a slight reddish cast. It is underlain at a depth of about 30 inches by silt loam, the parent material, which in places is neutral instead of acid like the solum. In spots the parent material is exposed at the surface, and some areas have been cut by shallow gullies. Sandstone outcrops at the foot of some slopes. A similar soil, but with a weakly developed fragipan, is included in mapped areas of this soil.

The sticky plow layer is difficult to work and tends to clod or crust. The moisture-supplying capacity is high, and roots and water penetrate easily into the deep subsoil. Natural fertility is moderately low, and the organic-matter content is very low. Crop response to fertilizer is limited. Lime is needed to correct the acidity.

This soil cannot be cultivated, because the erosion hazard is too severe. Most of the acreage is cleared and is used for pasture or hay; some is idle. Pasture and hay yields are moderate if adequate amounts of fertilizer are used. The growth potential of trees is good on this soil. (Capability unit VIe–2; woodland suitability group 8)

Morganfield Series

This series consists of deep, well-drained, silty soils that formed in alluvium washed from the loess uplands. The main layers of a typical profile are—

0 to 10 inches, brown, very friable silt loam.
10 to 36 inches, dark yellowish-brown, friable silt loam.

Morganfield soils are of minor extent but are scattered throughout the central part of the county. They occur as narrow bands near drainageways. They are moderately high in natural fertility and have a very high moisture-supplying capacity. Crops respond well to fertilizer. Lime is not needed, because the reaction is neutral. Water and roots easily penetrate the deep subsoil. The plow layer can be tilled easily throughout a wide range of moisture content without crusting or clodding.

These soils are used intensively for cultivated crops and for pasture. If well managed, they produce favorable yields of most of the locally grown crops. They are subject to winter flooding, so winter small grain and alfalfa generally are damaged.

Morganfield silt loam (Mr).—This is a level, well-drained, nonacid soil along drainageways. It formed in sediment that washed from the loess uplands. The surface layer is a brown very friable silt loam 8 to 10 inches thick. The subsoil is a dark yellowish-brown, friable silt loam. Included in the mapped areas of this soil are a few acres of well-drained, acid soils; some areas that are on a gradient of up to 4 percent; and a few places where the surface layer consists of acid overwash.

This soil has a deep root zone and a very high moisture-supplying capacity. It is moderately high in natural fertility. Crops respond well to fertilizer. Roots and water penetrate easily into the subsoil. The plow layer can be worked easily throughout a wide range of moisture content without crusting or clodding.

Most of the acreage is cultivated. Erosion is not a hazard; therefore, intensive cultivation is possible, but good management is necessary. Most of the locally grown crops are suitable. Excellent pasture can be produced, and hardwood trees grow well. This soil is subject to winter overflow, so winter cover crops and alfalfa generally are damaged. (Capability unit I–1; woodland suitability group 2)

Muskingum Series

This series consists of somewhat excessively drained soils that formed in residuum of sandstone and shale. These soils are covered by a thin mantle of windblown material. The main layers of a typical profile are—

0 to 10 inches, brown, very friable silt loam.
10 to 22 inches, yellowish-brown, friable silt loam.
22 to 26 inches, mottled gray and brown, firm clay loam; some sandstone fragments.
26 inches+, partly weathered sandstone and shale.

These are not extensive soils. They occupy steep slopes in the hilly southeastern section of the county. Most of the acreage is in hardwood trees, and much of it has never been used for anything else.

The moisture-supplying capacity of these soils is moderately low, natural fertility is moderately low, and the reaction is strongly acid. Roots and moisture penetrate easily to bedrock.

In Henderson County, Muskingum soils occur with Litz soils in such an intricate pattern that they could not be mapped separately. Therefore, they were mapped with Litz soils as one mapping unit.

Newark Series

The Newark series consists of nonacid, somewhat poorly drained soils that formed in mixed sediment dominantly of limestone origin. The main layers of a representative profile are—

0 to 6 inches, dark-brown, very friable silt loam.
6 to 12 inches, brown, friable silt loam.
12 to 38 inches, mottled brownish-gray and brown, friable silt loam. (The grayness increases with depth.)

These soils occupy long, narrow, low flats between areas of higher lying, better drained soils on the flood plain of the Ohio River and the Green River. The slope is dominantly 0 to 3 percent. The acreage is not large and is about evenly divided between two soil types, silt loam and silty clay loam.

Newark soils are moderate in natural fertility and have a high or very high moisture-supplying capacity. Crops respond to fertilizer. Normally, the areas along the Ohio River do not need lime, but a few areas along the Green River do. Roots and water easily penetrate this deep soil, but a seasonal high water table impedes root growth if drainage is not provided.

If adequately drained, these soils can be cultivated intensively and can produce better than average yields of summer crops, such as soybeans, corn, and milo. They are good soils for trees and for pasture consisting of water-tolerant grasses and legumes. Winter floods leave, in many cultivated areas, a thin crust that retards aeration.

Newark silt loam (Ne).—This is a somewhat poorly drained soil that occupies low, narrow flats between areas of better drained soils on the flood plain of the Ohio and Green Rivers. It has a plow layer of brown, very friable silt loam and a subsoil of brown, friable silt loam that has gray mottles. The mottles begin at a depth of about 12 inches. They increase with depth until, at a depth below 24 inches, gray becomes the dominant color. Stratified silty clay loam, silt loam, and fine sandy loam occur in some places at a depth below 40 inches. In a few acres, the surface layer is fine sandy loam.

This soil can be tilled throughout a wide range of moisture content without crusting or clodding. It is moderate in natural fertility, but crops respond well to fertilizer. Lime generally is not needed. The moisture-supplying capacity is very high. The depth of the root zone is restricted by a seasonal high water table unless adequate drainage is provided.

If adequately drained, this soil can be cultivated intensively and can produce better than average yields of summer crops, such as soybeans, corn, and milo. It is subject to flooding in winter, so perennials and winter cover crops cannot be grown without risk of damage. Water-tolerant plants make good pasture on this soil, and some trees grow moderately well. (Capability unit IIw–4; woodland suitability group 3)

Newark silty clay loam (Ns).—This is a somewhat poorly drained soil that occupies low, narrow flats near the outer edge of the flood plain of the Ohio and Green Rivers. It formed in mixed sediment chiefly of limestone origin. The plow layer is brown, slightly sticky silty clay loam. The subsoil is brown, sticky silty clay loam mottled with gray. The mottles begin at a depth of about 12 inches. They increase with depth until, at a depth below 24 inches, gray becomes the dominant color.

The plow layer is difficult to till because it is sticky and cloddy when wet and hard when dry. Wetness, especially in the lower lying areas, delays planting in spring for as much as a month in some years. The moisture-supplying capacity of this soil is high, but water movement through the subsoil is moderate. A seasonal high water table restricts the depth of the root zone if adequate drainage is not provided. Natural fertility is moderate, but crop response to fertilizer is good. Lime generally is not needed.

Because it is not subject to erosion, this soil can be cultivated continuously. If well managed, it is a better than average soil for such crops as soybeans, corn, and milo. Also, it is well suited to pasture plants and trees that tolerate some wetness. Perennials and winter crops are subject to damage by winter overflows. (Capability unit IIw–4; woodland suitability group 3)

Patton Series

This series consists of dark-colored, very poorly drained, nonacid soils that formed in silty sediment. These soils occupy wide, level terraces along tributaries of the Ohio and Green Rivers. The areas once were swampy. The main layers of a typical profile are—

0 to 6 inches, very dark grayish-brown, very friable silt loam.
6 to 24 inches, very dark gray, friable silt loam.
24 to 36 inches, dark-gray, slightly sticky silty clay loam with yellowish-brown mottles.
36 to 42 inches+, mottled dark grayish-brown and olive-brown, friable silt loam.

Patton soils are productive if adequately drained and otherwise well managed, so most of their acreage is cultivated. Corn and soybeans are two of the most extensively grown crops. Most areas are subject to infrequent flooding.

Patton silt loam (Pa).—This is a dark-colored, nonacid soil on broad, level terraces along the Ohio and Green Rivers. The plow layer is a very dark grayish-brown, friable silt loam. It is underlain by a very dark gray, friable silt loam that grades, at a depth of about 24 inches, to a dark-gray silty clay loam mottled with yellowish brown. The structure of the silty clay loam is angular blocky.

The organic-matter content of this soil is high, and the moisture-supplying capacity is very high. The depth of the root zone is restricted in wet seasons by a high water table if adequate drainage is not provided. The plow layer is easily tilled throughout a wide range of moisture content without clodding or crusting.

If drained and otherwise well managed, this is one of the most productive soils in the county. Furthermore, it can be cultivated intensively because it is not subject to erosion. Yields of corn, soybeans, legumes, and grasses are most favorable. (Capability unit IIw–5; woodland suitability group 3)

Patton silt loam, overwash (Po).—This is a wet, nonacid soil on terraces along tributaries of the Ohio and Green Rivers. The surface layer is a dark grayish-brown, very friable silt loam. It is as much as 15 inches thick.

Below the surface layer is a very dark grayish-brown, friable silt loam that grades, at a depth of about 30 inches, to a dark-gray silty clay loam mottled with brown.

The organic-matter content of this soil is medium, and the moisture-supplying capacity is very high. In wet seasons the depth of the root zone is restricted by a high water table if adequate drainage is not provided. The plow layer does not clod or crust when tilled.

If drained and otherwise well managed, this is a productive soil. Furthermore, it can be cultivated intensively because it is not subject to erosion. Yields of corn, soybeans, grasses, and legumes are most favorable. (Capability unit IIw–5; woodland suitability group 3)

Patton silty clay loam (Ps).—This is a wet, nonacid, dark-colored soil on broad, level terraces. Generally, its position is slightly lower than that of the surrounding soils. The surface layer is a very dark gray, sticky silty clay loam that extends to a depth of about 18 inches. The underlying layer is a mottled gray and olive silty clay loam. Lime concretions are common at a depth of about 4 feet.

The plow layer is sticky and can be tilled only within a narrow range of moisture content. If tilled when too wet, it clods and crusts. In wet seasons, a high water table limits the depth of the root zone if artificial drainage is not provided. The moisture-supplying capacity of this soil is very high, the organic-matter content is medium, and natural fertility is moderately high.

If adequately drained and otherwise well managed, this soil is highly productive of soybeans, corn, and most grasses and legumes. (Capability unit IIw–5; woodland suitability group 3)

Riverwash

Riverwash (Ra) is a miscellaneous land type that consists mostly of sandbars along and in the Ohio River. The river is constantly adding or removing sand from these areas. A single flood can completely shift a sandbar from one place to another. Some of the sandbars are manmade. These consist of sand that has been pumped from the river channel so as not to obstruct barge traffic.

Areas of Riverwash vary in depth and are loamy sand in some places and clayey in other places. They have no agricultural value. If willow and cottonwood trees establish themselves, the sand becomes stabilized. (Capability unit VIIw–1; woodland suitability group 12)

Robertsville Series

In this series are level, poorly drained soils that developed in mixed alluvium largely of limestone origin. These soils are dominantly gray and have a brittle, compact fragipan at a depth of about 18 to 26 inches. The main layers of a typical profile are—

0 to 11 inches, brown, very friable silt loam; light-gray mottles in the lower half.
11 to 20 inches, gray, friable silt loam mottled with brown.
20 to 30 inches, mottled gray and brown, compact silt loam.
30 to 40 inches, mottled light-gray and brown, compact, brittle silty clay loam; dominantly gray in the lower part.

Robertsville soils occur in the eastern part of the county; they occupy terraces along the Green River. They are not extensive but are agriculturally important. Most of their acreage is used for corn, soybeans, hay, and pasture.

The moisture-supplying capacity is moderately low. Natural fertility is moderately low, and the reaction ranges from slightly acid and medium acid in the upper part to strongly acid in the lower part. Crop response to fertilizer and lime is good. The plow layer is easy to till.

Wetness limits the suitability of these soils for cultivated crops. Yields of water-tolerant crops are fair but can be increased if the soils are drained. Open ditches are suitable for this purpose. These soils are subject to infrequent flooding.

Robertsville silt loam (Rn).—This is a level, poorly drained soil that developed in alluvium dominantly of limestone origin. It occurs on terraces along the Green River. The plow layer is a brown, very friable silt loam. The subsoil to a depth of about 20 inches is a gray, friable heavy silt loam that has brown mottles. Below that, it is a mottled gray and brown, firm, brittle silt loam and silty clay loam. This lower part is a compact fragipan. A few acres of a similar soil occurring in the loess uplands is included in the mapped areas of this soil.

The moisture-supplying capacity is moderately low. Natural fertility is moderately low, and the content of organic matter is low. Crops respond well to lime and fertilizer. The plow layer is easy to till and can be worked throughout a wide range of moisture content without crusting or clodding. Root penetration and water movement are greatly retarded in the fragipan.

This soil is not extensive in Henderson County. It is important agriculturally, though wetness is a severe limitation. A large part of the acreage is used for soybeans or pasture. Yields of water-tolerant grasses and legumes are good if the soil is drained. Water-tolerant trees grow well. (Capability unit IVw–1; woodland suitability group 3)

Sciotoville Series

The Sciotoville series consists of moderately well drained soils that developed in mixed sediment on stream terraces along the Ohio River. These soils have a fragipan at a depth of 18 to 26 inches. The main layers of a representative profile are—

0 to 8 inches, brown, very friable silt loam.
8 to 19 inches, dark yellowish-brown, firm silty clay loam; very strongly acid.
19 to 30 inches, brown, compact, brittle silt loam with brownish-gray mottles; very strongly acid.
30 to 36 inches, brown, friable silt loam with pale-brown mottles.

Sciotoville soils are extensive in this county and are agriculturally important. They occur on stream terraces and have a slope range of 0 to 6 percent. Two types, silt loam and fine sandy loam, are mapped in this county. The silt loam has the larger acreage.

The moisture-supplying capacity of these soils ranges from moderately low to moderately high. Natural fertility is moderate, and the reaction is very strongly acid. Crops respond well to lime and fertilizer. Water and roots penetrate easily down to the fragipan, but this layer impedes further penetration. The plow layer is easily tilled throughout a wide range of moisture content without crusting.

Sciotoville soils, for the most part, are well suited to corn, soybeans, small grain, pasture, and hay. They are not suited to alfalfa and other deep-rooted crops. These soils are subject to infrequent flooding.

Sciotoville fine sandy loam, 0 to 2 percent slopes (ScA).—This is a moderately well drained soil on broad stream terraces that run parallel to the flood plain of the Ohio River. It formed in mixed alluvium. The plow layer is a brown, very friable fine sandy loam. The subsoil is a yellowish-brown or strong-brown, firm clay loam to loam. A brittle, compact fragipan is at a depth of about 20 inches.

The moisture-supplying capacity of this soil is moderately low. Natural fertility is moderate, and the reaction is very strongly acid. Crops respond well to lime and fertilizer. Water and roots penetrate easily down to the fragipan, but this layer impedes further penetration. The plow layer, because of its low content of clay, is easily tilled throughout a wide range of moisture content without crusting or clodding.

This is not an extensive soil. The acreage is used mainly for corn, soybeans, and small grain. Yields are better than average if the soil is adequately fertilized and otherwise well managed. Deep-rooted crops are not suitable, because of the restricted root zone. Erosion is not a hazard, so continuous cultivation is possible. Wetness is a slight limitation, and in some years it delays planting. (Capability unit IIw–1; woodland suitability group 10)

Sciotoville fine sandy loam, 2 to 6 percent slopes (ScB).—This is a moderately well drained soil on stream terraces that run parallel to the flood plain of the Ohio River. The plow layer is brown, very friable fine sandy loam. It is underlain by yellowish-brown or strong-brown, firm loam or clay loam. A brittle, compact fragipan is at a depth of about 20 inches. Included in the mapped areas of this soil are a few moderately eroded places where, because some of the original surface layer has washed away, the plow layer consists partly of former subsoil.

This soil is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. Roots and water penetrate easily down to the fragipan, but this layer impedes further penetration. The moisture-supplying capacity is moderately low, the reaction is very strongly acid, and natural fertility is moderate. Crops respond well to lime and fertilizer.

Most of the acreage, which is not extensive, is used for cultivated crops, hay, and pasture. Yields are better than average. Cultivated areas are subject to erosion. Therefore, a cropping system and conservation practices are needed in these areas to help control the erosion. Alfalfa is short lived on this soil because of the restricted root zone. (Capability unit IIe–6; woodland suitability group 10)

Sciotoville silt loam, 0 to 2 percent slopes (SeA).—This is a moderately well drained soil on stream terraces that run parallel to the flood plain of the Ohio River. It formed in mixed alluvium. The surface layer is brown, very friable silt loam. The subsoil is dark yellowish-brown to strong-brown, firm silty clay loam. A mottled, brittle, compact fragipan is at a depth of about 2 feet. Included in the mapped areas of this soil is a small acreage of a soil that is similar in drainage and origin. This inclusion, however, has a less restricting fragipan; furthermore, it occupies lower positions and is subject to infrequent overflow by backwater of the Ohio River.

The moisture-supplying capacity is moderately high. Natural fertility is moderate, and the reaction is very strongly acid. Crops respond well to lime and fertilizer. Roots and water penetrate readily down to the fragipan, but this layer impedes further penetration. The plow layer is easily tilled throughout a wide range of moisture content.

This soil is extensive in the county. It is used for cultivated crops, pasture, and hay. It is especially well suited to corn, soybeans, grasses, and most legumes. Alfalfa and other deep-rooted crops do not grow well. Yields of the suitable crops are better than average if the soil is adequately fertilized and otherwise well managed. Erosion is not a hazard, so continuous cultivation is possible. Wetness is a slight limitation, and in some years it delays planting. (Capability unit IIw–1; woodland suitability group 10)

Sciotoville silt loam, 2 to 6 percent slopes (SeB).—This is a moderately well drained soil on broad stream terraces that run parallel to the flood plain of the Ohio River. The plow layer is a brown, very friable silt loam.

The upper part of the subsoil is a yellowish-brown, firm silty clay loam of subangular blocky structure. The lower part of the subsoil is a mottled yellowish-brown and gray, brittle, compact silt loam. This lower part is a fragipan, and it begins at a depth of about 20 inches.

This soil is very strongly acid, moderate in natural fertility, and moderately high in moisture-supplying capacity. Crops respond well to fertilizer and lime. Roots and water penetrate readily down to the fragipan, but this layer greatly retards further penetration. The plow layer is easily tilled under varying moisture conditions without crusting or clodding.

This is not an extensive soil. The acreage is used primarily for corn, soybeans, pasture, and hay. Yields are better than average if the soil is adequately limed and fertilized and otherwise well managed. Moderately deep rooted crops are more suitable than deep rooted ones, such as alfalfa. Cultivated areas are subject to erosion. Therefore, a cropping system and conservation practices are needed in these areas to help control the erosion. (Capability unit IIe–6; woodland suitability group 10)

Sciotoville silt loam, 2 to 6 percent slopes, eroded (SeB2).—This is a moderately well drained soil on stream terraces that run parallel to the flood plain of the Ohio River. The surface layer is a friable silt loam. The upper part of the subsoil is a yellowish-brown, firm silty clay loam of subangular blocky structure. The lower part of the subsoil is a mottled brown and gray, brittle silt loam. This lower part is a fragipan, and it begins at a depth of about 18 inches. Some of the original surface layer has washed away. Consequently, in plowed areas the upper part of the subsoil has been mixed with the remaining original surface layer. In spots the subsoil is exposed.

The plow layer is easy to till but tends to clod or crust. Roots and water can penetrate down to the fragipan, but this layer impedes further penetration. The moisture-supplying capacity is moderately high. Erosion has lowered the content of organic matter. The reaction is very strongly acid, and natural fertility is moderate. Crops respond well to lime and fertilizer.

This soil is of minor extent and occurs mostly as small areas. Most of the acreage is in corn and soybeans. Yields are moderate if the soil is adequately fertilized and

otherwise well managed. Cultivated areas have a moderate or moderately low erosion hazard, and therefore they need a suitable cropping system and conservation practices that can help minimize this hazard. This soil is well suited to pasture and to hardwood trees. (Capability unit IIe–6; woodland suitability group 10)

Sequatchie Series

The Sequatchie series consists of well-drained, low-lying soils that formed in medium acid or slightly acid, sandy sediment of mixed origin. The main layers of a representative profile are—

0 to 15 inches, dark-brown, very friable loam.
15 to 25 inches, brown, friable, fine sandy loam.
25 to 45 inches, strong-brown or reddish-brown, loose loamy fine sand.

These soils are on terraces along the Ohio River. They are not extensive but are agriculturally important. They have a high moisture-supplying capacity, are moderate in natural fertility, and are medium acid or slightly acid. Crops respond well to lime and fertilizer. Water and roots easily penetrate the deep soil material. The plow layer is easy to till throughout a wide range of moisture content, and it does not crust or clod.

Most of these soils are used intensively for corn and soybeans, but better than average yields of all the locally grown crops can be obtained if the soils are well managed. Sequatchie soils are subject to infrequent flooding.

Sequatchie loam, 0 to 2 percent slopes (ShA).—This is a deep, well-drained soil that formed in sandy sediment of mixed origin. It occurs on terraces along the Ohio River. It has a plow layer of dark-brown, very friable loam, and a subsoil of brown fine sandy loam. Immediately below the subsoil, at a depth of about 25 inches, is reddish-brown, loose loamy fine sand. In some places, thin strata of fine sandy loam and silt loam occur in this lower layer.

The moisture-supplying capacity of this soil is high. Natural fertility is moderate, and the reaction is medium acid or slightly acid. Crops respond well to lime and fertilizer. Water and roots easily penetrate the deep soil material. The plow layer is easy to till and does not clod or crust.

This soil is of minor extent but is locally important. It is used intensively for corn and soybeans. If well managed, it can produce better than average yields of all the locally grown crops. A few acres of this soil are part of a residential section of Henderson. (Capability unit I–3; woodland suitability group 7)

Sequatchie loam, 2 to 6 percent slopes (ShB).—This is a deep, well-drained soil on terraces along the Ohio River. It formed in sandy sediment of mixed origin. The plow layer consists of dark-brown, very friable loam with a noticeable amount of sand. The subsoil consists of brown, friable fine sandy loam that grades to loamy fine sand, which is at a depth of about 30 inches. Included in the mapped areas are a few acres of a similar soil that is slightly steeper than this soil and is moderately eroded.

The moisture-supplying capacity is high. The root zone is deep, and water and roots easily penetrate the soil material. Natural fertility is moderate, and the reaction is medium acid or slightly acid. Crops respond well to lime and fertilizer. The very friable plow layer can be tilled throughout a wide range of moisture content without clodding or crusting.

This soil is suited to a wide variety of crops. If adequately fertilized and limed and otherwise well managed, it produces better than average yields of corn, soybeans, tobacco, small grain, grasses, and legumes. If this soil is cultivated, a suitable cropping system and specific conservation practices are needed to combat erosion, which is a slight or moderate hazard.

Approximately 142 acres is in urban areas in and around Henderson. Leveling has altered the surface layer on much of this acreage. Additional acreage likely will be used for urban or other nonagricultural use. (Capability unit IIe–1; woodland suitability group 7)

Sharkey Series

This series consists of very poorly drained soils that formed in fine-textured sediment deposited by slack water along tributaries of the Ohio River. The main layers of a representative profile are—

0 to 6 inches, very dark gray, plastic silty clay.
6 to 18 inches, very dark gray clay, faintly mottled with brown; very plastic when wet and extremely hard when dry.
18 to 42 inches, gray, mottled with yellowish-brown, clay or silty clay; very plastic when wet and extremely hard when dry.

These soils occur on the wide, level bottoms along Canoe Creek. They are subject to flooding. They are high in organic-matter content, high or moderately high in moisture-supplying capacity, and moderately high in natural fertility. Generally, they are not acid and, therefore, seldom need lime. The root zone is limited in a wet season by a high water table. Water moves slowly through the soil material. The plow layer is not easily tilled, and it tends to crust or clod unless worked within a narrow range of moisture content.

Most of these soils are cultivated. Yields of corn, soybeans, red clover, and lespedeza generally are favorable if the soils are adequately drained and under a high level of management.

Sharkey silty clay (0 to 1 percent slopes) (Sk).—This is a dark-colored, wet, gumbo soil on the flood plain of the main tributaries of the Ohio River. The surface layer is very dark gray, plastic silty clay. The upper part of the subsoil is very dark gray clay that is very plastic when wet and extremely hard when dry. The lower part is mottled gray and yellowish-brown clay. It is mildly alkaline in some places.

This soil has a moderately high moisture-supplying capacity. It is moderately high in natural fertility and high in organic-matter content. Crops respond well to fertilizer. Lime generally is not needed. The root zone is deep or moderately deep but is restricted, in undrained areas, by a high water table. Water moves slowly through the soil material. The plow layer tends to crust or clod unless tilled within a narrow range of moisture content.

Wetness and the tendency to clod or crust are the principal limitations of this soil. Erosion is not a problem, so intensive cultivation is possible. Generally, yields of corn, soybeans, red clover, and Kobe lespedeza are favorable if the soil is under a high level of management that includes tile drainage. Crops that grow well only in a well-drained soil are poorly suited to this soil. Areas

that are not drained are best suited to water-tolerant trees. (Capability unit IIIw–6; woodland suitability group 3)

Sharkey silty clay loam, overwash (So).—This is a wet soil in broad, level areas along the larger tributaries of the Ohio River. The surface layer is dark grayish-brown, friable silty clay loam; it is generally 8 to 10 inches thick. The upper part of the subsoil is dark-gray clay that is very plastic when wet and extremely hard when dry. The lower part is mottled gray and yellowish-brown clay; it is mildly alkaline in some places.

This soil has a high moisture-supplying capacity. It is moderately high in natural fertility, and crops respond well to fertilizer. The organic-matter content is high. The root zone is deep or moderately deep, but a high water table restricts root penetration in undrained areas. Water moves slowly through the soil material. The plow layer has a slight tendency to clod or crust unless tilled under optimum moisture content.

If adequately drained, this soil can be cultivated intensively. If in addition to being drained it is fertilized and otherwise very well managed, it is a most favorable soil for corn, soybeans, red clover, and Korean lespedeza. Without drainage it is well suited to water-tolerant trees. (Capability unit IIIw–6; woodland suitability group 3)

Swamp

Swamp (Sw) is a miscellaneous land type that consists of long, narrow sloughs in the broad flats along the Ohio River. Most areas are in the northwestern part of the county.

Water is on the surface or very near the surface throughout most of the year. Only a few areas have been filled or drained. The vegetation consists mainly of cypress trees and buckbrush. A great many oil wells are operating in these areas, and on about one-fifth of the acreage the vegetation has been killed or severely damaged by toxic effluent from the oil wells. The sloughs must be diked or bridged to be crossed by farm machinery.

Waterfowl make use of these areas in fall and spring. Recently, the mosquitoes in these areas have become a severe hazard to farmers and their livestock. (Capability unit VIIw–1; woodland suitability group 12)

Taft Series

The soils of this series are somewhat poorly drained and have a fragipan. They developed in mixed sediment largely of limestone origin. The main layers of a representative profile are—

0 to 4 inches, dark grayish-brown, very friable silt loam.
4 to 18 inches, pale-brown, friable silt loam with brownish-gray and yellowish-brown mottles; strongly acid.
18 to 45 inches, mottled brown and brownish-gray, brittle, compact silty clay loam; very strongly acid.
45 inches+, mottled yellowish-brown and gray silt loam.

These soils occupy broad, level, low ridges along the Green River. They are associated with the Newark soils on bottom lands and the heavier textured McGary soils on terraces. They are minor in extent but are locally important.

The moisture-supplying capacity is moderately high. Natural fertility is moderately low, and the reaction is strongly acid. Crops, however, respond to lime and fertilizer. Water and roots penetrate easily down to the fragipan, but this layer impedes further penetration. The plow layer can be tilled easily throughout a wide range of moisture content without clodding or crusting.

Most of the acreage is cultivated. Corn and soybeans are the main crops. Some acreage is in fescue pasture or in hay. Wetness and shallowness are limitations. Therefore, alfalfa and plants requiring good drainage are not suitable. Most areas are subject to infrequent flooding.

Taft silt loam (Ta).—This is a somewhat poorly drained soil that developed in mixed sediment on broad, level benches along the Green River. The plow layer is dark grayish-brown, very friable silt loam. The upper part of the subsoil is pale-brown silt loam mottled with yellowish brown and brownish gray; its structure is subangular blocky. The lower part of the subsoil is mottled brown and gray, brittle, compact silty clay loam. A fragipan is at a depth of about 18 inches.

This soil is easily tilled throughout a wide range of moisture content. It has a moderately deep to shallow root zone and a moderately high moisture-supplying capacity. It is strongly acid and moderately low in natural fertility. Crops, however, respond to lime and fertilizer. Roots and water easily penetrate down to the fragipan where air, water, and root penetration is greatly retarded.

Erosion is not a problem on this soil, but wetness is a limitation. It delays planting and affects yields of cultivated crops. Most of the acreage is in soybeans, corn, pasture, and hay. Deep-rooted perennials and plants that are not tolerant of wetness are short lived on this soil. On the other hand, water-tolerant grasses and legumes make excellent pasture. (Capability unit IIIw–1; woodland suitability group 9)

Uniontown Series

This series consists of well drained and moderately well drained soils that developed in moderately fine textured, water-deposited sediment of loess origin. The main layers of a representative profile are—

0 to 8 inches, grayish-brown, friable silt loam; medium acid.
8 to 24 inches, yellowish-brown, firm silty clay loam with few brownish-gray mottles in lower part; angular blocky structure.
24 to 36 inches, light olive-brown, firm silty clay loam; angular blocky structure; medium acid or slightly acid.
36 to 40 inches+, light olive-brown silt loam; neutral or alkaline.

Uniontown soils are widespread on broad flats that, for the most part, are adjacent to the flood plain of the Ohio River and its tributaries, but at a higher elevation. Their acreage is large.

The moisture-supplying capacity of these soils is moderately low to high. Natural fertility is moderately low to moderately high, and the reaction is medium acid. Crops respond well to fertilizer, and only some areas need lime. Water and roots easily penetrate the subsoil.

Most of the acreage is used for corn, soybeans, hay, and pasture. But good yields of all the locally grown crops can be obtained if the soils are well managed. These soils are subject to infrequent flooding.

Uniontown silt loam, 0 to 2 percent slopes (UnA).—This is a well drained and moderately well drained soil on broad terraces that border the Ohio River flood plain.

205-946—66——3

The surface layer consists of about 8 to 10 inches of grayish-brown, friable silt loam. The subsoil is yellowish-brown and light olive-brown, firm silty clay loam. It is underlain, at a depth of about 3 feet, by nonacid, friable silt loam.

This soil is easy to till and can be worked throughout a wide range of moisture content without crusting. It has a deep root zone and a high moisture-supplying capacity. It is moderate in natural fertility and medium in content of organic matter. Crops respond well to fertilizer and to lime.

Erosion is not a hazard on this soil, so intensive cultivation is possible. All the locally grown crops are suitable. Yields are better than average if the soil is fertilized and well managed. (Capability unit I–3; woodland suitability group 7)

Uniontown silt loam, 2 to 6 percent slopes (UnB).—This is a deep, gently sloping, well drained and moderately well drained soil on terraces along the flood plain of major streams. Most areas are a few feet higher than the adjacent bottoms. The surface layer is about 6 to 10 inches of grayish-brown, friable silt loam. The subsoil is yellowish-brown and light olive-brown, firm silty clay loam. It is underlain, at a depth of about 3 feet, by light olive-brown, friable silt loam that is neutral or alkaline in reaction.

This soil has a deep root zone and a high moisture-supplying capacity. It is medium acid, moderately high in natural fertility, and medium in content of organic matter. Crops respond well to lime and fertilizer. The friable plow layer is easily tilled throughout a wide range of moisture content. Surface runoff is moderate, and water movement through the soil material is moderately slow.

This soil is suited to all crops commonly grown in the county. If fertilized and otherwise well managed, it produces better than average yields. Because cultivated areas have a moderate or moderately low erosion hazard, adequate erosion control practices are needed in these areas to prevent excessive soil loss. (Capability unit IIe–10; woodland suitability group 7)

Uniontown silt loam, 2 to 6 percent slopes, eroded (UnB2).—This is a gently sloping, well drained and moderately well drained soil on low, broad terraces. Most areas are a few feet higher than the adjacent bottom lands of the Ohio River and its tributaries. This soil, except in a few places, is eroded, and consequently the plow layer is a mixture of the original surface layer and some former subsoil. The subsoil is yellowish-brown and light olive-brown, firm silty clay loam. At a depth of about 27 inches it is underlain by light olive-brown, friable silt loam.

The moisture-supplying capacity of this soil is high, natural fertility is moderate, and the reaction is medium acid. Crops respond well to lime and fertilizer. The root zone is moderately deep. The plow layer clods or crusts if plowed when too wet, especially in the more eroded spots. Erosion has lowered the organic-matter content.

This soil is suited to most of the locally grown crops and, if fertilized and otherwise well managed, produces better than average yields. Cultivated areas have a moderate or moderately low erosion hazard and, therefore, need appropriate erosion control practices. (Capability unit IIe–10; woodland suitability group 7)

Uniontown silt loam, 6 to 12 percent slopes, eroded (UnC2).—This well drained and moderately well drained soil formed in sediment that washed from the loess uplands. It occupies short slopes on terraces along major tributaries of the Ohio River. These terraces, for the most part, are a few feet higher than the adjacent bottom lands. Some of the original surface layer has washed away. Consequently, the plow layer consists partly of former subsoil. It has a lower content of organic matter and is slightly more sticky than the plow layer of uneroded Uniontown silt loam. The subsoil is yellowish-brown and light olive-brown, firm silty clay loam. It extends to a depth of about 30 inches, where it is underlain by light olive-brown, friable, nonacid silt loam. In some places, lime concretions occur at a depth of about 4 feet.

This soil is medium acid and moderate in natural fertility. Crops, however, respond well to lime and fertilizer. The root zone is moderately deep. Water movement through the soil material is moderately slow, and the moisture-supplying capacity is high. Tillage is not difficult, but the plow layer tends to clod or crust.

Yields of all the locally grown crops are average or better than average if the soil is fertilized and otherwise well managed. Erosion is a moderate or severe hazard in cultivated areas and requires attention. Pasture and hay grow well on this soil. (Capability unit IIIe–2; woodland suitability group 7)

Uniontown silty clay loam, 2 to 6 percent slopes, severely eroded (UoB3).—This is a well drained and moderately well drained soil on terraces that border the flood plain of the Ohio River and its tributaries. Throughout most of the area, 75 percent or more of the original surface layer has washed away. The present surface layer, consequently, consists mostly of former subsoil. It is yellowish-brown, sticky silty clay loam. It is underlain by a slightly more clayey material that extends to a depth of about 2 feet. Below that is brown, friable silt loam. Lime concretions generally occur at a depth of about 3 feet, but in some places they are exposed at the surface.

The moisture-supplying capacity of this soil is moderately low, and the root zone is moderately deep. Natural fertility is moderately low, and the content of organic matter is very low. But crops respond to fertilizer and lime. Tillage is difficult because the plow layer is sticky and tends to clod or crust.

Fair yields of corn, soybeans, grasses, and legumes can be obtained from this soil if adequate amounts of fertilizer and lime are used. Erosion is a moderate or severe hazard in cultivated areas and needs to be controlled by means of specific conservation practices. This soil is well suited to pasture. Sweetclover grows naturally in the most severely eroded areas. (Capability unit IIIe–12; woodland suitability group 8)

Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded (UoC3).—This well drained and moderately well drained soil formed in water-deposited sediment of loess origin. It occupies short slopes on terraces along major streams. Throughout most of the area the original surface layer has washed away, and in some places part of the subsoil has been removed. A few shallow gullies have formed. The present surface layer is yellowish-brown, acid, sticky silty clay loam. It is underlain at a depth of about 2 feet by light olive-brown, nonacid silt loam. Lime concretions generally occur at a depth of about 3 feet, but in the most severely eroded places they are exposed at the surface.

The root zone of this soil is moderately deep, and water movement through the soil material is moderately slow. The moisture-supplying capacity is moderately low. Natural fertility also is moderately low, and the content of organic matter is very low. Crops respond to fertilizer and lime. Tillage is difficult because the plow layer is sticky when wet and is likely to clod or crust when too wet or too dry.

Most of the acreage is used for pasture, a use for which this soil is well suited. Some areas are idle, and the most severely eroded places are in naturally growing sweetclover. Moderate yields of most crops grown in this county can be obtained if the soil is adequately fertilized and otherwise well managed. Erosion is a severe or very severe hazard on this soil. Practices that can reduce runoff are needed, and close-growing crops are necessary in a cropping system to help prevent excessive soil loss. (Capability unit IVe–14; woodland suitability group 8)

Uniontown soils, 12 to 35 percent slopes (UtE).—These soils occupy short, escarpmentlike breaks between the level terraces and the level bottom lands along major streams. The surface layer is brown, friable silt loam or silty clay loam. It is about 4 inches thick and is underlain by yellowish-brown or olive-brown, firm silty clay to silty clay loam. This layer, in turn, is underlain at a depth of about 30 inches by light olive-brown, nonacid, friable silt loam. Some similar but eroded soils are included in the mapped areas of this unit. These eroded soils are gullied and in a few places have lost all of their surface layer and part of their subsoil.

The Uniontown soils making up this unit are well drained. Surface runoff is rapid, water movement through the soil material is moderately slow, and the moisture-supplying capacity is moderately high. The reaction is acid, except in the severely eroded places. The root zone is deep, and natural fertility is moderate.

Most areas are not suitable for cultivated crops, because the slope is too steep and erosion is too severe a hazard. They are suitable, however, for hay and pasture. A few areas are suitable only for trees. Most grasses and legumes, including alfalfa, grow well if management is good. (Capability unit VIe–1; woodland suitability group 7)

Wakeland Series

This series consists of somewhat poorly drained soils that formed in sediment derived from nearly neutral loess. The main layers of a typical profile are—

0 to 8 inches, brown, very friable silt loam.
8 to 12 inches, dark yellowish-brown, very friable silt loam with some light brownish-gray mottles.
12 to 35 inches, mottled gray and brown, very friable heavy silt loam.

These soils occupy extensive acreage in the central and northern parts of the county. They occur in low-lying places along secondary drains where the valleys have widened out. Slopes are dominantly 0 to 3 percent. Associated with these soils are the better drained Adler soils and the more poorly drained Birds soils.

The moisture-supplying capacity of Wakeland soils is very high, and natural fertility is moderate. Crops respond to fertilizer. Lime is not needed, because the soils are nonacid. The plow layer is easily tilled throughout a wide range of moisture content, and roots and moisture easily penetrate the deep soil material. A seasonal high water table, however, may retard root growth if drainage is not provided. Some areas are subject to flooding.

Wakeland soils are suited to most general farm crops, especially summer annuals. They are well suited to most pasture plants and to trees. Much of the acreage has been tile drained and is used intensively for cultivated crops, principally soybeans, corn, and milo sorghum. If these soils are fertilized and otherwise well managed, good crop yields can be obtained.

Wakeland silt loam (Wa).—This is a somewhat poorly drained soil on wide flood plains. The plow layer is brown, very friable silt loam. The upper part of the subsoil is dark yellowish-brown, faintly mottled, very friable silt loam; it extends to a depth of about 12 inches. The lower part of the subsoil is mottled gray and brown, very friable heavy silt loam. In a few places a very dark gray layer occurs below a depth of 20 inches.

The plow layer of this soil is easily tilled throughout a wide range of moisture content without clodding or crusting. The moisture-supplying capacity is very high, and roots and moisture easily penetrate the deep soil material. Natural fertility is moderate, but crops respond to fertilizer. Lime generally is not needed.

This soil is suited to most general farm crops, to pasture, and to trees. Erosion is not a problem, so continuous cultivation is possible. Drainage, however, is necessary for consistent good yields. Some areas are subject to flooding by headwaters. (Capability unit IIw–4; woodland suitability group 3)

Waverly Series

The Waverly series consists of poorly drained soils that formed in loess sediment. The main layers of a typical profile are—

0 to 9 inches, brown grading to grayish-brown, friable silt loam with brownish-gray mottles.
9 to 20 inches, light brownish-gray, friable silt loam with pale-brown, yellowish-brown, and gray mottles.
20 to 32 inches, light brownish-gray silty clay loam with olive and yellowish-brown mottles.
32 inches+, increasingly finer textured material as depth increases.

Waverly soils occur mainly in the southern part of the county. Many areas are wooded, and cleared areas are used for corn, soybeans, pasture, and hay. Wetness and a flooding hazard are the main limitations. Nevertheless, good crop yields can be obtained if the soils are adequately drained, fertilized, limed, and otherwise well managed.

Waverly silt loam (We).—This is a poorly drained soil of the bottom lands. Much of the acreage lies lower than the drainage channel. The surface layer is a brown, grading to grayish-brown, friable silt loam. It is 6 to 9 inches thick and is underlain by a light brownish-gray, friable silt loam with distinct, pale-brown and yellowish-brown mottles that are more abundant with depth. Below this mottled silt loam, at a depth of 20 to 30 inches, is silty clay loam. A few areas of soils that are nonacid below a depth of 20 inches are included in the mapped areas of Waverly silt loam.

This soil is in good tilth and is easily kept that way. It can be tilled without clodding or crusting, if drained enough to lower the seasonal high water table. Roots

easily penetrate the subsoil, but root growth may be retarded by the high water table. The moisture-supplying capacity is very high. This soil is acid and has moderately low natural fertility. Crops, however, respond well to lime and fertilizer.

Yields of soybeans, corn, and hay are good if the soil is drained, fertilized, and otherwise well managed. Kentucky 31 fescue grows exceptionally well in undrained areas. Trees also grow well, and many areas are wooded. Erosion is not a hazard on this soil, so intensive use is possible. Overflows, however, may damage crops. (Capability group IIIw–5; woodland suitability group 3)

Weinbach Series

The Weinbach series consists of level, somewhat poorly drained soils that have a fragipan at a depth of 20 to 30 inches. The main layers of a representative profile are—

0 to 24 inches, brown to grayish-brown, friable silt loam mottled with gray in the lower half.
24 to 40 inches, mottled yellowish-brown, light-gray, and dark-brown silt loam; somewhat compact and brittle.
40 to 42 inches+, dark yellowish-brown silty clay loam with pale-brown mottles.

Weinbach soils occur in the northern part of the county. They are on stream terraces above the flood plain of the Ohio River and near the mouth of its tributaries. These soils have a moderately high moisture-supplying capacity, have moderate natural fertility, and are very strongly acid to medium acid. Crops respond fairly well to fertilizer and lime. Roots and water penetrate easily down to the fragipan, but this layer resists further penetration.

These soils are not subject to erosion, but they are flooded occasionally. They are wet soils but, if adequately drained, can be used for cultivated crops, including corn and soybeans. They produce good yields of hay and pasture grasses and of legumes that are tolerant of wetness.

Weinbach silt loam (Wh).—This is a wet soil on benches above the flood plain of the Ohio River and near the mouth of its tributaries. It has a brown silt loam surface layer overlying a mottled yellowish-brown and gray, slightly finer textured subsoil. A compact, brittle layer, or fragipan, is at a depth of 20 to 30 inches. Stratified silty, sandy, and clayey material occurs below a depth of 4 feet. Bedrock is at a depth of more than 10 feet.

This soil is easily tilled throughout a wide range of moisture content without clodding or crusting. It has a moderately high moisture-supplying capacity and is moderate in natural fertility. Permeability is favorable down to the fragipan, but this layer slows air and water movement and root penetration.

Hay and pasture plants that are tolerant of wetness grow well on this soil if good management is practiced. Soybeans and other cultivated crops can be grown if the soil is drained. A surface drainage system is best. Generally, a closed system is not feasible because of the shallow fragipan. Alfalfa is short lived because this soil is wet and has a shallow root zone. (Capability unit IIIw–1; woodland suitability group 9)

Wellston Series

This series consists of sloping and strongly sloping, well-drained, strongly acid soils of the sandstone and shale uplands. The upper part of these soils developed in loess. The main layers of a representative profile are—

0 to 6 inches, brown, friable silt loam.
6 to 26 inches, reddish-brown, firm silty clay loam; subangular blocky structure.
26 to 34 inches, brown, firm sandy clay loam; angular blocky structure.
34 to 40 inches, yellowish-brown sandy loam. (Sandstone fragments are scattered throughout this layer.)
40 inches+, sandstone.

These soils are of minor importance in Henderson County, yet they are noticeably prominent on side slopes in the rolling southeastern section of the county. South of Hebbardsville, at an elevation of almost 550 feet, is a small acreage of soils similar to Wellston soils in the upper layers but different in that they are underlain by beds of rounded gravel intermixed with sandy clay loam.

Wellston soils have a deep or moderately deep root zone. They are easily penerated by moisture and roots. The response of crops to lime and fertilizer is good. Pasture and woods are the chief uses. Considerable acreage, formerly cropped, is now idle.

Wellston silt loam, 12 to 20 percent slopes, eroded (WnD2).—This is a well-drained soil of the uplands in the southeastern section of the county. The upper part developed in loess and the lower part in sandstone and shale residuum. The plow layer is brown, friable silt loam; it is a mixture of the original surface layer and former subsoil. In spots all of the original surface layer has eroded away and the subsoil is exposed. The subsoil is reddish-brown, firm silty clay loam and, at a depth of about 24 inches, sandy clay loam. Its structure is blocky.

The root zone of this soil is moderately deep. The plow layer may clod or crust if worked at other than near optimum moisture content. The reaction is strongly acid, but the response to lime is good. The moisture-supplying capacity is high. Natural fertility is moderate, but crops respond well to fertilizer.

This is the most extensive of the Wellston soils in this county. It has been cleared, for the most part, and was row cropped at one time, but now it is mostly wooded and pastured. Some areas are idle. This soil is well suited to permanent vegetation consisting of grasses and legumes or trees. If highly fertilized it produces fairly good yields of hay and pasture. It is especially well suited to Kentucky 31 fescue and to sericea lespedeza but is only fairly well suited to alfalfa. Erosion is a severe hazard because runoff is rapid; therefore, cultivated crops should be grown only occasionally. (Capability unit IVe–4; woodland suitability group 11)

Wellston silty clay loam, 6 to 12 percent slopes, severely eroded (WoC3).—This is a well-drained soil of the uplands south of Hebbardsville. Mostly, it occurs as small areas that are next to strongly sloping soils but in a higher position. The upper part of this soil developed in loess, and the lower part in sandstone and shale residuum. The surface layer is brown to reddish-brown silty clay loam or heavy silt loam; most of this material is former subsoil. The subsoil is brown to reddish-brown silty clay loam in the upper part and sandy clay loam in the lower part. In some places, rounded gravel occurs in the lower part of the subsoil, and a gravelly soil material underlies the subsoil. A few acres of this soil are not severely eroded.

This soil must be worked at optimum moisture content; otherwise it will clod or crust. The root zone is moderately deep, and the moisture-supplying capacity is moderately high. The organic-matter content is very low, natural fertility is moderately low, and the reaction is strongly acid. Crops, however, respond well to fertilizer and lime.

This soil is well suited to pasture and to trees. It is only marginally suited to cultivated crops because erosion is a moderately severe hazard. If cultivated, it requires conservation practices that will effectively control runoff and thereby minimize the erosion hazard. Also, heavy applications of fertilizer are needed for fairly good yields. (Capability unit IVe–14; woodland suitability group 8)

Wellston silty clay loam, 12 to 20 percent slopes, severely eroded (WoD3).—This is a well-drained soil that developed partly from loess and partly from sandy parent material. It occurs in the southeastern section of the county. The surface layer is mixed brown and reddish-brown silty clay loam; most of this material is former subsoil, for much of the original surface layer has washed away. Immediately below the surface layer is brown to reddish-brown, firm silty clay loam or sandy clay loam. This layer is about 25 inches thick, and it is underlain by a 10-inch layer of yellowish-brown sandy loam. Below that is sandstone and shale bedrock.

This soil must be worked at near optimum moisture content; otherwise it will clod or crust. The root zone is moderately deep, and the moisture-supplying capacity is moderately low. The organic-matter content is very low, natural fertility is moderately low, and the reaction is strongly acid. Crops, however, respond well to fertilizer and lime.

Erosion is a severe hazard; therefore, this soil should not be used for cultivated crops. It is best suited to permanent vegetation consisting of grasses and legumes or trees. If highly fertilized, it produces fairly good yields of hay and pasture. Sericea lespedeza is a suitable crop, but alfalfa is only fairly suitable. (Capability unit VIe–2; woodland suitability group 8)

Wheeling Series

This series consists of well-drained soils that developed in Ohio River sediment of mixed origin. The main layers of a representative profile are—

0 to 9 inches, brown, very friable silt loam.
9 to 38 inches, brown, firm silty clay loam; blocky structure.
38 to 50 inches, brown, friable silt loam.

These soils are extensive on the broad stream terraces along the Ohio River. They are important locally because generally they occupy the highest areas of a farm.

Wheeling soils are easy to till and can be worked throughout a wide range of moisture content without crusting or clodding. They have a very high moisture-supplying capacity, have moderate or moderatley high natural fertility, and are acid. Crops respond well to fertilizer and lime. Moisture and roots readily penetrate the soil material.

These soils are well suited to all the locally grown crops. If fertilized and otherwise well managed, they produce favorable yields. Occasionally, they are flooded.

Wheeling silt loam, 0 to 2 percent slopes (WpA).—This is a well-drained soil on the broad terraces along the Ohio River. It occupies the long, narrow ridges throughout this area. It is the most extensive of the Wheeling soils and is important locally because much of its acreage is on the highest reaches of a farm. The plow layer is brown, very friable silt loam. The subsoil is brown, friable to firm silty clay loam of blocky structure. Strata of sand or gravel occur below a depth of 4 feet in some places.

This soil has a deep root zone and a very high moisture-supplying capacity. It is acid and moderately high in natural fertility. Crops respond well to lime and fertilizer. The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting.

This soil is well suited to all the locally grown crops, including deep-rooted and specialty crops. It is not subject to erosion and, therefore, can be cultivated continuously. Yields are favorable if the soil is fertilized and otherwise well managed. A small acreage is within the Henderson city limits. (Capability unit I–3; woodland suitability group 7)

Wheeling silt loam, 2 to 6 percent slopes (WpB).—This is a well-drained soil on terraces along the Ohio River. It is an extensive soil occupying the long, narrow benches that generally are the highest areas on a farm. The plow layer is a brown, very friable silt loam. The subsoil is a brown, firm silty clay loam of blocky structure. Strata of sand or gravel, or both, occur below a depth of 4 feet in some places.

The moisture-supplying capacity of this soil is very high. Natural fertility is moderately high, and the reaction is acid. Crops respond well to lime and fertilizer. The plow layer can be tilled throughout a wide range of moisture content without crusting or clodding. The root zone is deep.

This soil is suited to all the locally grown crops, including deep-rooted and specialty crops. Yields are favorable if the soil is fertilized and otherwise well managed. Erosion is a moderate or moderately low hazard in cultivated areas. (Capability unit IIe–1; woodland suitability group 7)

Wheeling silt loam, 2 to 6 percent slopes, eroded (WpB2).—This is a well-drained soil on terraces along the Ohio River. It is not an extensive soil but is important locally because much of it constitutes the highest ground on the farm. The plow layer is a brown, firm silt loam that is a mixture of the original surface layer and some former subsoil. The subsoil is brown, friable to firm silty clay loam of blocky structure. In a few spots it is exposed at the surface. Strata of sand or gravel occur below a depth of 4 feet in some places.

This soil has a deep root zone and a very high moisture-supplying capacity. It is acid and moderately high in natural fertility. The content of organic matter has been lowered by erosion, and consequently the productivity potential has been reduced. Crops respond well to lime and fertilizer. The plow layer may clod or crust if worked when too moist.

If this soil is fertilized and otherwise well managed, favorable yields of all the locally grown crops can be obtained. Erosion is a moderate or moderately low hazard in cultivated areas and requires some attention. (Capability unit IIe–1; woodland suitability group 7)

Wheeling silt loam, 6 to 12 percent slopes, eroded (WpC2).—This is a well-drained soil that occupies short slopes on the sides of long, narrow, benchlike ridges near the Ohio River. A few acres of this soil are not eroded, and there are spots where all of the original surface layer has washed away. Throughout most of the area, however, only part of the original surface layer has been removed by erosion. The plow layer, consequently, is brown, friable silt loam that is a mixture of the original surface layer and some former subsoil. The subsoil is brown, firm silty clay loam.

This soil has a deep root zone and a very high moisture-supplying capacity. It is acid and moderately high in natural fertility. Crops respond well to lime and fertilizer. The friable plow layer is easy to till. Water and roots easily penetrate the soil material to a depth of 3 feet or more.

Most plants common to this area can be grown on this soil, and yields, especially of corn, soybeans, grasses, and legumes, are better than average. But good management, including the use of fertilizer, is essential. Erosion is a moderate or severe hazard in cultivated areas, but most of these areas, because of their uniform slope, are suited to terraces, contour cultivation, and other erosion control practices. (Capability unit IIIe–2; woodland suitability group 7)

Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded (WsC3).—This soil formed in sediment deposited by the Ohio River. It occupies short slopes on the sides of long, narrow ridges. Erosion has removed the original topsoil in most places and has removed part of the subsoil in some places. Consequently, both the plow layer and the subsoil are brown, firm silty clay loam. A few shallow gullies are scattered in this area.

The moisture-supplying capacity of this soil is high. Internal drainage is good, and the root zone is deep. The reaction is strongly acid, and natural fertility is moderate. Crops respond well to lime and fertilizer. Because of its clay content, the plow layer clods if tilled when too wet, and it tends to crust if tilled following rain.

This soil is suited to most plants commonly grown in the area. It is a lower yielding soil, however, than the uneroded Wheeling soils. It is not suited to frequent plowing, because it is subject to erosion. This soil is well suited to long rotations or to permanent vegetation of hay or pasture. Also, it is good for trees. (Capability unit IVe-9; woodland suitability group 8)

Wheeling soils, 12 to 30 percent slopes (WtE).—These are well-drained soils that formed in sediment deposited by the Ohio River. They occur in the northern part of the county, where they occupy the sides of benches, which roughly parallel the Ohio River.

Uneroded, eroded, and severely eroded Wheeling soils make up this mapping unit. The uneroded soils have a surface layer of brown, friable silt loam that is about 7 inches thick. Their subsoil is a brown, firm silty clay loam. The eroded soils have a thinner surface layer than the uneroded soils, or a plow layer that is a mixture of the original surface layer and some former subsoil. The severely eroded soils have their silty clay loam subsoil exposed at the surface, for their original surface layer has washed away.

A fine sandy loam type is included in the mapped areas of these Wheeling soils. It has a slightly coarser textured subsoil than the silt loam type, but both types have similar capabilities.

Wheeling soils have a deep root zone and a very high moisture-supplying capacity. Surface runoff is rapid. Natural fertility is moderately high, and the reaction is acid. Crops respond well to lime and fertilizer. The severely eroded soils are very low in organic-matter content.

Generally, these soils are not suited to cultivated crops, because they are too steep. Most can be used for permanent hay or pasture. Some of the steepest and most severely eroded areas are better for trees than for grass. Yields of grasses and legumes are good if the soils are adequately fertilized and otherwise well managed. (Capability unit VIe–1; woodland suitability group 7)

Zanesville Series

The Zanesville series consists of well drained and moderately well drained soils that have a fragipan. The uppermost 36 to 42 inches formed in loess that was deposited on sandstone and shale. The main layers of a typical profile are—

0 to 7 inches, dark-brown, friable silt loam.
7 to 19 inches, brown, firm heavy silt loam; blocky structure.
19 to 31 inches, dark-brown, firm silty clay loam; blocky structure; a few, distinct, grayish-brown mottles occur below a depth of 20 inches.
31 to 40 inches, mottled brown and gray, compact, brittle silty clay loam; sticky when wet; sand is noticeable.

These soils are of minor extent but are agriculturally important. They occur on uplands in the southeastern part of the county. The dominant slope is 6 to 20 percent. Zanesville soils are associated with Loring and Memphis soils, which are on the ridgetops above the Zanesville, and with Wellston and Litz soils, which are on steeper slopes below.

Zanesville soils are easily worked throughout a wide range of moisture content without crusting. They have a moderately low to moderately high moisture-supplying capacity. They are very strongly acid and are moderate or moderately low in natural fertility. Crops, however, respond well to lime and fertilizer. Moisture and roots penetrate easily down to the fragipan, but this layer greatly impedes further penetration.

Most of the acreage has been cultivated at some time, but now much of it is idle, especially the severely eroded areas. If these soils are well managed, they can produce good yields of forage crops.

Zanesville silt loam, 6 to 12 percent slopes, eroded (ZaC2).—This is a well drained and moderately well drained soil of the southeastern uplands. The plow layer is dark-brown, friable silt loam that, for the most part, is a mixture of the original surface layer and some former subsoil. The subsoil is brown, firm, heavy silt loam or silty clay loam to a depth of about 31 inches; below that it is mottled brown and gray, compact, brittle silty clay loam. This lower layer is a fragipan. In spots the subsoil is exposed at the surface, and a few shallow gullies have formed. A few acres where the slope is slightly less than 6 percent are included in the mapped areas of this soil.

This is a minor soil in the Rock House section. It is moderate in natural fertility, has a moderately high moisture-supplying capacity, and is very strongly acid. Crops

respond well to lime and fertilizer. Roots and moisture easily penetrate down to the fragipan, but this layer retards further penetration. Generally, the plow layer is easy to till and can be worked throughout a wide range of moisture content, but in some places it crusts and clods.

If well managed, this soil produces good yields of adapted crops. Alfalfa requires extra care, but pasture and hay are suitable. Cultivated areas are subject to moderate or severe erosion. Therefore, conservation practices that can effectively control runoff and thereby reduce erosion are needed in those areas. (Capability unit IIIe–2; woodland suitability group 11)

Zanesville silt loam, 6 to 12 percent slopes, severely eroded (ZaC3).—This is a well drained and moderately well drained soil of the southeastern uplands. The plow layer is brown to yellowish-brown, firm silt loam or silty clay loam; it consists mostly of former subsoil because most of the original surface layer has washed away. Mottled brown and gray, brittle, compact silty clay loam is at a depth of about 20 inches. This layer is a fragipan.

This is a minor soil in the Rock House section. It has a moderately high moisture-supplying capacity, is moderately low in natural fertility, and is very strongly acid. Crops respond to lime and fertilizer. Roots and moisture penetrate easily down to the fragipan, but this layer greatly retards further penetration. The sticky plow layer must be worked at optimum moisture content; otherwise it will crust or clod. Additional organic matter is needed to improve productivity and workability.

If fertilized and otherwise well managed, this soil produces moderate yields of adapted crops. Alfalfa needs exceptional care on this soil. Sericea lespedeza grown with grass makes good pasture. Row crops should be grown only occasionally because erosion is a moderately severe hazard in cultivated areas. Conservation practices are needed to minimize this hazard. (Capability unit IVe–14; woodland suitability group 8)

Zanesville silt loam, 12 to 20 percent slopes, eroded (ZaD2).—This is a well drained and moderately well drained soil in the southeastern section of the county. The plow layer is a dark-brown, friable silt loam; it is a mixture of the original surface layer and some former subsoil. The subsoil is brown, firm silty clay loam to a depth of about 26 inches; below that it is mottled brown and gray, compact, brittle silty clay loam—a fragipan. Shallow gullies have formed in some areas. A few acres of this soil are not eroded, and a few acres are on a slope of up to 25 percent.

This is a minor soil in the Rock House section. It is moderate in natural fertility, has a moderately high moisture-supplying capacity, and is very strongly acid. Crops respond to lime and fertilizer. Roots and moisture penetrate easily down to the fragipan, but this layer retards further penetration. The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting.

Good yields of adapted crops can be obtained if this soil is fertilized and otherwise well managed. Pasture, hay, and trees grow well on this soil, but deep-rooted crops need extra care. Row crops should be grown only occasionally because erosion is a severe hazard in cultivated areas. Conservation practices that can control runoff and thereby reduce erosion are needed in these areas. (Capability unit IVe–3; woodland suitability group 11)

Zanesville silt loam, 12 to 20 percent slopes, severely eroded (ZaD3).—This is a well drained and moderately well drained soil in the southeastern section of the county. The plow layer is a brown, firm, heavy silt loam spotted with dark brown. It consists mostly of former subsoil, for most of the original surface layer has washed away. The subsoil is brown, firm silty clay loam to a depth of about 22 inches; below that it is mottled brown and gray, compact, brittle silty clay loam—a fragipan. A few acres of this soil are on a slope of 25 percent or more. In a few spots, rill-type gullies and some deeper ones have formed.

This is a minor soil in the Rock House section. It has a moderately low moisture-supplying capacity, is moderately low in natural fertility, and is very strongly acid. Crops respond to lime and fertilizer. The fragipan retards root and moisture penetration. The plow layer tends to clod and crust if tilled when too wet. Because erosion has removed most of the original surface layer, the organic-matter content, the moisture-supplying capacity, and natural fertility have been reduced, and workability is less favorable.

This soil is subject to severe erosion and, therefore, should not be cultivated. It needs good management, including the use of fertilizer, for goods yields of pasture and hay. Kentucky 31 fescue is a highly suitable grass. The timber growth potential is good. (Capability unit VIe–3; woodland suitability group 8)

Use of the Soils for Farming

This section has four parts. The first part discusses some general principles of soil management. The second explains the capability classification system, and the third discusses use and management of the soils in each of the capability units. The fourth part gives estimated yields of the principal crops.

The information in this section is based on research and experiments carried on by the Agricultural Research Service, the Agricultural Experiment Station, and the Soil Conservation Service. More detailed information can be obtained from the local staff of the Soil Conservation Service, the Agricultural Extension Service, or the Agricultural Experiment Station.

General Principles of Soil Management

Most of the soils in Henderson County are acid, are low in content of organic matter, and are medium or low in content of the basic plant nutrients. On most of the soils, however, crops respond well to lime and fertilizer. The amounts of lime and fertilizer needed depend on the type of soil, on the crops to be grown, on past cropping, and on the level of yield desired, but they should be determined largely by laboratory analysis of a soil sample. Each sample for testing should consist of a single soil type, and each sample should represent no more than 10 acres. Information and instructions on collecting samples and on testing to determine fertilizer needs can be obtained from a local representative of the Soil Conservation Service or from the county extension agent.

If cultivated, all of the sloping soils in Henderson County are subject to erosion. Sheet erosion accounts for heavy losses of organic matter and plant nutrients. There-

fore, a major management problem in this county is controlling runoff and reducing the hazard of erosion. Suitable cropping systems, contour cultivation, terraces, stripcropping, diversions, grassed waterways, minimum tillage, and proper use of crop residues are effective in the control of runoff and erosion.

The factors to consider in choosing a cropping system and practices for a particular soil are: relative effectiveness of the cropping system and of each of the practices in reducing erosion; relative erodibility of the particular soil; eroding capability of rainstorms, and the distribution of rainstorms during the year; the length and steepness of the slope; and the average annual loss of soil material that can be tolerated. Generally, if fewer conservation practices are used, a cropping system dominated by meadow or sod crops is necessary for a longer period.

The most common method of removing excess water from the wet soils in this county is by means of open ditches. A more expensive method, and a more satisfactory one under certain conditions, is by means of tile drains. Neither method can be used unless suitable outlets are available. Ordinarily, the soils that have a claypan or a fragipan are difficult to drain. Tile drains generally are not effective in pan soils. Open ditches are effective only if they intercept water moving laterally on top of the pan. Even if drained, some wet soils are not responsive, and pan soils will not produce a crop like corn, for example, so well as well-drained soils. If fertilized and limed, the deep, permeable, wet soils are generally highly productive after they are adequately drained. For advice about laying out a properly designed drainage system, consult the local representative of the Soil Conservation Service.

Capability Groups of Soils

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels—the capability class, the subclass, and the unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclass is indicated 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* means that water in or on the soil will interfere 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, is droughty, or has unfavorable workability; and *c*, which is not used in Henderson County, indicates 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 or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, range, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils 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 generally are identified by numbers assigned locally, for example IIe–1 or IIIe–2.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

In Henderson County, the capability units are not numbered consecutively within the subclasses, because they fit into the statewide system of capability classification, and not all of the capability units in the State are represented in this county. The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows:

Class I. Soils that have few limitations that restrict their use.
- Unit I–1.—Deep, well drained and moderately well drained, level or nearly level soils on bottom lands.
- Unit I–2.—Deep, moderately well drained, level or nearly level soils on bottom lands.
- Unit I–3.—Deep, well drained and moderately well drained, level or nearly level soils on uplands and terraces.

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

Subclass IIe. Soils moderately limited mainly by their susceptibility to erosion if they are cultivated and not protected.
- Unit IIe–1.—Deep, well-drained, gently sloping soils on uplands and terraces.
- Unit IIe–6.—Moderately deep, moderately well drained, gently sloping soils on uplands and terraces.
- Unit IIe–8.—Deep, well-drained, mostly sloping soils on bottom lands.
- Unit IIe–10.—Moderately deep, well drained and moderately well drained, gently sloping soils on uplands and terraces.

Subclass IIw. Soils moderately limited mainly by excess water.
- Unit IIw.–1.—Moderately deep, moderately well drained, level or nearly level soils on uplands and terraces.
- Unit IIw–4.—Deep, mostly somewhat poorly drained, level soils on low terraces and bottom lands.

Unit IIw–5.—Deep, very poorly drained, level, dark-colored soils on terraces and bottom lands.

Subclass IIs. Soils that have somewhat unfavorable workability.

Unit IIs–3.—Deep, well drained and moderately well drained soils that have a moderately fine textured plow layer.

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

Subclass IIIe. Soils severely limited mainly by their susceptibility to erosion if they are cultivated and not protected.

Unit IIIe–2.—Deep, well drained and moderately well drained, sloping soils on uplands and terraces.

Unit IIIe–8.—Moderately deep, moderately well drained, sloping soils on uplands.

Unit IIIe–12.—Deep, well drained and moderately well drained, gently sloping, severely eroded soils on uplands and terraces.

Unit IIIe–14. Moderately deep, well drained and moderately well drained, gently sloping soils on terraces.

Subclass IIIw. Soils severely limited mainly by excess water.

Unit IIIw–1.—Shallow to moderately deep, somewhat poorly drained, level to gently sloping soils on uplands and terraces.

Unit IIIw–5.—Deep, poorly drained, level soils on bottom lands.

Unit IIIw–6.—Deep or moderately deep, very poorly drained, level soils on bottom lands.

Subclass IIIs. Soils limited by unfavorable soil characteristics.

Unit IIIs–1.—Deep, excessively drained, level to gently sloping soils on bottom lands and terraces.

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

Subclass IVe. Soils very severely limited mainly by their susceptibility to erosion if they are cultivated and not protected.

Unit IVe–3.—Moderately deep, well drained and moderately well drained, strongly sloping soils on uplands.

Unit IVe–4.—Moderately deep, well-drained, strongly sloping soils on uplands.

Unit IVe–8.—Deep, well drained and moderately well drained, sloping soils on terraces.

Unit IVe–9.—Deep, well-drained, sloping, severely eroded soils on uplands and terraces.

Unit IVe–14.—Moderately deep, well drained and moderately well drained, sloping, severely eroded soils on uplands and terraces.

Subclass IVw. Soils very severely limited mainly by excess water.

Unit IVw–1.—Shallow, poorly drained, level soils on terraces.

Subclass IVs. Soils limited by unfavorable soil characteristics.

Unit IVs–2.—Deep, excessively drained, gently sloping to sloping soils on bottom lands.

Class V. Soils that have little or no hazard of erosion but have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture or range, woodland, or food and cover for wildlife. (None in Henderson County.)

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

Subclass VIe. Soils severely limited mainly by their susceptibility to erosion if protective cover is not maintained.

Unit VIe–1.—Deep or moderately deep, well drained and moderately well drained, strongly sloping and moderately steep soils on uplands and terraces.

Unit VIe–2.—Deep or moderately deep, well drained and moderately well drained, strongly sloping, severely eroded soils on uplands.

Unit VIe–3.—Deep, well drained and moderately well drained, sloping and strongly sloping, severely eroded soils on uplands and terraces.

Unit VIe–7.—Deep and moderately deep, well drained and moderately well drained, strongly sloping, eroded soils on uplands.

Class VII. Soils that have very severe limitations that make them unsuited to cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIe. Soils very severely limited mainly by their susceptibility to erosion if protective cover is not maintained.

Unit VIIe–1.—Deep, well-drained, steep soils on uplands.

Unit VIIe–2.—Shallow to moderately deep, somewhat excessively drained, steep soils on uplands.

Unit VIIe–4.—Gullied land.

Subclass VIIw. Soils very severely limited mainly by excess water.

Unit VIIw–1.—Soil areas that are almost continually covered by shallow water.

Class VIII. Soils and landforms that, without major reclamation, have limitations that preclude their use for commercial production of plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes. (None in Henderson County.)

Management by Capability Units

The soils in one capability unit have about the same limitations, are suited to about the same kinds of crops, and can produce about the same yields. The soils in one unit, therefore, need about the same kind of management, though they may have developed from different kinds of parent materials and in different ways.

The capability units are described in the following pages. The soils in each unit are listed, characteristics of the soils that affect use and management are discussed, and management suitable for the soils of each unit is suggested.

Capability unit I–1

This unit consists of well drained and moderately well drained, deep, medium-textured and moderately coarse textured soils on bottom lands. The slope range is 0 to 4

205–946—66——4

percent, but most areas are nearly level. These soils can be cultivated throughout a wide range of moisture content without serious crusting or clodding. They range from medium acid to neutral, have a high or very high moisture-supplying capacity, and are high or moderately high in natural fertility. Their content of organic matter is medium. The soils are—

Egam silt loam.
Huntington fine sandy loam, 0 to 4 percent slopes.
Huntington silt loam, 0 to 4 percent slopes.
Morganfield silt loam.

These soils make up about 5.9 percent of the county. They are suited to most of the locally grown crops. A large part of their acreage is used for corn, soybeans, and other summer annuals. Generally, yields are favorable if high-level management is applied. These soils are good producers of feed grains. Suitable hay and pasture plants include orchardgrass, Kentucky 31 fescue, alsike clover, Korean lespedeza, alfalfa, red clover, white clover, and sweetclover.

If well managed, these soils can be cultivated intensively. Applying fertilizer, growing cover crops, and turning under crop residues are good management practices.

Internal drainage is not a limitation, nor is erosion in the usual sense. There is occasional flooding in winter and early in spring, but scour damage is minor and overflow is not detrimental to the crops grown on these soils. Most areas are benefited by deposition of fertile sediments.

Johnsongrass infests some areas, but it can be partly controlled by summer fallow and a chemical spray.

Capability unit I–2

This unit consists of deep, moderately well drained, level or nearly level soils on bottom lands. These soils have a very friable plow layer that is easily tilled. They have a very high moisture-supplying capacity, are moderate to high in natural fertility, and are medium in organic-matter content. Water readily penetrates the soil material, but in a wet season, root penetration may be somewhat restricted by a seasonal high water table. The soils are—

Adler silt loam.
Collins silt loam.
Lindside silt loam.

These soils make up about 2.5 percent of the county. They are well suited to corn, soybeans, and grain sorghum, as well as to most of the locally grown hay and pasture plants and small grains. Generally, favorable yields of Kentucky 31 fescue, orchardgrass, timothy, Korean lespedeza, alsike clover, red clover, and white clover can be obtained if high-level management is applied.

The soils in this unit are slightly wet. Tile drainage, however, corrects the wetness and generally helps to increase crop yields enough to make this practice profitable. Some of these soils are subject to flooding in winter and spring. The floods, in some years, damage small grains and perennials. These soils can be cultivated intensively and need no erosion control practices. Those soils adjacent to the uplands, however, need diversions to protect them from runoff. The content of organic matter can be maintained or increased by growing cover crops or by turning under crop residue. Lime and fertilizer should be added in amounts determined by soil tests.

Capability unit I–3

This unit consists of deep, well drained and moderately well drained, level or nearly level soils on uplands and terraces. These soils are very friable and can be tilled throughout a wide range of moisture content without crusting or clodding. They have a high or very high moisture-supplying capacity, are moderate to high in natural fertility, and are medium in content of organic matter. Water moves downward through the soil material at a favorable rate. The soils are—

Ashton silt loam.
Elk silt loam, 0 to 2 percent slopes.
Loring silt loam, 0 to 2 percent slopes.
Sequatchie loam, 0 to 2 percent slopes.
Uniontown silt loam, 0 to 2 percent slopes.
Wheeling silt loam, 0 to 2 percent slopes.

These soils make up about 4 percent of the county. They are well suited to most of the locally grown crops and pasture plants. Favorable yields of corn, soybeans, tobacco, grain sorghum, small grain, hay, and pasture can be obtained if high-level management is applied. Suitable grasses and legumes include orchardgrass, Kentucky 31 fescue, timothy, alfalfa, red clover, alsike clover, Ladino clover, Korean lespedeza, and sweetclover.

Erosion is not a problem, so these soils can be cultivated intensively. They need lime and fertilizer, both of which should be applied in amounts determined by soil tests. Growing a cover crop and turning under crop residue help to maintain the content of organic matter and the good structure of the soil material.

Capability unit IIe–1

This unit consists of gently sloping, well-drained soils on uplands and terraces. The moisture-supplying capacity of these soils is high or very high, and permeability is moderate. The organic-matter content is low or medium, natural fertility is moderate to high, and the reaction is strongly acid. The root zone is deep, and the medium-textured plow layer is easy to till. The soils in this unit are—

Elk silt loam, 2 to 6 percent slopes.
Memphis silt loam, 2 to 6 percent slopes.
Memphis silt loam, 2 to 6 percent slopes, eroded.
Sequatchie silt loam, 2 to 6 percent slopes.
Wheeling silt loam, 2 to 6 percent slopes.
Wheeling silt loam, 2 to 6 percent slopes, eroded.

These soils make up about 9.6 per cent of the county. They are suited to all the locally grown crops, and yields generally are favorable. Corn, soybeans, grain sorghum, and tobacco grow well. Good yields of small grain, alfalfa, Kentucky 31 fescue, red clover, orchardgrass, and other hay and pasture plants can be obtained from those soils that are not subject to flooding.

A few acres of the Sequatchie soil are in built-up areas and have been graded in places and filled over in other places. Some areas of the Sequatchie soil and some of the Wheeling soils are good sites for farmsteads because of their good drainage and their position, which is slightly higher than that of the adjacent soils.

These soils can be used intensively, but sod crops generally are needed in the cropping system to prevent excessive soil loss by erosion, which is the main limitation of these soils. Moreover, the short slopes on the sides of long, narrow ridges need to be cultivated on the contour; and

those slopes that are long enough need to be terraced. Returning crop residue to the soil and growing a cover crop help to maintain the supply of organic matter. Crops respond exceptionally well to lime and fertilizer, both of which should be applied in amounts determined by soil tests.

Capability unit IIe–6

This unit consists of moderately well drained, gently sloping soils that have a compact layer, or fragipan, in the lower part of the subsoil. The surface layer of these soils and the upper part of their subsoil have fairly good structure, are permeable to water, and are favorable for root growth. The fragipan is very slowly permeable and limits internal drainage. It is not easily penetrated by roots. The moisture-supplying capacity is moderately low to moderately high, natural fertility is moderate or moderately low, and the reaction is strongly acid. Crops respond well to lime and fertilizer. The plow layer can be tilled without clodding or crusting. The soils in this unit are—

Captina silt loam, 2 to 6 percent slopes.
Grenada silt loam, 2 to 6 percent slopes.
Grenada silt loam, 2 to 6 percent slopes, eroded.
Sciotoville silt loam, 2 to 6 percent slopes.
Sciotoville silt loam, 2 to 6 percent slopes, eroded.
Sciotoville fine sandy loam, 2 to 6 percent slopes.

These soils make up about 5.3 percent of the county. They are suited to most of the locally grown crops. Deep-rooted crops, such as alfalfa, grow only moderately well. Yields of corn, soybeans, hay, pasture, and small grain are generally good.

Artificial drainage normally is not needed, but there is some runoff and erosion is a hazard. Sod crops generally are needed in the cropping system to prevent excessive soil loss. Slopes are mostly short, but some are long enough for terracing or stripcropping. Other practices, such as contour cultivation, sodded waterways, use of crop residue, and use of cover crops in a cropping system, are desirable in cultivated areas. Lime and fertilizer are needed in most places and can be applied in amounts determined by soil tests.

Capability unit IIe–8

Huntington silt loam, 4 to 16 percent slopes, makes up this unit. It is a well-drained soil occupying short slopes on the sides of sloughs and drains in the flood plain of the Ohio and Green Rivers. The dominant slope is 4 to 10 percent. This soil can be cultivated throughout a wide range of moisture content without clodding or crusting. It has a very high moisture-supplying capacity, is high in natural fertility, and generally is neutral. Roots and moisture readily penetrate the deep soil material.

This soil makes up 0.2 percent of the county. It is a productive soil and is well suited to most of the locally grown crops. Because of floods, however, its use throughout most of the acreage is limited to corn, soybeans, grain sorghum, and summer annuals. In those areas not subject to flooding, this soil produces favorable yields of small grain, alfalfa, red clover, white clover, alsike clover, Korean lespedeza, orchardgrass, Kentucky 31 fescue, and sweetclover.

Erosion is a hazard on this soil, but sod crops, where they are not damaged by floods, are effective in controlling erosion. Stripcropping is not practical, because slopes are generally too short. Floods sometimes remove soil by scouring but more often leave a deposit of fertile soil. Hardwood trees grow well on this soil and control scouring and cutting of stream banks. The areas that receive fertile deposits can be cropped in a short rotation if they are cultivated on the contour and if crop residue is returned to the soil. Crop residue, which is worked into the soil, generally is not carried away by floodwater.

Capability unit IIe–10

This unit consists of gently sloping, well drained and moderately well drained, moderately deep soils on uplands and terraces. The surface layer of these soils and the upper part of their subsoil are medium textured, have good structure, and are permeable. The lower part of the subsoil is more compact and somewhat restricts water, air, and root penetration. The plow layer has good workability. These soils are strongly acid, are moderate or moderately high in natural fertility, and have a high moisture-supplying capacity. Their organic-matter content is medium or low. The soils are—

Loring silt loam, 2 to 6 percent slopes.
Loring silt loam, 2 to 6 percent slopes, eroded.
Uniontown silt loam, 2 to 6 percent slopes.
Uniontown silt loam, 2 to 6 percent slopes, eroded.

These soils make up about 7.4 percent of the county. They are well suited to the general farm crops grown in the area, such as corn, tobacco, soybeans, Kentucky 31 fescue, Korean lespedeza, Ladino clover, red clover, orchardgrass, and small grain. Yields are better than average if high-level management is applied. Loring soils are well suited to orchard crops.

These soils can be cultivated intensively, but erosion is a hazard in cultivated areas. Cultivating on the contour, combined with terracing or stripcropping, can help to control runoff and reduce erosion. Generally, hay or pasture is needed in the cropping system to help control erosion and maintain the supply of organic matter. Natural waterways in cultivated areas should be permanently sodded. Lime and fertilizer are necessary for good yields. The amounts to be applied should be determined by soil tests.

Capability unit IIw–1

This unit consists of level or nearly level, moderately well drained soils on uplands and terraces. These soils have a compact layer, or fragipan, in the lower part of the subsoil. This layer is largely responsible for the impeded drainage. Water and roots easily penetrate down to the fragipan, but this layer restricts further penetration. Because the root zone is only about 2 feet deep, these soils are slightly droughty in a dry summer. These soils are acid and moderately low to moderately high in natural fertility. They have good workability and can be tilled throughout a wide range of moisture content without crusting or clodding. Some of the acreage is subject to infrequent flooding. The soils in this unit are—

Captina silt loam, 0 to 2 percent slopes.
Grenada silt loam, 0 to 2 percent slopes.
Sciotoville silt loam, 0 to 2 percent slopes.
Sciotoville fine sandy loam, 0 to 2 percent slopes.

These soils make up about 3 percent of the county. They are suited to such crops as corn, soybeans, and grain sorghum. Yields generally are good. Yields of small grain, Kentucky 31 fescue, orchardgrass, red clover, white

clover, and Korean lespedeza also are good, except when these plants are damaged by winter or spring floods. Alfalfa and other deep-rooted crops are short lived in most places, and tobacco ordinarily grows well but is likely to drown in low spots during a long, rainy period.

A few areas of Grenada and Sciotoville soils are built up and have been graded in some places and filled over in other places.

Slight droughtiness and a restricted root zone are the main limitations of these soils. Lime and fertilizer are needed for good yields; they should be applied in amounts determined by soil tests. Except possibly in a few low places, artificial drainage is not needed. Growing a cover crop and working crop residue into the soil help to maintain the supply of organic matter. Because of the slow permeability of the fragipan, these soils are severely limited for use as septic tank disposal fields. To establish and maintain lawns in graded areas, generous applications of fertilizer and mulch are necessary.

Capability unit IIw–4

This unit consists of deep, somewhat poorly drained and very poorly drained soils on low terraces and bottom lands. The plow layer of these soils and the upper part of their subsoil are brown; the lower part of the subsoil is gray or is mottled with gray. Generally, it is saturated with water during a wet period. Roots and moisture easily penetrate the soil material. A seasonal high water table, however, can restrict root growth. The moisture-supplying capacity is high or very high, natural fertility is moderate to high, and the organic-matter content is medium. The reaction ranges from strongly acid to neutral. The soils in this unit are—

Dekoven and Wakeland silt loams.
Falaya silt loam.
Henshaw silt loam.
Newark silt loam.
Newark silty clay loam.
Wakeland silt loam.

These soils make up about 18.6 percent of the county. All are subject to flooding (fig. 10), though the Henshaw soil is flooded only infrequently. These soils are wet, but if adequately drained, they produce favorable yields of the suitable crops. Corn, soybeans, grain sorghum, Korean lespedeza, sudangrass, and other summer annuals are suitable. Most of the hay and pasture plants grown in the county are suitable also, except in areas where the flooding hazard is serious. Tobacco and alfalfa, because of wetness, are only fairly suitable.

Areas that are subject to lengthy overflow by the larger streams can only be used for summer annuals or a crop that is not affected by winter floods, such as pecan trees.

Water-tolerant plants, such as soybeans, can be grown profitably with only surface ditches draining the soils. Corn, however, and other plants that are adversely affected by wetness require a more satisfactory system of drainage. Erosion control practices are not needed, because these soils are level. Nevertheless, diversions can be used to intercept runoff that comes from the adjacent hills. The use of sod crops, cover crops, and crop residue help to maintain the content of organic matter. Soil tests should determine lime and fertilizer needs.

Capability unit IIw–5

This unit consists of dark-colored, very poorly drained soils on low terraces and bottom lands. These soils have a deep root zone, but in a wet season a high water table restricts root growth. These soils are medium or high in organic-matter content, are moderately high or high in natural fertility, and have a high or very high moisture-supplying capacity. Generally, they are nearly neutral in reaction. They are easy to till, but in a few areas they crust or clod to a slight degree when tilled. The soils are—

Dekoven silt loam.
Dekoven silty clay loam.
Patton silt loam.
Patton silt loam, overwash.
Patton silty clay loam.

These soils make up about 2.6 percent of the county. They are among the most productive soils in the county but are suited only to certain crops. Under high-level management that includes drainage, they produce favorable yields of corn, soybeans (fig. 11), grain sorghum, Korean lespedeza, and other summer annuals. Generally, yields of red clover, alsike clover, white clover, Kentucky 31 fescue, and timothy are favorable also, but these plants are damaged occasionally by floods. These soils are

Figure 10.—Flooded bottom land and low terraces near the mouth of the Green River. The soils are in capability unit IIw–4.

Figure 11.—Soybeans on Dekoven and Patton soils of the bottom lands. These soils are in capability unit IIw–5. If drained and otherwise well managed, they are well suited to soybeans and other row crops.

Figure 12.—An open ditch to reduce wetness on this field of class II soils.

poorly suited to alfalfa, sericea lespedeza, and other crops that grow well only in a deep, well-drained soil.

Wetness is the main limitation of these soils. Generally, both tile and surface drainage (fig. 12) are necessary for favorable crop yields. Erosion control practices are not needed. Areas that are damaged by runoff from the adjacent hills can be protected by diversion ditches. Streams occasionally overflow and flood some areas. Working crop residue into the soil will prevent soil drift and, at the same time, help maintain the supply of organic matter. Cover crops, where they will grow, can reduce leaching and can increase the supply of organic matter. Fertilizer should be applied in amounts determined by soil tests.

Capability unit IIs–3

This unit consists of deep, well drained and moderately well drained soils on bottom lands. These soils have somewhat unfavorable workability because of their moderately fine textured plow layer. This layer is slightly sticky and plastic when wet and hard when dry. These soils are moderately high or high in natural fertility, are nearly neutral in reaction, are medium in organic-matter content, and have a high moisture-supplying capacity. Water moves downward somewhat slowly but at a satisfactory rate. These soils are subject to flooding by the Ohio and Green Rivers. The soils are—

Egam silty clay loam.
Lindside silty clay loam.

These soils make up about 3.6 percent of the county. They are well suited to corn, soybeans, and grain sorghum. Yields generally are favorable if high-level management is applied. Yields of small grain, grasses, and legumes are good in areas not subject to flooding in winter and spring.

Generally, erosion is not a problem, but floodwaters scour some areas and deposit sediment in other areas. Trees or other woodland plants or Kentucky 31 fescue can reduce or prevent scouring, but little can be done to control deposition. Only the very sandy deposits, however, are considered harmful. Tile drainage generally helps to increase yields of row crops on the Lindside soil. Lime is not needed in most places, but fertilizer should be applied in amounts determined by soil tests. Soil structure and workability can be improved by increasing the content of organic matter.

Capability unit IIIe–2

This unit consists of sloping, well drained and moderately well drained soils on uplands and terraces. Some of the original surface layer of these soils has washed away. Consequently, their plow layer is a mixture of the remaining original surface layer and some former subsoil. The plow layer is easy to till and can be worked throughout a wide range of moisture content without crusting and clodding. The moisture-supplying capacity of these soils is moderately high to very high, the organic-matter content is low, natural fertility is moderate or moderately high, and the reaction is strongly acid. The response of crops to lime and fertilizer is good. Water and roots readily penetrate the deep soil material. The Loring and Zanesville soils, however, have a fragipan at a depth of about 28 to 32 inches. This fragipan impedes water and root penetration. The soils in this unit are—

Loring silt loam, 6 to 12 percent slopes, eroded.
Memphis silt loam, 6 to 12 percent slopes, eroded.
Uniontown silt loam, 6 to 12 percent slopes, eroded.
Wheeling silt loam, 6 to 12 percent slopes, eroded.
Zanesville silt loam, 6 to 12 percent slopes, eroded.

These soils make up about 5.5 percent of the county. They are suited to most of the locally grown crops. Under high-level management, they produce better than average yields of corn, tobacco, soybeans, small grain, alfalfa, orchardgrass, timothy, red clover, Kentucky 31 fescue, and the lespedezas. These soils are well suited to orchard crops. The Memphis soil, in a few built-up areas, has been graded or filled in.

Erosion is a hazard in cultivated areas. Contour cultivation, in addition to terraces or stripcropping, helps to reduce runoff and, at the same time, makes more intensive cultivation possible. Permanently sodding waterways prevents scouring of the channel. Sod crops used for hay or pasture are effective in controlling erosion if the sod is dense. Growing a cover crop and working crop residue into the soil add to the supply of organic matter and help to reduce leaching, in addition to preventing erosion. Lime and fertilizer are necessary for favorable crop yields and for an adequate vegetative cover. They should be applied in amounts determined by soil tests.

Capability unit IIIe–8

Grenada silt loam, 6 to 12 percent slopes, eroded, makes up this capability unit. It is a moderately well drained upland soil that has a compact layer, or fragipan, at a depth of about 20 inches. Roots and moisture readily penetrate the soil material down to the fragipan, but this layer restricts further penetration. This soil has a moderately high moisture-supplying capacity, but it is slightly droughty in a dry season because the root zone is so shallow. This soil is strongly acid and is moderately low in natural fertility.

This soil makes up about 0.3 percent of the county. It is suited to most of the commonly grown crops. Under a high level of management, it produces moderate yields of corn, soybeans, tobacco, Kentucky 31 fescue, timothy, red clover, Korean lespedeza, and white clover. Alfalfa is not suitable as a permanent meadow crop, because of the shallow root zone.

Erosion is a hazard in cultivated areas. Contour cultivation, in addition to terraces or stripcropping, helps to

reduce erosion and, at the same time, makes more intensive cultivation possible. Sod crops, included in the cropping system, and permanently grassed waterways also are effective in controlling erosion. Applying lime and fertilizer, growing a cover crop, and working crop residue into the soil are other practices that benefit this soil. Lime and fertilizer should be applied in amounts determined by soil tests.

Capability unit IIIe–12

This unit consists of deep, gently sloping, severely eroded soils. These soils are well drained and moderately well drained. They are very low in organic-matter content and moderately low in natural fertility. Most of the original surface layer has washed away, so the plow layer consists mainly of former subsoil. Because of its moderately fine texture, the plow layer clods or crusts when tilled. Generally, these soils are medium acid, but in a few of the most severely eroded places, underlying layers of alkaline material are exposed. The soils in this unit are—

Loring silty clay loam, 2 to 6 percent slopes, severely eroded.
Memphis silty clay loam, 2 to 6 percent slopes, severely eroded.
Uniontown silty clay loam, 2 to 6 percent slopes, severely eroded.

These soils make up about 1.4 percent of the county. Most of the local crops can be grown on these soils, and moderate yields can be obtained if a high level of management is used. Suitable crops include corn, Kentucky 31 fescue, soybeans, small grain, red clover, redtop, timothy, Korean lespedeza, alfalfa, and sweetclover. Orchard crops also are suitable.

Erosion is the main limitation of these soils. Conservation practices that help to control erosion include terraces, stripcropping, sodded waterways, contour cultivation, and sod crops as part of a cropping system. Minimum tillage, use of cover crops, and working crop residue into the soil, in addition to controlling erosion, help to increase yields and to conserve moisture. Lime and fertilizer should be applied in amounts determined by soil tests.

Capability unit IIIe–14

This unit consists of well drained and moderately well drained, gently sloping soils on terraces. Except in the few places where erosion has removed most of the original surface layer, these soils can be cultivated without crusting and clodding. They are low to moderate in organic-matter content, have a moderately high or high moisture-supplying capacity, and are strongly acid. Water moves slowly through the subsoil. The root zone is moderately deep, although the tight clay subsoil somewhat restricts root growth. The soils in this unit are—

Markland silt loam, 2 to 6 percent slopes.
Markland silty clay loam, 2 to 6 percent slopes, eroded.

These soils make up about 0.2 percent of the county. They produce satisfactory yields of soybeans, corn, Kentucky 31 fescue, Korean lespedeza, redtop, and timothy but produce moderately low yields of most of the other locally grown crops. Generally, they are poorly suited to high-value crops, such as tobacco and truck crops, and produce only fair yields of these crops. Some hardwoods grow on these soils.

Runoff is high during a rainy season, and erosion is a hazard in cultivated areas. Stripcropping is not feasible, because slopes generally are too short. Terracing and cultivating on the contour, however, help to control erosion. Use of cover crops and working crop residue into the soil help to maintain the supply of organic matter. Sod crops, in addition to preventing erosion, help to replenish the supply of organic matter. The need for fertilizer and lime can be determined by soil tests.

Capability unit IIIw–1

This unit consists of level to gently sloping, somewhat poorly drained soils on uplands and terraces. These soils have a compact, slowly permeable layer in the lower part of their subsoil. In a wet season they generally are saturated with water down to the compact layer. In a dry season, however, they are slightly droughty because of the shallow to moderately deep root zone. These soils are very friable and are easy to till. They do not clod or crust. They are strongly acid, low in content of organic matter, and moderate or moderately low in natural fertility. The soils are—

Calloway silt loam, 0 to 2 percent slopes.
Calloway silt loam, 2 to 6 percent slopes.
McGary silt loam.
Taft silt loam.
Weinbach silt loam.

These soils make up about 3.2 percent of the county. All but the Calloway soils are subject to infrequent flooding. Yields of suitable crops are low in an unusually wet or unusually dry season but are moderate in an average season. Suitable crops include corn, soybeans, grain sorghum, Kentucky 31 fescue, Ladino clover, redtop, timothy, and Korean lespedeza. Tobacco, alfalfa, sericea lespedeza, and other crops that have low tolerance to wetness are poorly suited.

Erosion generally is a minor limitation of these soils. Poor drainage and moderately low fertility are the main limitations. A tile drainage system generally does not effectively remove excess water from these soils, because water moves slowly through the lower part of the subsoil. Open ditches generally drain enough excess moisture from the soils that yields of all crops slightly tolerant of wetness are increased. Use of cover crops, working crop residue into the soil, and minimum tillage also help to increase yields. Lime and fertilizer should be applied in amounts determined by soil tests.

Capability unit IIIw–5

This unit consists of level, poorly drained soils on bottom lands. These soils have a deep root zone, but they also have a seasonal high water table. During wet seasons, usually in winter and spring, they are saturated with water. Furthermore, they are subject to flooding. When the water table is lowered, water moves through the soil material at a favorable rate. These soils range from neutral to strongly acid, have a high or very high moisture-supplying capacity, and are moderately low in natural fertility. Their content of organic matter is low. The soils are—

Birds silt loam.
Birds silty clay loam.
Melvin silt loam.
Melvin silty clay loam.
Waverly silt loam.

These soils make up about 5.6 percent of the county. If adequately drained, they can be cultivated intensively. Yields of corn, soybeans, grain sorghum, Kentucky 31 fescue, Ladino clover, Korean lespedeza, and alsike clover are better than average if a high level of management is applied. Without drainage, yields generally are low. The most frequently flooded areas are best suited to summer annuals and hardwood trees. Only water-tolerant crops are suitable for the soils in this unit.

Poor drainage is the main limitation of these soils, but either an open ditch system or a tile drainage system effectively removes excess water. Erosion is not a limitation, but floodwaters scour a few areas. A good stand of trees generally prevents scouring. Diversions intercept runoff away from those few areas that are adjacent to uplands. Cover crops also help to control runoff. Working crop residue into the soil prevents drifting by floodwaters. Soil tests should determine the need for lime and fertilizer.

Capability unit IIIw–6

This unit consists of level, very poorly drained soils on bottom lands. These soils are difficult to till, and they tend to crust or clod unless worked within a narrow range of moisture content. They have a deep or moderately deep root zone and have a high or moderately high moisture-supplying capacity. They are high in organic-matter content, are slightly acid or neutral, and are moderately high in natural fertility. Water moves slowly through the soil material. The soils in this unit are—

Sharkey silty clay.
Sharkey silty clay loam, overwash.

These soils make up about 1.3 percent of the county. They are suited to intensive cultivation. Under a high level of management, they produce better than average yields of corn, soybeans, red clover, Kentucky 31 fescue, and Korean lespedeza. These soils are not suited to crops that are not tolerant of wetness. Adapted hardwoods grow well in undrained areas.

Wetness is the main limitation of these soils. Generally, both an open ditch system and a tile drainage system are needed if these soils are used for agriculture. Main drains occasionally overflow their banks and flood the soils, but generally the flooding hazard is not serious enough to prevent the growing of perennials and cover crops. In some years, winter and spring floods damage crops. These soils, for the most part, do not need lime, and crop response to fertilizer is moderate. The need for lime and fertilizer can be determined by soil tests. Erosion is not a problem.

Capability unit IIIs–1

This unit consists of level to gently sloping, excessively drained, sandy soils on uplands and terraces. These soils have a moderately low moisture-supplying capacity, are low in organic-matter content, and are moderately low in natural fertility. They can be worked throughout an extremely wide range of moisture content. The root zone is deep, and water moves rapidly through the soil material. Power equipment is fairly difficult to operate on these soils because of the sandy texture. The soils in this unit are—

Bruno loamy fine sand, 0 to 4 percent slopes.
Lakin loamy fine sand, 2 to 6 percent slopes.

These soils make up about 0.8 percent of the county. They are suited to most of the locally grown crops. Under a high level of management, they produce moderate yields of corn, soybeans, grain sorghum, and summer annuals. The Bruno soil is subject to flooding in winter and spring, and the Lakin soil is subject to infrequent flooding. In areas that are not flooded, these soils are suited to small grain, Kentucky 31 fescue, orchardgrass, sweetclover, alfalfa, and sericea lespedeza. In a dry period, deep-rooted plants are damaged less than shallow-rooted plants by lack of moisture.

Erosion is a slight hazard on some of these soils, but practices, such as contour cultivation, terraces, stripcropping, and use of sod crops, are effective in controlling erosion. Some areas that are subject to scouring can be stabilized if planted to Kentucky 31 fescue, reed canarygrass, or hardwood trees. Areas subject to flooding generally do not need lime, and the response to fertilizer in these areas is fair or good. Frequent small applications of fertilizer are more beneficial than an occasional heavy application. The need for lime and fertilizer can be determined by soil tests.

Capability unit IVe–3

Zanesville silt loam, 12 to 20 percent slopes, eroded, makes up this unit. It is a moderately deep, well drained and moderately well drained soil on uplands. It is very strongly acid, is moderate in natural fertility, and has a moderately high moisture-supplying capacity. The plow layer is easy to till and can be worked throughout a wide range of moisture content without clodding or crusting. A compact layer, or fragipan, is in the lower part of the subsoil. Roots and water easily penetrate down to the fragipan, but this layer restricts further penetration.

This soil makes up about 0.2 percent of the county. It is suited to corn, tobacco, soybeans, Kentucky 31 fescue, redtop, timothy, Korean lespedeza, small grain, and sericea lespedeza. Yields are better than average, if high-level management is applied. Alfalfa (fig. 13), orchardgrass, alsike clover, Ladino clover, and Kobe lespedeza also can be grown, if high-level management is applied, but yields are only fairly good.

Erosion is a hazard on this soil. Such erosion control practices as contour cultivation, grassed waterways, use of sod crops in a cropping system dominated by row crops,

Figure 13.—Alfalfa, in the foreground, on class IV soils. The pasture in the background is on class IV soils. The corn is on class II soils.

return of crop residue to the soil, minimum tillage, and stripcropping are needed to prevent excessive soil loss. Permanent use of the soil for hay or pasture prevents excessive soil loss if a dense sod is maintained. The need for lime and fertilizer can be determined by soil tests.

Capability unit IVe-4

Wellston silt loam, 12 to 20 percent slopes, eroded, makes up this unit. It is a well-drained, moderately deep soil on uplands. It has a high moisture-supplying capacity, is low in organic-matter content, is moderate in natural fertility, and is strongly acid. It is very friable and, therefore, easy to till. Part of the original surface layer has washed away. The plow layer, consequently, is a mixture of the remaining original surface layer and some former subsoil.

This soil makes up about 0.3 percent of the county. Under high-level management, it produces better than average yields of corn, soybeans, tobacco, small grain, Kentucky 31 fescue, redtop, timothy, Korean lespedeza, and sericea lespedeza. It is less productive of alfalfa, orchardgrass, brome, alsike clover, Ladino clover, and Kobe lespedeza. Hardwood trees grow well on this soil.

Erosion is the main limitation in cultivated areas. A cropping system that includes sod crops for more than 2 consecutive years, along with such practices as stripcropping, sodded waterways, contour cultivation, use of cover crops, return of crop residue to the soil, and minimum tillage will reduce runoff and prevent excessive soil loss. Lime and fertilizer can be applied in amounts determined by soil tests.

Capability unit IVe-8

Markland silty clay loam, 6 to 12 percent slopes, eroded, makes up this unit. It is a well drained and moderately well drained soil on terraces. It has a fine-textured subsoil that impedes water movement and somewhat restricts root growth. The organic-matter content of this soil is low, natural fertility is moderately low, and the moisture-supplying capacity is moderately high. The plow layer clods or crusts somewhat if tilled when too wet.

This soil makes up about 0.1 percent of the county. It is suited to most of the locally grown crops. Under a high level of management, it produces moderate yields of corn, soybeans, Kentucky 31 fescue, redtop, timothy, Ladino clover, Korean lespedeza, and sweetclover.

Erosion is the main limitation of this soil. Practices, such as use of a sod crop in the cropping system, terraces, contour cultivation, sodded waterways, and minimum tillage, help to control erosion. Growing a cover crop or a sod crop and working crop residue into the soil, in addition to controlling erosion, help to increase the supply of organic matter. Lime and fertilizer can be applied in amounts determined by soil tests.

Capability unit IVe-9

This unit consists of well-drained, sloping, severely eroded soils on uplands and terraces. Gullies are scattered throughout the area, and the plow layer consists mostly of former subsoil. It tends to crust and clod when cultivated. The content of organic matter is very low, natural fertility is moderate or moderately low, the moisture-supplying capacity is high, and the reaction is strongly acid. Crops on these soils respond well to lime and fertilizer. The soils are—

Memphis silty clay loam, 6 to 12 percent slopes, severely eroded.
Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded.

These soils make up about 2.1 percent of the county. Under high-level management, they produce better than average yields of corn, tobacco, small grain, Kentucky 31 fescue, timothy, Korean lespedeza, and sericea lespedeza. They are less productive of alfalfa, Ladino clover, red clover, and orchardgrass.

Because of their moderately fine texture and very low organic-matter content, these soils are somewhat difficult to till. Their susceptibility to erosion, however, is the main limitation. A good growth of permanent hay or pasture effectively controls erosion and, at the same time, increases the supply of organic matter. Cultivated crops can be grown occasionally if erosion control practices are used. These practices include terraces, stripcropping, sodded waterways, contour cultivation, minimum tillage, use of cover crops, and return of crop residue to the soils. Erosion control practices not only help to reduce the erosion hazard but also make more intensive cultivation possible. A good fertilization program improves the vegetative cover and replenishes the supply of organic matter; it thereby helps in controlling erosion. The need for lime and fertilizer can be determined by soil tests.

Capability unit IVe-14

This unit consists of well drained and moderately well drained, sloping soils on uplands and terraces. The original surface layer of these soils has washed away, and the present plow layer is mostly former subsoil. Because of the high content of clay in the plow layer, these soils are slightly sticky and plastic when wet and are hard and cloddy when dry. Roots and moisture readily penetrate to a depth of about 20 inches; further penetration is restricted. These soils are very low in organic-matter content, are moderately low in natural fertility, and have a low to moderately high moisture-supplying capacity. Generally they are strongly acid. Crop response to fertilizer is fair. The soils in this unit are—

Grenada silt loam, 6 to 12 percent slopes, severely eroded.
Loring silty clay loam, 6 to 12 percent slopes, severely eroded.
Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded.
Wellston silty clay loam, 6 to 12 percent slopes, severely eroded.
Zanesville silt loam, 6 to 12 percent slopes, severely eroded.

These soils make up about 5.2 percent of the county. They produce moderate yields of corn, tobacco, small grain, Kentucky 31 fescue, redtop, timothy, Korean lespedeza, and sericea lespedeza. Because moisture conditions are not so favorable in summer, they produce low yields of hay and pasture plants that normally grow rapidly in summer.

Erosion is a hazard on these soils. A cropping system that includes a sod crop, if combined with one or more erosion control practices, such as terraces, stripcropping, sodded waterways, contour cultivation, or minimum tillage helps to control erosion. Growing a cover crop and work-

ing crop residue into the soil increase the supply of organic matter, decrease the hazard of erosion, and increase yields. Lime and fertilizer can be applied in amounts determined by soil tests.

Capability unit IVw–1

This unit consists of level, poorly drained soils on terraces. These soils are saturated with water during parts of the year and are droughty during a dry season. They have a compact layer, in the lower part of their subsoil, that restricts root growth and water movement. They are strongly acid, low in organic-matter content, and moderately low in natural fertility. They have a moderately low moisture-supplying capacity. Most of these soils are easy to work, but Ginat silty clay loam tends to crust and clod if cultivated when wet. The soils in this unit are—

Ginat silt loam.
Ginat silty clay loam.
Robertsville silt loam.

These soils make up about 3.5 percent of the county. They are suited to soybeans, grain sorghum, Kentucky 31 fescue, redtop, timothy, Ladino clover, Korean lespedeza, and alsike clover. Yields are moderate if high-level management is applied. Yields of corn and other crops that grow well only in a well-drained soil generally are poor or fair. A few areas that are subject to ponding or flooding are best used for hardwood trees.

Generally, these soils need to be drained for satisfactory growth of crops. In some areas, however, drainage outlets are not available. Draining these soils is more expensive than draining soils on the bottom lands, because of the slow lateral movement of water and the need for close spacing of drains. Therefore, a tile drainage system is of questionable value. Substantial amounts of fertilizer are necessary for good yields of all crops. The amounts of lime and fertilizer that are needed can be determined by soil tests. Management practices that increase the supply of organic matter also increase yields and improve workability. Erosion is not a problem on these soils.

Capability unit IVs–2

Bruno loamy fine sand, 4 to 10 percent slopes, makes up this unit. It is an excessively drained soil occupying the sides of sloughs on the bottom lands of the Ohio River. It is flooded occasionally by the river. The moisture-supplying capacity of this soil is low. Water moves downward rapidly through the deep root zone. The content of organic matter is low, and natural fertility is moderately low. This soil is loose, and poor traction makes the operation of power equipment difficult.

This soil makes up about 0.1 percent of the county. It is suited to sweetclover. Moderate yields of corn and soybeans are possible if high-level management is applied. A few areas are infested with johnsongrass, which competes with desirable plants and reduces yields of these plants. Areas that are subject to flooding can be stabilized if they are planted to Kentucky 31 fescue or to hardwood trees.

Erosion is a moderate hazard on this soil. Flooding also is a hazard, though most floods occur before summer annuals are planted. The floods generally leave sediment in the areas that they cover. These areas can be cultivated if the rotation is short. Furthermore, contour cultivation and proper utilization of crop residue are necessary. If crop residue is worked into the soil in fall, generally it will not be washed away by floodwaters in winter and spring.

Capability unit VIe–1

This unit consists of deep and moderately deep, well drained and moderately well drained soils on uplands and terraces. These soils are strongly sloping and moderately steep, and most are only slightly eroded. These soils are easy to till. They have a moderately high to very high moisture-supplying capacity. They are strongly acid, moderately low to moderately high in natural fertility, and medium in content of organic matter. The soils are—

Gilpin-Wellston silt loams, 20 to 30 percent slopes.
Markland soils, 12 to 35 percent slopes.
Memphis silt loam, 20 to 30 percent slopes.
Uniontown soils, 12 to 35 percent slopes.
Wheeling soils, 12 to 30 percent slopes.

These soils make up about 1 percent of the county. They are suited to permanent hay, pasture, and trees. Most of the locally grown grasses and legumes, including Kentucky 31 fescue, Korean lespedeza, alsike clover, Ladino clover, sericea lespedeza, and redtop, can be grown on these soils. Orchardgrass, red clover, Kobe lespedeza, and alfalfa, require high-level management. Yields of hay and pasture are better in spring than in summer because of the more favorable moisture condition in spring.

Because of the hazard of erosion, row crops should not be grown on these soils. Permanent hay or pasture is best. Erosion can be reduced by tilling and reseeding on the contour, and by permanently sodding waterways. On the long slopes, sod crops should be seeded in strips on the contour. Liberal applications of fertilizer are needed for good yields and for a good vegetative cover. Amounts of lime and fertilizer that are needed can best be determined by soil tests. Generally, erosion is not a hazard in wooded areas.

Capability unit VIe–2

This unit consists of strongly sloping, well drained and moderately well drained soils on uplands. These soils are severely eroded. Most of the original surface layer has washed away. Consequently, the present surface layer consists mainly of former subsoil. Some areas are gullied. These soils have a deep or moderately deep root zone. They tend to clod or crust when cultivated. They are strongly acid, have a moderately low to high moisture-supplying capacity, and are moderately low in natural fertility. Their content of organic matter is very low. The soils are—

Loring silty clay loam, 12 to 20 percent slopes, severely eroded.
Memphis silty clay loam, 12 to 25 percent slopes, severely eroded.
Wellston silty clay loam, 12 to 20 percent slopes, severely eroded.

These soils make up about 2.7 percent of the county. They are suited to most of the locally grown sod crops, including Kentucky 31 fescue, Ladino clover, alsike clover, Korean lespedeza, redtop, timothy, sericea lespedeza, and alfalfa. Yields are fair or good if a high level of manage-

ment is used. Broomsedge and trees generally grow naturally in abandoned areas.

Because of the hazard of erosion, permanent hay or pasture is a better use for these soils than cultivated crops. Sod crops, in addition to controlling erosion, help to replenish the supply of organic matter. Under good management, the grasses seldom need reseeding. Management practices that help maintain a good vegetative cover and produce good quality hay and pasture include grazing control, weed control, and proper fertilization. Need for lime and fertilizer can be determined by soil tests. Erosion can be reduced on the long slopes by seeding sod crops in strips on the contour in successive years.

Capability unit VIe–3

This unit consists of deep, well drained and moderately well drained, severely eroded soils. The Markland soil is sloping and occurs on terraces. It is difficult to work because of its fine texture. The Zanesville soil is strongly sloping and occurs on uplands. It is easy to work. Both soils have a moderately low moisture-supplying capacity, are very low in organic-matter content, and are strongly acid. A few gullies are scattered in the area. The soils in this unit are—

Markland silty clay, 6 to 12 percent slopes, severely eroded.
Zanesville silt loam, 12 to 20 percent slopes, severely eroded.

These soils make up about 0.6 percent of the county. They are suited to Kentucky 31 fescue, redtop, timothy, alsike clover, Ladino clover, Korean lespedeza, and sericea lespedeza. Yields are fair if high-level management is used.

Because of the erosion hazard, there will be soil loss if these soils are cultivated, so permanent pasture is best. Fairly good yields of permanent pasture can be expected for several years without reseeding if specific management practices are applied. These practices include grazing control, weed control, and proper fertilization. Erosion can be controlled in areas of pasture by seeding the sod crops in strips on the contour in alternate years.

Capability unit VIe–7

This unit consists of strongly sloping, well drained and moderately well drained soils of the loess uplands. These soils have lost part of their original topsoil through erosion, and consequently the present plow layer is a mixture of the remaining topsoil and some former subsoil. The Memphis soil has a deep root zone and a very high moisture-supplying capacity. The Loring soil has a moderately deep root zone and a high moisture-supplying capacity. Both soils are low in organic-matter content, are moderate in natural fertility, and are strongly acid. They can be cultivated throughout a moderately wide range of moisture content without clodding or crusting. The soils are—

Loring silt loam, 12 to 20 percent slopes, eroded.
Memphis silt loam, 12 to 20 percent slopes, eroded.

These soils make up about 0.5 percent of the county. They are suited to Kentucky 31 fescue, Korean lespedeza, timothy, sericea lespedeza, Ladino clover, redtop and alsike clover. Under a high level of management, they are suited to alfalfa, orchardgrass, red clover, Kobe lespedeza, and orchard crops.

Because of their susceptibility to erosion, these soils should not be used for row crops. Permanent pasture is a better use. Management practices, such as grazing control, weed control, and adequate fertilization, help in maintaining a good vegetative cover and thereby help in controlling erosion. When reseeding or renovating pastures, tilling on the contour helps to control erosion. On the long slopes, sod crops should be seeded in strips on the contour.

Capability unit VIIe–1

Memphis silt loam, 30 to 50 percent slopes, makes up this unit. It is a deep, well-drained soil on uplands. It has a high moisture-supplying capacity, is moderate in natural fertility, is medium in organic-matter content, and is strongly acid. The plow layer is very friable and can be tilled without clodding or crusting.

This soil makes up about 0.3 percent of the county. Most of the acreage is wooded and has not been cultivated. Crops than can be grown on this soil include Kentucky 31 fescue, bermudagrass, sweetclover, and sericea lespedeza.

Because of the erosion hazard, this soil is not suitable for cultivation. Some areas can be used for pasture without excessive soil loss, provided a dense sod is maintained. Grazing control, weed control, and use of lime and fertilizer help in maintaining a dense sod. Farm machinery, at best, is difficult to operate because most areas are steep. The mowing of brush and weeds, consequently, is a problem. In some areas, a hand scythe or chemicals need to be used. In some places, lime, fertilizer, and seed have to be spread using hand equipment. Growing trees is the best use for most of this soil.

Capability unit VIIe–2

This unit consists of Litz-Muskingum silt loams, 30 to 50 percent slopes. These are shallow to moderately deep, somewhat excessively drained soils on uplands. They are medium in content of organic matter, are moderately low in natural fertility, and are strongly acid. The moisture-supplying capacity is moderately low. Root penetration is retarded by weathered sandstone at a depth that ranges from 15 to 36 inches.

These soils make up about 0.1 percent of the county. They are well suited to trees. Bermudagrass, Kentucky 31 fescue, redtop, and sericea lespedeza can be grown, but they require a high level of management.

Erosion is a hazard on these soils, even though most areas are wooded and are uneroded. If these soils are used for pasture, care has to be taken to prevent overgrazing. Machinery operation is difficult or impossible because of the steep slopes. In many areas hand equipment has to be used to control weeds and to spread lime, fertilizer, and seed.

Capability unit VIIe–4

Gullied land makes up this unit. It consists of areas so severely gullied or so severely eroded by sheet erosion that the original soil material is not recognizable. The gullies cover more than 20 percent of the areas. These areas may occur on any slope but are dominantly strongly sloping and moderately steep. Small spots between gullies may be only slightly eroded. The moisture-supplying capacity,

the organic-matter content, and natural fertility vary in these areas but generally are moderate or low.

This land type makes up about 0.4 percent of the county. Because the gullies are so deep and numerous, cultivation of this land type is impractical. If graded and smoothed, some areas can be used for hay or pasture. Suitable grasses and legumes include Kentucky 31 fescue, bermudagrass, redtop, sericea lespedeza, and kudzu. Sweetclover grows well in alkaline places.

Areas that are smoothed and seeded to grasses and legumes require careful management in establishing and maintaining a sod. Liberal applications of lime, fertilizer, barnyard manure, and mulch are desirable. Areas that are not graded and smoothed can be stabilized if planted to sericea lespedeza or kudzu, and seedbed preparation is not necessary if these areas are not grazed.

Trees can grow between the gullies and in places in and below the gullies, where silt has been deposited. Gullied areas can be stabilized in a shorter period with sericea lespedeza or kudzu than with trees.

Capability unit VIIw-1

This unit consists of areas that are unsuitable for agriculture because of excess water. These areas are called miscellaneous land types, for they have little or no natural soil material. They are—

Breaks and Alluvial land.
Riverwash.
Swamp.

These land types make up about 1.8 percent of the county. Swamps are covered by shallow water most of the time. Drainage outlets generally are not available, so drainage is not possible or is not feasible. Riverwash consists of sandbars and other low-lying areas along the Ohio River. Areas of Riverwash are frequently covered by floodwaters and are constantly shifting. Breaks and Alluvial land, for the most part, consists of unstabilized areas on steep slopes along the rivers.

Cypress trees and buck bushes are growing in most areas of Swamp, and apparently other types of vegetation are not suitable. Most areas of Breaks and Alluvial land and of Riverwash are supporting brushy or low-grade hardwood trees.

Stable areas generally vegetate naturally. The low-lying areas that are continually shifting do not justify any management effort to establish or maintain trees. Some areas can produce marketable timber products and, therefore, a low level of management is justified. Areas on the riverbank and some sandbars are suitable for fishing and for camp sites during periods of low water. Swamps are restocked with fish by floodwaters from the Ohio River. Possibly, they can be developed as fishing and wild-duck hunting areas.

Unclassified

Made land, a miscellaneous land type, was not classified, because conditions for plant growth vary from area to area. Therefore, no general suggestions for use, treatment, or suitability could be made.

Areas of Made land have been graded, filled, or otherwise altered to the extent that the material in these areas cannot be classified as a soil. Made land makes up about 0.1 percent of the county.

Estimated Yields

Table 2 gives the estimated average acre yields of the principal field and pasture crops grown in Henderson County under high-level management. It gives yields for each soil in the county but not for the land types—Breaks and Alluvial land, Gullied land, Made land, Riverwash, and Swamp. These land types generally are not suited to crops or pasture without extensive reclamation, and yields would depend on the nature of the soil material and on its location.

The estimates in table 2 are based on the information obtained from farmers in the county, the observations by members of the soil survey party, the data on soil properties that affect crop growth, the research material on yields of the same crops on similar soils, and the recorded crop yields. These estimates apply to soils that had not been irrigated and that had received an average amount of rainfall over a long period of time. Because the frequency of flooding varies as does the amount of damage resulting, flooding was not taken into consideration in estimating the yields.

The yields given in table 2, though not the maximum obtainable, are those that can be expected if improved management practices are applied. These practices are—

1. Choosing well-suited varieties for planting.
2. Using the proper amount of seed or the proper number of plants; and seeding, planting, and harvesting at the proper time and according to approved methods.
3. Controlling weeds, insects, and plant diseases.
4. Applying fertilizer in amounts equal to or in excess of the need shown by soil tests that are properly interpreted.
5. Applying adequate amounts of lime, where needed.
6. Reducing excess water in wet soils by means of open ditches or tile drains.
7. Selecting crops and cropping systems that return organic residue to the soils and thus add to the supply of organic matter, that maintain or improve the structure of the soils, and that help to control erosion.
8. Controlling runoff by means of grassed waterways and diversion ditches, terraces, contour tillage, and stripcropping.
9. Using good pasture management.

TABLE 2.—*Estimated average acre yields of principal crops under defined management*

[Absence of figure indicates the crop is not suitable for the soil or is not commonly grown]

Soil	Corn	Wheat	Soybeans	Tobacco	Hay				Pasture [1]
					Alfalfa and grass	Red clover and grass		Korean lespedeza	
						1st year	2d year		
	Bu.	*Bu.*	*Bu.*	*Lb.*	*Tons*	*Tons*	*Tons*	*Tons*	*Animal-unit-days* [2]
Adler silt loam	98	35	35	2,020	3.6	1.1	3.0	2.0	191
Ashton silt loam	101	------	35	--------	4.0	1.1	3.0	2.1	--------
Birds silt loam	71	------	31	--------	--------	.7	1.9	1.9	162
Birds silty clay loam	66	------	30	--------	--------	.6	1.6	1.9	158
Bruno loamy fine sand, 0 to 4 percent slopes	46	------	25	--------	2.0	.7	1.8	1.1	--------
Bruno loamy fine sand, 4 to 10 percent slopes	41	------	22	--------	2.0	.6	1.7	1.0	--------
Calloway silt loam, 0 to 2 percent slopes	50	15	20	1,510	--------	------	------	1.6	147
Calloway silt loam, 2 to 6 percent slopes	50	15	20	1,540	--------	------	------	1.7	148
Captina silt loam, 0 to 2 percent slopes	82	32	34	1,940	2.5	1.1	2.8	2.0	175
Captina silt loam, 2 to 6 percent slopes	82	32	32	1,980	2.5	1.1	2.8	2.0	170
Collins silt loam	92	33	38	1,890	3.4	------	------	2.0	189
Dekoven silt loam	97	32	37	--------	--------	1.1	2.8	2.0	174
Dekoven silty clay loam	94	26	31	--------	--------	1.0	2.7	2.0	167
Dekoven and Wakeland silt loams	97	31	34	--------	--------	1.1	2.8	2.0	174
Egam silt loam	95	------	37	--------	--------	1.1	2.8	--------	--------
Egam silty clay loam	92	------	35	--------	--------	1.0	2.6	--------	--------
Elk silt loam, 0 to 2 percent slopes	101	38	34	2,180	4.0	1.1	3.0	2.0	191
Elk silt loam, 2 to 6 percent slopes	99	38	34	2,200	3.9	1.1	3.0	2.0	186
Falaya silt loam	82	32	34	1,780	--------	1.1	2.8	2.0	178
Gilpin-Wellston silt loams, 20 to 30 percent slopes	------	------	------	--------	2.9	1.0	2.7	1.6	145
Ginat silt loam	38	------	18	--------	--------	------	------	1.6	144
Ginat silty clay loam	35	------	15	--------	--------	------	------	1.5	133
Grenada silt loam, 0 to 2 percent slopes	72	27	32	1,820	2.4	1.0	2.7	2.0	167
Grenada silt loam, 2 to 6 percent slopes	71	28	30	1,790	2.5	1.1	2.8	2.0	168
Grenada silt loam, 2 to 6 percent slopes, eroded	67	24	25	--------	2.1	.9	2.5	2.0	150
Grenada silt loam, 6 to 12 percent slopes, eroded	59	22	23	--------	2.0	.9	2.3	1.9	142
Grenada silt loam, 6 to 12 percent slopes, severely eroded	------	------	------	--------	--------	.7	1.8	1.6	106
Henshaw silt loam	77	28	33	1,740	--------	.7	1.8	1.7	161
Huntington fine sandy loam, 0 to 4 percent slopes	94	------	39	--------	--------	1.1	3.0	1.8	170
Huntington silt loam, 0 to 4 percent slopes	109	------	44	--------	--------	1.1	3.0	2.0	194
Huntington silt loam, 4 to 16 percent slopes	107	------	42	--------	--------	1.1	3.0	2.0	186
Lakin loamy fine sand, 2 to 6 percent slopes	54	21	18	--------	2.5	.7	1.9	1.1	102
Lindside silt loam	98	------	36	--------	--------	1.1	3.0	2.0	193
Lindside silty clay loam	91	------	31	--------	--------	1.1	3.0	2.0	189
Litz-Muskingum silt loams, 30 to 50 percent slopes	------	------	------	--------	--------	------	------	--------	99
Loring silt loam, 0 to 2 percent slopes	87	34	29	1,950	3.1	1.1	3.0	1.9	181
Loring silt loam, 2 to 6 percent slopes	87	35	28	1,990	3.2	1.1	2.9	1.9	176
Loring silt loam, 2 to 6 percent slopes, eroded	81	29	24	1,830	2.9	1.0	2.6	1.7	164
Loring silty clay loam, 2 to 6 percent slopes, severely eroded	59	18	18	1,540	2.3	.8	2.1	1.4	133
Loring silt loam, 6 to 12 percent slopes, eroded	78	27	23	1,680	2.7	.9	2.5	1.7	160
Loring silty clay loam, 6 to 12 percent slopes, severely eroded	58	17	17	1,420	2.2	.8	2.0	1.3	128
Loring silt loam, 12 to 20 percent slopes, eroded	------	25	------	--------	2.7	.9	2.4	1.6	152
Loring silty clay loam, 12 to 20 percent slopes, severely eroded	------	16	------	--------	2.1	.7	1.9	1.3	126
Markland silt loam, 2 to 6 percent slopes	66	21	29	--------	--------	.8	2.2	1.9	158
Markland silty clay loam, 2 to 6 percent slopes, eroded	56	17	24	--------	--------	.7	1.9	1.7	143
Markland silty clay loam, 6 to 12 percent slopes eroded	55	16	19	--------	--------	.7	1.8	1.7	137
Markland silty clay, 6 to 12 percent slopes, severely eroded	------	------	------	--------	--------	.5	1.3	1.2	99
Markland soils, 12 to 35 percent slopes	------	------	------	--------	--------	------	------	1.6	136
McGary silt loam	48	------	19	--------	--------	.8	1.95	1.4	151
Melvin silt loam	74	------	32	--------	--------	------	------	1.8	172
Melvin silty clay loam	69	------	28	--------	--------	------	------	1.8	163
Memphis silt loam, 2 to 6 percent slopes	87	35	29	1,990	3.9	1.1	3.0	2.0	182
Memphis silt loam, 2 to 6 percent slopes, eroded	81	30	28	1,830	3.6	1.1	2.8	2.0	173
Memphis silty clay loam, 2 to 6 percent slopes, severely eroded	61	19	25	1,580	3.0	.9	2.3	1.6	148
Memphis silt loam, 6 to 12 percent slopes, eroded	79	28	24	1,690	3.4	1.0	2.7	1.9	166
Memphis silty clay loam, 6 to12 percent slopes, severely eroded	59	18	19	1,490	2.9	.8	2.2	1.6	142
Memphis silt loam, 12 to 20 percent slopes, eroded	------	25	------	--------	3.3	1.0	2.6	1.9	161
Memphis silty clay loam, 12 to 25 percent slopes, severely eroded	------	------	------	--------	2.8	.8	2.1	1.6	137
Memphis silt loam, 20 to 30 percent slopes	------	------	------	--------	3.3	1.0	2.7	1.9	164
Memphis silt loam, 30 to 50 percent slopes	------	------	------	--------	--------	------	------	--------	152
Morganfield silt loam	72	27	28	1,680	2.0	1.0	3.0	1.7	163
Newark silt loam	89	32	33	--------	--------	.9	2.5	1.8	186
Newark silty clay loam	84	26	32	--------	--------	.9	2.4	1.7	181

See footnotes at end of table.

TABLE 2.—*Estimated average acre yields of principal crops under defined management*—Continued

Soil	Corn	Wheat	Soybeans	Tobacco	Hay				Pasture [1]
					Alfalfa and grass	Red clover and grass		Korean lespedeza	
						1st year	2d year		
	Bu.	*Bu.*	*Bu.*	*Lbs.*	*Tons*	*Tons*	*Tons*	*Tons*	*Animal-unit-days* [2]
Patton silt loam	91	34	36		3.5	0.7	1.9	2.0	179
Patton silt loam, overwash	91	34	36		3.2	.7	1.9	2.0	179
Patton silty clay loam	89	29	35		3.5	.7	1.9	2.0	174
Robertsville silt loam	41		23					1.7	148
Sciotoville fine sandy loam, 0 to 2 percent slopes	73	26	24	1,790	2.2	.9	2.3	1.7	147
Sciotoville fine sandy loam, 2 to 6 percent slopes	70	25	22	1,780	2.2	.9	2.3	1.6	144
Sciotoville silt loam, 0 to 2 percent slopes	79	29	33	1,900	2.3	1.0	2.6	2.0	168
Sciotoville silt loam, 2 to 6 percent slopes	79	28	31	1,900	2.5	1.0	2.7	2.0	171
Sciotoville silt loam, 2 to 6 percent slopes, eroded	71	23	26	1,790	2.2	.9	2.5	1.9	159
Sequatchie loam, 0 to 2 percent slopes	81	34	29	1,760	3.3	1.1	3.0	1.9	164
Sequatchie loam, 2 to 6 percent slopes	81	32	28	1,750	3.3	1.1	3.0	1.9	162
Sharkey silty clay	82		31			1.1	3.0	1.9	164
Sharkey silty clay loam, overwash	82		31			1.1	3.0	1.9	164
Taft silt loam	59		19					1.7	154
Uniontown silt loam, 0 to 2 percent slopes	84	29	31	1,970	3.4	1.1	3.0	2.0	184
Uniontown silt loam, 2 to 6 percent slopes	82	31	31	1,990	3.5	1.1	3.0	2.0	181
Uniontown silt loam, 2 to 6 percent slopes, eroded	73	26	27	1,750	3.2	1.1	2.9	1.9	168
Uniontown silty clay loam, 2 to 6 percent slopes, severely eroded	58	20	21		2.6	.8	2.3	1.5	133
Uniontown silt loam, 6 to 12 percent slopes, eroded	69	24	21		3.1	1.0	2.7	1.8	157
Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded	51	19	17		2.5	.8	2.2	1.5	131
Uniontown soils, 12 to 35 percent slopes								1.6	141
Wakeland silt loam	87	32	35	1,740		1.1	2.9	1.9	181
Waverly silt loam	73	17	27			.7	1.9	1.7	174
Weinbach silt loam	57	16	22					1.7	156
Wellston silty clay loam, 6 to 12 percent slopes, severely eroded	48	17	16			.8	2.2	1.3	129
Wellston silt loam, 12 to 20 percent slopes, eroded	57	17	16			1.0	2.6	1.3	129
Wellston silty clay loam, 12 to 20 percent slopes, severely eroded		15				.8	2.1	1.3	117
Wheeling silt loam, 0 to 2 percent slopes	96	41	36	2,200	4.0	1.1	3.0	2.0	191
Wheeling silt loam, 2 to 6 percent slopes	96	40	35	2,120	3.9	1.1	3.0	2.0	188
Wheeling silt loam, 2 to 6 percent slopes, eroded	86	34	29	2,030	3.6	1.1	3.0	2.0	181
Wheeling silt loam, 6 to 12 percent slopes, eroded	82	34	29	1,880	3.4	1.1	3.0	1.9	174
Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded	61	23	18	1,720	2.9	1.0	2.6	1.6	146
Wheeling soils, 12 to 30 percent slopes					3.2	1.0	2.9	1.8	157
Zanesville silt loam, 6 to 12 percent slopes, eroded	68	26	21	1,660	2.5	1.1	2.8	1.6	158
Zanesville silt loam, 6 to 12 percent slopes, severely eroded	47	20	15	1,460	2.0	.9	2.3	1.5	131
Zanesville silt loam, 12 to 20 percent slopes, eroded		21			2.4	1.0	2.7	1.6	152
Zanesville silt loam, 12 to 20 percent slopes, severely eroded		14			1.9	.8	2.2	1.3	129

[1] Kentucky 31 fescue, grown with a legume, such as Ladino clover, white clover, or Korean lespedeza, is considered good pasture.

[2] An animal-unit-day represents a day of grazing for one animal unit (one cow, steer, or horse; five hogs; or seven sheep or goats) without injury to the pasture.

Use of the Soils for Woodland [1]

Wooded areas in Henderson County, at the time of settlement, consisted of fair- to top-quality hardwoods. Stands of yellow-poplar, gum, cottonwood, oak, maple, ash, walnut, and cherry covered lowlands and plateaus; cypress and silver maple grew in some of the swamps; and low-quality oak and hickory were common on the steeper slopes. Pecan trees were scattered throughout the county.

As a result of land clearing, logging, and forest fires, the quantity and quality of the timber have steadily decreased. At present, only about 15 percent of the county is wooded. The large tracts are confined to the lowlands and the steep uplands; small woodlots are in sloping or gently sloping areas. All woodland is privately owned and is receiving practically no management.

Most of the soils in the county are suited to trees, but little attention is directed toward timber production because the economy is based mainly on cultivated crops, pasture, hay crops, oil, and coal. Nevertheless, good markets exist for top-quality oak, walnut, and cherry logs, all of which are suitable for flooring, veneer, furniture, and

[1] By WILLIAM M. MORRILL, woodland conservationist, Soil Conservation Service, in collaboration with E. V. HUFFMAN, assistant State soil scientist, Soil Conservation Service.

stave bolts. About 60 percent of the timber cut in the county is used for making crates and pallets. Rough lumber also is processed.

There is no recent history of epidemic attacks by insects or of diseases that have destroyed forest stands.

Woodland Suitability Groups

Management of woodland can be planned more effectively if soils are grouped according to those characteristics that affect tree growth. To this end, the soils of Henderson County have been placed in 12 woodland suitability groups. Each group consists of soils that are suited to the same kinds of trees, that need the same management, and that have about the same potential productivity. The woodland suitability groups are listed in table 3 and are discussed in this section.

The factors considered in placing each soil in a woodland group include (1) potential productivity for several kinds of trees, (2) species to favor in managing existing woodland, (3) species preferred for planting, and (4) critical soil-related hazards and limitations to be considered in woodland management. These factors are explained in the pages that follow.

Potential productivity indicates the amount of wood crops a soil can produce under a specified level of management. In table 3, potential productivity for given tree species is expressed as a site index. A site index is the average height of dominant trees (the tallest trees in the stand) at age 30 for cottonwood and age 50 for other species. Foresters accept a site index as the best readily available indicator of potential productivity of a soil.

For each of the tree species listed in table 3, the site index was determined after on-site measurement and, except for yellow-poplar and redcedar, with the help of published site index curves (*3*, *4*, *13*, *15*, *19*).[2] The curves used to help determine the site index for yellow-poplar are unpublished ones that were constructed in 1957 by W. T. Doolittle of the U.S. Forest Service. Those used for redcedar are based on observations of plots in 1948 by the Tennessee Valley Authority. Data on the sites that were studied are available in the State office of the Soil Conservation Service.

For some species, sites suitable for measurement could not be found on all kinds of soil. In such instances, a site index was interpolated by using data on site index for similar soils.

A site index for a given species at a given site commonly reflects the potential productivity of other species at the same site. Nevertheless, such assumptions are best made on the basis of experience and local information.

A site index can be converted to a volumetric prediction of growth and yield, and the prediction can be shown in different common units of wood measurement, such as board feet. Predictions of average yearly growth per acre are given in table 3 for cottonwood, sweetgum, pin oak, upland oak, Shumard oak, and yellow-poplar. To arrive at these predictions, site index values were related to published research material (*10*, *13*) and to tree-growth data developed by the Soil Conservation Service from on-site evaluations.

Species to favor in managing existing woodland are listed in table 3 from top to bottom in decreasing order of desirability. Site index, quality of tree, and density of growth in natural stands determine desirability, or priority. The species listed are those to favor in weeding, improvement cutting, harvest cutting, and similar woodland management.

Species preferred for planting also are listed in table 3. The listing is based on experience.

Soil-related hazards and limitations to be considered in woodland management are erosion hazard, equipment limitations, plant competition, and seedling mortality. These also are given, where applicable, in table 3.

The hazard of erosion is rated according to the risk of erosion on woodland not protected by special practices but otherwise well managed. Generally, the hazard is rated *slight* on slopes of 0 to 6 percent, *moderate* on slopes of 6 to 12 percent, and *severe* on slopes greater than 12 percent. These ratings are modified when the factors of slope length and soil characteristics, or both, emphasize or minimize the factor of slope. Erosion of woodland can be minimized by adjusting the rotation age and cutting cycles and by properly constructing and maintaining roads, trails, and landings.

Steep slopes, wetness of the soils, texture of the surface layer, rough terrain, and rocks or other obstacles restrict the use of conventional equipment for harvesting and planting wood crops, for constructing roads, for controlling fires, and for destroying unwanted vegetation. Furthermore, different soils may require different kinds of equipment or special methods of operation or may be unsuitable for machine use at different seasons.

The equipment limitation is *slight* if there are only slight restrictions or no restrictions on the type of equipment that can be used or on the time of year that the equipment can be used. It is *moderate* if slope, rocks or other obstacles, seasonal wetness, or other soil characteristics restrict the use of equipment, or if tree roots are damaged to some extent by the use of equipment. The limitation is *severe* if special equipment is required for woodland operations; if the use of such equipment is severely restricted by slope, rocks, seasonal wetness, or other soil characteristics; and if the use of such equipment severely damages tree roots.

Following the removal of the tree canopy, some undesirable trees, vines, shrubs, and other plants may invade the site and hinder the establishment and growth of desirable trees.

Competition from unwanted plants is *slight* if no special measures are needed to control the invaders, for they will not impede the normal development of the desirable naturally occurring trees or planted trees. Competition is *moderate* if the invaders delay and somewhat hinder the establishment of a fully stocked stand. It is *severe* if the invaders prevent the development of a fully stocked stand unless the site is carefully prepared for planting and special management practices are put to use.

The ratings for seedling mortality refer to the expected loss of naturally occurring or planted seedlings as a result of unfavorable soil characteristics or topographic features,

[2] Italic numbers in parentheses refer in Literature Cited, page 106.

not as a result of plant competition. The ratings reflect the percentage of seedlings lost out of the number needed to adequately restock an area.

Seedling mortality is *slight* if the loss is less than 25 percent. It is *moderate* if the loss is between 25 and 50 percent. The mortality is *severe* if more than 50 percent of the seedlings die. Where mortality is severe, it is necessary to do much replanting, to prepare special seedbeds, and to use superior planting techniques.

Woodland suitability group 1

This group consists of sandy soils on flood plains and on terrace benches. These soils are —

Bruno loamy fine sand, 0 to 4 percent slopes (BrA).
Bruno loamy fine sand, 4 to 10 percent slopes (BrC).
Lakin loamy fine sand, 2 to 6 percent slopes (LoB).

The potential productivity of these soils for cottonwood trees is fair. Therefore only a medium level of management is justified.

Equipment limitations are moderate, especially on Bruno soils, because they are flooded 2 or 3 months out of the year.

Plant competition is moderate because sufficient moisture for growth is available to plants early in the growing season. The competing vegetation, mostly herbaceous plants, ordinarily does not prevent desirable trees from establishing themselves, but it hinders initial growth and delays the development of a fully stocked stand.

Seedling mortality is moderate. In spring, droughts lasting 3 weeks cause moderate loss of newly germinated or newly planted cottonwood seedlings.

Woodland suitability group 2

This group consists of well drained and moderately well drained silty soils on flood plains. These soils are—

Adler silt loam (Ad).
Collins silt loam (Co).
Egam silt loam (Eg).
Egam silty clay loam (Ec).
Huntington fine sandy loam, 0 to 4 percent slopes (HnA).
Huntington silt loam, 0 to 4 percent slopes (HsA).
Huntington silt loam, 4 to 16 percent slopes (HsC).
Lindside silt loam (Ld).
Lindside silty clay loam (Le).
Morganfield silt loam (Mr).

Most of these soils are subject to overflow during a period of 2 or 3 months every winter. Nevertheless, the potential productivity of these soils is high for cottonwood, sweetgum, pin oak, yellow-poplar, and upland oak. Yellow-poplar and upland oak grow rapidly on the soils that are not flooded frequently or that are not flooded for long periods. Intensive management is justified.

Equipment limitations are moderate because of the hazard of overflow.

Plant competition is severe because of the abundant moisture available during the growing season. Shade-tolerant trees of low quality establish themselves in the understory of saw-log stands and prevent the satisfactory reestablishment of desirable trees unless the site is weeded intensively. Interplanting or conversion planting generally is not feasible, because competition from undesirable trees is severe. Trees planted in open fields require one or more cultivations.

Woodland suitability group 3

This group consists of somewhat poorly drained to very poorly drained silty and clayey soils on flood plains. These soils are—

Birds silty clay loam (Bc).
Birds silt loam (Bd).
Dekoven silt loam (De).
Dekoven silty clay loam (Dk).
Dekoven and Wakeland silt loams (Dw).
Falaya silt loam (Fa).
Ginat silt loam (Gn).
Ginat silty clay loam (Go).
Melvin silt loam (Mm).
Melvin silty clay loam (Mn).
Newark silt loam (Ne).
Newark silty clay loam (Ns).
Patton silt loam (Pa).
Patton silt loam, overwash (Po).
Patton silty clay loam (Ps).
Robertsville silt loam (Rn).
Sharkey silty clay (Sk).
Sharkey silty clay loam, overwash (So).
Wakeland silt loam (Wa).
Waverly silt loam (We).

The potential productivity of these soils is high for cottonwood, pin oak, and sweetgum. Intensive management is justified.

Equipment limitations are severe because these soils are under water or are wet for periods that total more than 3 months every year.

Plant competition is severe because of the abundant moisture available during the growing season. Shade-tolerant trees of low quality establish themselves in the understory of saw-log stands. Following logging of the stands, these shade-tolerant trees prevent the satisfactory reestablishment of desirable trees unless the site is weeded intensively. Interplanting or conversion planting generally is not feasible, because competition from undesirable trees is severe. Trees planted in open fields ordinarily require one or more cultivations.

Woodland suitability group 4

Markland silty clay, 6 to 12 percent slopes, severely eroded (MeC3), is the only soil in this group. It is a well drained or moderately well drained soil on terraces.

The potential productivity of this soil is fair for upland oak and redcedar. A medium level of management is justified.

The erosion hazard is severe. Therefore, special attention needs to be given to the location, construction, and maintenance of roads and skid trails.

Equipment limitations are moderate.

Seedling mortality is moderate because of droughts of 2 or 3 weeks duration that generally occur early in the growing season. These dry periods cause moderate loss of newly germinated or newly planted trees.

Woodland suitability group 5

This group consists of slack-water soils that developed from calcareous alluvium on stream terraces. These soils are—

Markland silt loam, 2 to 6 percent slopes (MdB).
Markland silty clay loam, 2 to 6 percent slopes, eroded (MhB2).
Markland silty clay loam, 6 to 12 percent slopes, eroded (MhC2).
Markland soils, 12 to 35 percent slopes (MkE).

TABLE 3.—*Woodland suitability*

Woodland suitability group and soil symbols	Potential productivity		
	Species [1]	Site index [2]	Estimated annual growth per acre [3]
			Bd. ft., International rule
Group 1: Sandy, droughty soils on bottom lands and terraces. Soils on bottom lands are subject to overflow (BrA, BrC, LaB).	Cottonwood	82±5	400
Group 2: Deep, well drained and moderately well drained silty soils that have potential for high productivity, although they are subject to seasonal overflow (Ad, Co, Ea, Ec, HnA, HsA, HsC, Ld, Le, Mr).	Cottonwood	110 to 120	930
	Sweetgum	100 to 110	605
	Pin oak	90 to 95	430
	Yellow-poplar	107±4	625
	Upland oak	80 to 85	325
Group 3: Somewhat poorly drained to very poorly drained silty and clayey soils that have potential for high productivity, although they are subject to overflow (Bc, Bd, De, Dk, Dw, Fa, Gn, Go, Mm, Mn, Ne, Ns, Pa, Po, Ps, Rn, Sk, So, Wa, We).	Cottonwood	103±8	690
	Pin oak	99±7	495
	Sweetgum	93±6	470
Group 4: Sloping, severely eroded, well drained or moderately well drained silty clay that developed from calcareous slack-water alluvium (MeC3).	Upland oak	60 to 70	155
	Redcedar	30 to 35	[4]
Group 5: Well drained and moderately well drained soils that developed from calcareous slack-water alluvium on stream terraces. Some soils are eroded. The slope range is 2 to 12 percent, for the most part, but a few areas are as steep as 35 percent (MdB, MhB2, MhC2, MkE).	Upland oak	75 to 85	290
	Yellow-poplar	90 to 100	495
Group 6: Somewhat poorly drained soil on terraces in slack-water area. The subsoil consists of plastic, fine-textured material (Ml).	Shumard oak	65 to 75	200
Group 7: Deep, well drained and moderately well drained soils on loess uplands and on river terraces. Some soils are eroded. The slope range is 2 to 12 percent, for the most part, but a few areas are as steep as 50 percent (As, EkA, EkB, LnA, LnB, LnB2, LnC2, LnD2, MoB, MoB2, MoC2, MoD2, MoE, MoF, ShA, ShB, UnA, UnB, UnB2, UnC2, UtE, WpA, WpB, WpB2, WpC2, WtE).	Upland oak	93±5	430
	Yellow-poplar	100±4	550
	Loblolly pine	75 to 85	[4]
	Shortleaf pine	74±6	[4]
	Virginia pine	82±5	[4]
Group 8: Severely eroded, deep, well drained and moderately well drained soils on uplands and terraces. The slope range is 6 to 20 percent, for the most part. In a few areas, it is 2 to 6 percent (GrC3, LoB3, LoC3, LoD3, MpB3, MpC3, MpD3, UoB3, UoC3, WoC3, WoD3, WsC3, ZaC3, ZaD3).	Loblolly pine	70 to 80	[4]
	Shortleaf pine	60 to 70	[4]
	Upland oak	60 to 70	155
Group 9: Level to gently sloping, wet silty soils on loess uplands and on stream terraces. These soils have a fragipan (CaA, CaB, He, Ta, Wh).	Cottonwood	97±5	600
	Sweetgum	101±8	560
	Shumard oak	95±6	455
	Pin oak	98±5	485
Group 10: Level to sloping, moderately well drained soils on loess uplands and on river terraces. These soils have a fragipan (CnA, CnB, GrA, GrB, GrB2, GrC2, ScA, ScB, SeA, SeB, SeB2).	Upland oak	70±3	195
	Yellow-poplar	90 to 100	570
	Loblolly pine	75 to 85	[4]
Group 11: Moderately well drained to somewhat excessively drained silty soils of the sandstone and shale uplands. These soils are sloping to steep, and some are moderately eroded (GeE, LmF, WnD2, ZaC2, ZaD2).	Upland oak	67±5	170
	Virginia pine	74±3	[4]
Group 12: Miscellaneous land types (Bk, Gu, Ma, Ra, Sw).	[5]	[5]	[5]

[1] Reference age is 30 years for cottonwood; for all other species it is 50 years.

[2] Where four or more site measurements were available in a group, the standard deviation was calculated and is shown following the ± symbol. Otherwise the range of site index values obtained by measurements are shown.

[3] Growth estimates are based on well-stocked, managed stands of cottonwood to age 30 and of other species to age 60.

groups of soils

Species to favor in managing existing woodland	Species preferred for planting	Hazards and limitations			
		Erosion hazard	Equipment limitations	Plant competition	Seedling mortality
Cottonwood	Cottonwood	Slight	Moderate	Moderate	Moderate.
Cottonwood, sweetgum, and pin oak.	Cottonwood, sweetgum, and pin oak.	Slight	Moderate	Severe	Slight.
Cottonwood, pin oak, cherrybark oak, and sweetgum.	Cottonwood	Slight	Severe	Severe	Slight.
White oak, black oak, and eastern redcedar.	Shortleaf pine, loblolly pine, and eastern redcedar.	Severe	Moderate	Slight	Moderate.
Northern red oak, white oak, Shumard oak, and yellow-poplar.	Northern red oak, white pine, shortleaf pine, loblolly pine, black locust, yellow-poplar, and black walnut.	Moderate or severe.	Moderate or severe.	Severe	Slight.
Shumard oak	Shumard oak	Slight	Moderate	Slight	Moderate.
White oak, black oak, southern red oak, yellow-poplar, loblolly pine, shortleaf pine, and Virginia pine.	Loblolly pine, shortleaf pine, white pine, black locust, yellow-poplar and black walnut.	Moderate or severe.	Moderate or severe.	Severe	Slight.
Loblolly pine, shortleaf pine, black oak, southern red oak, and hickory.	Loblolly pine and shortleaf pine.	Moderate or severe.	Moderate or severe.	Slight	Moderate or severe.
Cottonwood, sweetgum, Shumard oak, and pin oak.	Cottonwood, sweetgum, pin oak, and Shumard oak.	Slight	Severe	Severe	Slight.
Yellow-poplar and loblolly pine	Loblolly pine, shortleaf pine, and white pine.	Slight or moderate.	Slight	Severe	Slight.
White oak, black oak, southern red oak, hickory, and Virginia pine.	Loblolly pine, shortleaf pine, and white pine.	Moderate or severe.	Slight to severe.	Severe	Slight.
[5]	[5]	[5]	[5]	[5]	[5]

[4] Information is not available.

[5] Because of their variable nature, miscellaneous land types generally are not suitable for planned production of wood crops; and thus specific interpretations for them cannot be made.

The potential productivity of these soils is moderately high for upland oak and yellow-poplar. Intensive management is justified.

The erosion hazard is moderate on slopes greater than 6 percent and severe on slopes greater than 12 percent. The location, construction, and maintenance of roads and skid trails, therefore, require special attention, especially on the steeper slopes.

Equipment limitations are moderate where the slope is less than 20 percent and severe where the slope is more than 20 percent.

Plant competition is severe because of the abundance of moisture. Shade-tolerant trees of low quality, growing in the understory of saw-log stands, generally prevent the satisfactory natural regeneration of desirable trees after the stands have been cut. In most places, it is necessary to prepare a site for planting and then to control the competing vegetation by intensive weeding. Interplanting or conversion planting ordinarily is not feasible, because of the competition from undesirable vegetation. Trees planted in open fields, as a rule, require one or more cultivations.

Woodland suitability group 6

McGary silt loam (Ml) is the only soil in this group. It is a somewhat poorly drained soil on stream terraces in a slack-water area.

The potential productivity of this soil is fair for Shumard oak. Medium management is justified.

Equipment limitations are moderate during periods of wetness, which total up to 3 months every year.

Seedling mortality is moderate because of a seasonal high water table followed, late in the growing season, by periods of drought.

Woodland suitability group 7

This group consists of deep, well drained and moderately well drained soils that are on loess uplands and on terrace benches along the Ohio and Green Rivers. These soils are—

Ashton silt loam (As).
Elk silt loam, 0 to 2 percent slopes (EkA).
Elk silt loam, 2 to 6 percent slopes (EkB).
Loring silt loam, 0 to 2 percent slopes (LnA).
Loring silt loam, 2 to 6 percent slopes (LnB).
Loring silt loam, 2 to 6 percent slopes, eroded (LnB2).
Loring silt loam, 6 to 12 percent slopes, eroded (LnC2).
Loring silt loam, 12 to 20 percent slopes, eroded (LnD2).
Memphis silt loam, 2 to 6 percent slopes (MoB).
Memphis silt loam, 2 to 6 percent slopes, eroded (MoB2).
Memphis silt loam, 6 to 12 percent slopes, eroded (MoC2).
Memphis silt loam, 12 to 20 percent slopes, eroded (MoD2).
Memphis silt loam, 20 to 30 percent slopes (MoE).
Memphis silt loam, 30 to 50 percent slopes (MoF).
Sequatchie loam, 0 to 2 percent slopes (ShA).
Sequatchie loam, 2 to 6 percent slopes (ShB).
Uniontown silt loam, 0 to 2 percent slopes (UnA).
Uniontown silt loam, 2 to 6 percent slopes (UnB).
Uniontown silt loam, 2 to 6 percent slopes, eroded (UnB2).
Uniontown silt loam, 6 to 12 percent slopes, eroded (UnC2).
Uniontown soils, 12 to 35 percent slopes (UtE)
Wheeling silt loam, 0 to 2 percent slopes (WpA).
Wheeling silt loam, 2 to 6 percent slopes (WpB).
Wheeling silt loam, 2 to 6 percent slopes, eroded (WpB2).
Wheeling silt loam, 6 to 12 percent slopes, eroded (WpC2).
Wheeling soils, 12 to 30 percent slopes (WtE).

The potential productivity of these soils is high for upland oak and yellow-poplar and moderately high for loblolly pine, shortleaf pine, and Virginia pine. Intensive management is justified.

The erosion hazard is moderate on slopes of 12 to 20 percent and severe on slopes of more than 20 percent. Furthermore, concentrations of water readily cut gullies in these soils. Accordingly, special attention needs to be given to the location, construction, and maintenance of roads and skid trails.

Equipment limitations are moderate on slopes of 12 to 20 percent and severe on slopes of more than 20 percent. Track-type equipment and power winches are needed to harvest wood crops on slopes of more than 20 percent.

Plant competition is severe because of the favorable supply of moisture that is available during the growing season. Shade-tolerant trees of low quality establish themselves in the understory of saw-log stands. Following the logging of the stands, these shade-tolerant trees prevent the satisfactory natural regeneration of desirable trees. Generally, intensive weeding is required to insure the dominance of desirable trees. Interplanting or conversion planting is not feasible. Competition to newly planted trees ordinarily is severe in open fields that have been abandoned as cropland or pasture for 2 years or more.

Woodland suitability group 8

This group consists of severely eroded, well drained and moderately well drained soils on uplands and terraces. Most of these soils developed from loess underlain by sandstone and shale. The soils in this group are—

Grenada silt loam, 6 to 12 percent slopes, severely eroded (GrC3).
Loring silty clay loam, 2 to 6 percent slopes, severely eroded (LoB3).
Loring silty clay loam, 6 to 12 percent slopes, severely eroded (LoC3).
Loring silty clay loam, 12 to 20 percent slopes, severely eroded (LoD3).
Memphis silty clay loam, 2 to 6 percent slopes, severely eroded (MpB3).
Memphis silty clay loam, 6 to 12 percent slopes, severely eroded (MpC3).
Memphis silty clay loam, 12 to 25 percent slopes, severely eroded (MpD3).
Uniontown silty clay loam, 2 to 6 percent slopes, severely eroded (UoB3).
Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded (UoC3).
Wellston silty clay loam, 6 to 12 percent slopes, severely eroded (WoC3).
Wellston silty clay loam, 12 to 20 percent slopes, severely eroded (WoD3).
Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded (WsC3).
Zanesville silt loam, 6 to 12 percent slopes, severely eroded (ZaC3).
Zanesville silt loam, 12 to 20 percent slopes, severely eroded (ZaD3).

The potential productivity of these soils is fair for upland oak, loblolly pine, and shortleaf pine. These soils tend to improve in productivity following a period of protection and stabilization.

The erosion hazard is moderate on slopes of 6 to 12 percent and severe on slopes of more than 12 percent. Excess water readily cuts gullies in these soils. For this reason, special care needs to be taken in locating, constructing, and maintaining roads and skid trails.

Equipment limitations, in most places, are moderate. In an area where the slope is greater than 20 percent, the limitations are severe. Track-type equipment and power

winches are needed on the steeper slopes to harvest wood crops efficiently.

Because of droughts in the early part of the growing season, seedling mortality is moderate or severe, depending on the length of the drought. Generally these dry periods are of 2 or 3 weeks duration. The losses are of newly planted trees. Natural seedlings ordinarily grow too slowly to provide protective cover.

Woodland suitability group 9

This group consists of somewhat poorly drained silty soils that have a fragipan. These soils are—

Calloway silt loam, 0 to 2 percent slopes (CaA).
Calloway silt loam, 2 to 6 percent slopes (CaB).
Henshaw silt loam (He).
Taft silt loam (Ta).
Weinbach silt loam (Wh).

The potential productivity of these soils is high for cottonwood, sweetgum, Shumard oak, and pin oak. Intensive management is justified.

Equipment limitations are severe because these soils are wet during periods that total more than 3 months every year.

Plant competition is severe because of the abundance of moisture. Shade-tolerant trees of low quality grow in the understory of saw-log stands. When the overstory is removed by logging, these shade-tolerant trees usually prevent the satisfactory reestablishment of desirable trees unless the site is weeded intensively. Interplanting or conversion planting generally is not feasible, because of the severe competition from undesirable vegetation. Trees planted in open fields that have been abandoned as cropland or pasture for 2 years or more ordinarily require one or more cultivations.

Woodland suitability group 10

This group consists of moderately well drained soils that have a fragipan. These soils are—

Captina silt loam, 0 to 2 percent slopes (CnA).
Captina silt loam, 2 to 6 percent slopes (CnB).
Grenada silt loam, 0 to 2 percent slopes (GrA).
Grenada silt loam, 2 to 6 percent slopes (GrB).
Grenada silt loam, 2 to 6 percent slopes, eroded (GrB2).
Grenada silt loam, 6 to 12 percent slopes, eroded (GrC2).
Sciotoville fine sandy loam, 0 to 2 percent slopes (ScA).
Sciotoville fine sandy loam, 2 to 6 percent slopes (ScB).
Sciotoville silt loam, 0 to 2 percent slopes (SeA).
Sciotoville silt loam, 2 to 6 percent slopes (SeB).
Sciotoville silt loam, 2 to 6 percent slopes, eroded (SeB2).

The potential productivity of these soils is moderately high for upland oak, yellow-poplar, and loblolly pine. Intensive management is justified.

The erosion hazard is slight, except on slopes greater than 6 percent where some attention needs to be given to the location, construction, and maintenance of roads and skid trails.

Plant competition is severe because of the favorable supply of moisture that is available to plants during the growing season. Shade-tolerant trees of low quality generally grow in the understory of saw-log stands. When the overstory is removed by logging, these shade-tolerant trees prevent the satisfactory natural regeneration of desirable trees. To insure the dominance of desirable trees, one or more weedings are required. Interplanting or conversion planting generally is not feasible, because of the competition from undesirable trees. Competition to newly planted trees generally is severe in open fields that have been abandoned as cropland or pasture for 2 years or more.

Woodland suitability group 11

This group consists of sloping to steep soils of the sandstone and shale uplands. These soils are —

Gilpin-Wellston silt loams, 20 to 30 percent slopes (GeE).
Litz-Muskingum silt loams, 30 to 50 percent slopes (LmF).
Wellston silt loam, 12 to 20 percent slopes, eroded (WnD2).
Zanesville silt loam, 6 to 12 percent slopes, eroded (ZaC2).
Zanesville silt loam, 12 to 20 percent slopes, eroded (ZaD2).

The potential productivity of these soils is moderately high for upland oak and Virginia pine. Intensive management is justified.

The erosion hazard, for the most part, is moderate or severe. It is slight on slopes of less than 12 percent. Special attention needs to be given to locating, constructing, and maintaining roads and skid trails on slopes greater than 12 percent.

Equipment limitations are severe on Gilpin-Wellston silt loams and slight or moderate on the other soils. On the steeper slopes and where the terrain is rough, track-type equipment and power winches are needed to harvest wood crops efficiently.

Plant competition is severe because of the favorable supply of moisture that is available to plants during the growing season. Shade-tolerant trees of low quality establish themselves in the understory of saw-log stands. These trees prevent the satisfactory natural regeneration of desirable trees after the overstory is removed by logging. Generally, intensive weeding is required to insure the dominance of desirable trees. Interplanting or conversion planting is not feasible. Competition to newly planted trees generally is severe in open fields that have been abandoned as cropland or pasture for 2 years or more.

Woodland suitability group 12

This group is made up of miscellaneous land types so variable in origin, soil characteristics, physiography, behavior, and management requirements that on-site inspection is necessary in making interpretations regarding growth and management of trees. These land types are—

Breaks and Alluvial land (Bk).
Gullied land (Gu).
Made land (Ma).
Riverwash (Ra).
Swamp (Sw).

Breaks and Alluvial land consists of escarpments on terraces and along riverbanks. Texture and slope are variable. The potential productivity generally is low for most kinds of trees. Low quality hardwoods, such as willow, silver maple, and sycamore, can be grown in most places but only for their usefulness in controlling erosion. A few areas may be suitable for species of commercial value.

Gullied land consists of areas that are subject to severe sheet erosion. These areas are more than 20 percent scarred by deep or moderately deep gullies, and thus the subsoil is exposed in many places. The potential productivity is very low for most kinds of trees. In acid areas that are not severely eroded, shortleaf pine, loblolly pine, and Virginia pine will grow, though slowly, and will provide some protection and ground cover. Redcedar will

grow in limy, or calcareous, areas where raw marl is not exposed. Generally, seedling mortality is severe because of the active erosion and the limited supply of available moisture. For the same reasons, plant competition is low. Equipment limitations are severe.

Made land consists of areas where construction operations have greatly altered the soil profile. Examples of Made land include deep fills and cuts, borrow pits, and earth levees. Most areas are gently sloping to strongly sloping, and a few are nearly level. Each individual area has to be appraised separately because the soil material varies so much in origin, in composition, and in degree of compaction.

Figure 14.—**A cypress swamp, which is typical of such areas in the county. Most of the cypress trees in this swamp have been harvested.**

Riverwash consists mostly of sandy or gravelly material. It supports some willow and silver maple in scattered areas but, for the most part, is unsuitable for trees.

Swamp consists of areas that are flooded and thereby are inaccessible most of the time.. The only kind of tree of any commercial value that will grow in these areas is the water-tolerant bald cypress (fig. 14).

Use of the Soils for Wildlife [3]

This section discusses the wildlife resources of Henderson County and the relationship of wildlife to the soils in the county. Using the soil associations, which are patterns of soils, is a convenient way to interpret the suitability of the soils for wildlife. The soil associations are described generally in the section "General Soil Map" and are shown on the colored map at the back of this report.

Huntington-Egam-Newark and Ginat-Melvin associations

These two associations are similar in their suitability for wildlife. Both occur on the flood plain of the Ohio River. The Huntington-Egam-Newark association is an area of long, low, parallel ridges separated by flats. The deep, well drained Huntington soils and well drained and moderately well drained Egam soils occupy the ridges, and the somewhat poorly drained Newark soils occupy the flats. The Ginat-Melvin association also is an area of parallel ridges separated by flats.

Most of the acreage of both associations is used for corn and soybeans. Some minor soils, the Wheeling and Sciotoville in the Ginat-Melvin association are used mostly for cultivated crops. Some areas, made up mostly of poorly drained soils, are wooded. Some swampy areas are included in the Huntington-Egam-Newark association. These too are wooded.

The principal kinds of wildlife in these associations are duck, white-tailed deer, swamp rabbit, mourning dove, fox squirrel, raccoon, mink, skunk, and opossum.

Ducks congregate in the swamps and on the poorly drained Melvin soils when these soils are flooded. Swamp rabbits, fox squirrels, raccoons, and opossums are most numerous in the swamps and on the Melvin soils that are wooded. Mink occur mostly along drainageways on Melvin and Newark soils. Mourning doves are attracted to the abundant food available to them on the Huntington and Egam soils and in the cultivated areas of the Ginat-Melvin association. White-tailed deer and skunks are distributed throughout both associations.

Uniontown-Dehoven-Henshaw and Markland-Sharkey-Newark associations

These associations also are similar in their suitability for wildlife. The Uniontown-Dekoven-Henshaw association is an area of level terraces and bottoms along Canoe Creek, Highland Creek, and Lick Creek. The Markland-Sharkey-Newark association is an area of broad terraces along the Green River.

Almost all of the soils in both associations are suited to intensive cultivation, and most of the acreage is used for corn and soybeans. The somewhat poorly drained Newark soils, for the most part, are wooded.

The principal kinds of wildlife in these associations are bobwhite quail, cottontail rabbit, skunk, mink, red fox, gray squirrel, and raccoon. Because fence rows of vegetation and brush cover are not available, particularly on Patton, Dekoven, and Henshaw soils, numbers of quail, rabbits, skunks, and red foxes are not so high as on associations that have a more varied land use. Gray squirrels and raccoons are found mostly on the wooded Newark and Uniontown soils. Mink occur mostly on the Wakeland soils along Canoe Creek.

Loring-Grenada association

This is an area of rolling ridges and broad flats. The ridgetops are wide and gently sloping, and the side slopes are gently sloping to strongly sloping.

The soils in this association are used for general farming. Falaya, Waverly, Collins, and Dekoven soils, all of which are minor soils in this association, are used for corn, soybeans, and hay. Loring, Grenada, and Memphis soils are used mostly for pasture. There is very little woodland on any of these soils.

The principal kinds of wildlife in this association are cottontail rabbit, mourning dove, and skunk. The rabbits and skunks are distributed throughout the association. Mourning doves are found mostly on the cultivated Falaya, Collins, and Dekoven soils.

[3] By William H. Casey, biologist, Soil Conservation Service, U.S. Department of Agriculture.

MEMPHIS-WAKELAND AND LORING-ZANESVILLE-WELLSTON ASSOCIATIONS

The soils in these associations are used similarly, and therefore they support similar kinds of wildlife. The Memphis-Wakeland association is an area of steep bluffs overlooking level river terraces and bottoms. The Loring-Zanesville-Wellston association is an area of hills that have steep sides and narrow, gently sloping ridgetops.

The Memphis soils occupy the steep bluffs. Much of their acreage is wooded, but some sloping areas are grassed. The Wakeland soils on the bottom lands and the Uniontown soils on the terraces are used for corn and soybeans. The Loring, Collins, and Falaya soils in the Loring-Zanesville-Wellston association make up more than a third of the association. They are used mostly for cultivated crops. Much of the area occupied by the Wellston, Gilpin, and Litz soils has been abandoned and is reverting to trees.

The soils in these associations probably support the most kinds and numbers of wildlife in the county. The principal kinds are gray squirrel, opossum, skunk, red fox, gray fox, cottontail rabbit, raccoon, and bobwhite quail. Gray squirrels, opossums, and raccoons are found mostly in the wooded areas of the Memphis, Wellston, Gilpin, and Litz soils. Gray foxes apparently prefer conditions on the Wellston and Zanesville soils. Skunks, rabbits, and bobwhite quail are most likely to be found on the Wakeland, Dekoven, Collins, and Falaya soils. A small number of white-tailed deer are concentrated near Hebbardsville in the Memphis-Wakeland association.

Engineering Applications [4]

Soils engineering deals with soil as structural material and as foundation material upon which structures are built. Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. The soil properties most important to the engineer are shear strength, drainage, grain size, plasticity, and permeability to water. Compaction characteristics, shrink-swell characteristics, depth to water table, depth to bedrock, topography, and degree of acidity or alkalinity are perhaps as important. These properties and characteristics are discussed in this section.

With the use of the soil map for identification, the engineering interpretations reported here can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of soil properties in planning for conservation of soil and water, including the planning of systems for surface drainage and internal drainage and systems for water storage and water supply.
3. Make preliminary evaluations of soil conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations of the selected locations.
4. Locate probable sources of sand and gravel for use in construction.
5. Correlate performance of engineering structures with types of soil and thus develop information that will be useful in overall planning, designing, and maintaining of other engineering structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement information from other published maps, reports, and aerial photographs in preparing maps or reports for specific areas.
8. Develop preliminary estimates for construction purposes pertinent to a particular area.

It should be emphasized that the engineering interpretations reported here may 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, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some terms used by soil scientists may not be familiar to engineers, and other terms have special meanings in soil science. Many of the terms soil scientists use in describing soils are defined in the Glossary at the back of this report.

Other parts of this report, particularly the section "Descriptions of the Soils," can be informative and useful to the engineer.

Agricultural and Engineering Classification of the Soils

Soils are classified for various purposes, but mainly for agriculture and for engineering. The three most widely used systems of classification are explained in the pages that follow.

The system used by the U.S. Department of Agriculture is primarily for agricultural use. It is helpful to engineers, however, because it classifies soil material according to texture. Of primary importance in this system is the relative proportion of the various-sized individual grains in a mass of soil. Textural classes are based on different combinations of sand (2.0 millimeters to 0.05 millimeter), silt (0.05 to 0.002 millimeter), and clay (less than 0.002 millimeter). The basic 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. Sands are further identified as very coarse, coarse, fine, and very fine. Soils containing gravel up to 3 inches in diameter are gravelly; soils containing stones more than 10 inches in diameter are stony; soils containing flattened fragments of shale less than 6 inches along the longer axis are shaly; and soils containing relatively thin fragments of sandstone, limestone, slate, or shale 6 to 15 inches long are flaggy.

The Unified soil classification system (*21*), developed by the U.S. Army Corps of Engineers and the U.S. Bureau of Reclamation, is based on the identification of soils according to texture, plasticity, and performance as construction material. The characteristics that form the basis of the classification are (1) percentage of gravel, sand,

[4] By WILLIAM M. ADAMS, civil engineer, Soil Conservation Service.

and fines,[5] (2) grain-size distribution, and (3) plasticity and compressibility.

In this system, soils are primarily classified as coarse grained, fine grained, or highly organic.

In coarse-grained soils more than 50 percent of the material is retained on a No. 200 sieve. Coarse-grained soils are subdivided into gravel (symbol G) and sand (symbol S). If the greater part of the coarse fraction retained on the No. 200 sieve is also retained on the No. 4 sieve (4.76 millimeters), the soil is classed as gravel. If the greater part of the coarse fraction passes through the No. 4 sieve, the soil is classed as sand. The gravel and sand groups are each divided into four secondary groups, as follows: well-graded material (symbol W), poorly graded material (symbol P), coarse material with nonplastic fines (silty material) (symbol M), and coarse material with plastic fines (clayey material) (symbol C). Thus, well-graded gravel is designated by the symbol GW, and well-graded sand by the symbol SW; poorly graded gravel is GP, and poorly graded sand is SP; silty gravel is GM, and silty sand is SM; clayey gravel is GC, and clayey sand is SC.

In fine-grained soils more than 50 percent of the material passes through the No. 200 sieve. Fine-grained soils are subdivided into inorganic silt (symbol M), inorganic clay (symbol C), and organic silt and clay (symbol O). These groups are further subdivided on the basis of the liquid limit; symbol L is used for soils with a low liquid limit (50 and less), and symbol H for soils with a high liquid limit (more than 50). Thus, the groups that evolve are identified as ML, CL, and OL and MH, CH, and OH.

Highly organic soils generally are very compressible and have characteristics that make them undesirable as construction material. These soils contain a high percentage of organic matter and decayed roots. Generally, they are designated by the symbol Pt (peat) and are not subdivided.

The system of classifying soils that is used by the American Association of State Highway Officials (AASHO) (*1*) is based on field performance of soils in highways. Soils of about the same general load-carrying capacity and service are grouped together. In this system soil materials are classified in seven principal groups. The groups range from A-1, which consists of gravelly soils of high bearing capacity, to A-7, which consists of clayey soils that have low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index. Group indexes range from 0 for the best material to 20 for the poorest. Increasing values of the group index reflect decreasing load-carrying capacity of the subgrade, increasing liquid limit and plasticity index, and decreasing percentage of coarse material. The group index is shown in parentheses following the soil group symbol, for example, A–4(1).

The seven principal groups are divided into two major classes: granular materials (35 percent or less of the material passes through the No. 200 sieve) and silt-clay materials (more than 35 percent of the material passes through the No. 200 sieve). Whether a soil is silty or clayey depends on its plasticity index (P.I.). Fine material having a P.I. of 10 or less is silty, and fine material having a P.I. of more than 10 is clayey. Five textural soil fractions are recognized: boulders, gravel, coarse sand, fine sand, and combined silt and clay.

Granular materials are classified in the A–1, A–2, and A–3 soil groups. A–1 soils are well-graded, coarse-textured to fine-textured mixtures that have nonplastic or slightly plastic soil binder. Soil binder is generally considered as minus No. 200 sieve-size material. A–2 soils are poorly graded, have inferior soil binder, or both. A–3 soils are sands deficient in soil binder and coarse material. The A–1 group is divided into A–1–a soils and A–1–b soils, and the A–2 group is divided into A–2–4, A–2–5, A–2–6, and A–2–7 soils. A–1–a soils include those materials that consist mostly of stone fragments or gravel either with or without a well-graded soil binder. A–1–b soils include those materials that consist mostly of coarse sand either with or without a well-graded soil binder. A–2–4 and A–2–5 soils include those granular materials that have soil binder characteristic of the A–4 and A–5 groups. A–2–6 and A–2–7 soils include those granular materials that have soil binder characteristic of the A–6 and A–7 groups.

Silt-clay materials are classified in the A–4, A–5, A-6, and A–7 groups. A–4 soils consist mostly of silt and contain only moderate or small amounts of coarse material and only small amounts of sticky colloidal clay. When dry, they provide a firm riding surface with little rebound after loading. When water is absorbed rapidly, they expand and lose stability. These soils are subject to frost-heave. A–5 soils are similar to A–4 soils, except that they include very poorly graded soils that have elastic properties and very low stability. A–6 soils consist mostly of clay and contain moderate or small amounts of coarse material. They have good bearing capacity when compacted to maximum practical density but lose this bearing capacity when moisture is absorbed. A–7 soils also consist mostly of clay, but they have a higher liquid limit than A–6 soils and may be elastic and undergo high volume changes. At certain moisture contents, they deform quickly under load and rebound when load is removed. The A–7 group is divided into A–7–5 and A–7–6 soils. A–7–5 soils represent those A–7 soils that have a moderate plasticity index in relation to liquid limit and may be highly elastic as well as subject to considerable volume change. A–7–6 soils represent those A–7 soils that have a high plasticity index in relation to liquid limit and are subject to extremely high volume change.

Table 4 shows the estimated classification of all soils in the county according to the three systems. For a more complete explanation of the AASHO and the Unified systems of classification, see the PCA Primer (*9*).

Engineering Descriptions of the Soils

Table 4 gives a brief description of all the soils mapped in Henderson County. Also, it gives estimates of some soil characteristics significant in engineering, and the engineering classification of the soil material in the principal horizons. This table excludes Breaks and Alluvial land, Gullied land, Made land, Riverwash, and Swamp, all of which are miscellaneous land types. On-site studies

[5] Fines are particles that will pass through a No. 200 (0.074 millimeter) sieve. They are about the smallest particles visible to the naked eye.

are necessary to determine the engineering potential of these land types because their soil material is variable.

Some of the items in table 4 need no explanation; others are explained as follows:

The brief soil description gives the position of the soil on the landscape and the texture of its significant horizons to a depth of 36 to 50 inches. Also, it gives the depth to bedrock and the depth to the seasonal high water table. The depth to bedrock refers to the approximate depth from the surface to solid rock, or noncompressible material, which may be shale, limestone, or sandstone. The depth to the seasonal high water table is the approximate distance from the surface to the free water in the soil. It is based on field observations.

Permeability indicates the rate at which water will move downward in soil material that is not compacted (undisturbed material). It is measured in inches per hour. The rates are based on estimates made by soil scientists familiar with the soils in this county.

Available water capacity refers to the amount of water in the soil that can be taken up by plants. It is measured in inches per inch of soil.

Reaction, the estimated degree of acidity or alkalinity, is expressed in pH value. A notation of pH 7.0 indicates precise neutrality; higher values indicate increasing alkalinity, and lower values indicate increasing acidity. The values in table 4 are based on quick tests made with "Soiltex" at the time the soils were identified.

The shrink-swell potential indicates the volume change to be expected with a change in moisture content; that is, shrinking of the soil when it dries and swelling when it takes up moisture. Ratings are high, moderate, or low. They were estimated primarily on the basis of the amount and type of clay in the soil. In general, soils classified as CH or A–7 have high shrink-swell potential. Structureless soils (clean sand and gravel) and soils containing a small amount of nonplastic to slightly plastic fines, as well as most nonplastic to slightly plastic soils, have low shrink-swell potential.

Interpretation of the Soils for Engineering

Table 5 gives, for each soil series, suitability ratings for specific purposes and soil features that limit suitability for engineering structures that help conserve soil and water on farmlands. The data are based on the estimates given in table 4, on field observation of the soils, and on past experience with the soils or with similar soils. The miscellaneous land types—Breaks and Alluvial land, Gullied land, Made land, Riverwash, and Swamp—are excluded from table 5 because of the variability of their soil material.

Susceptibility of soils to frost action is rated low, moderate, or high in table 5. Frost action includes the heave caused by ice lenses as they form in a soil and the subsequent loss of strength caused by the added moisture in the soil as the ice lenses thaw. The ratings, therefore, denote the degree of this combined action. Frost action depends on the amount of water in the soil during the freezing period and the length of the freezing period. The water may be from any source, that is, capillary water, water held within the voids of the soil material, water that has infiltrated into the soil material, and water that makes up the water table.

A rating of good, fair, or poor is given to show suitability of the soils as a source of topsoil and suitability for road subgrade when not subject to frost action. Topsoil, as used here, refers to soil material, preferably high in content of organic matter, for dressing slopes, roadbanks, lawns, gardens, and other earth structures that require a vegetative cover for protection and beautification. The suitability of a soil for road subgrade depends, to a large extent, on its susceptibility to frost action.

The degree of limitation of the soils as a site for low buildings (1 or 2 stories, and 6 feet or less of basement) and as a sewage disposal area for domestic septic tanks is given as slight, moderate, or severe. A severe limitation does not necessarily preclude use of a given soil for the stated purpose. The ratings are based on those soil characteristics that determine limitations of a soil for these purposes.

Formation, Morphology, and Classification of the Soils

In this section, the factors of soil formation and their relation to the soils in Henderson County are discussed; the morphology and classification of the soils are described; and laboratory data are given for selected soil series.

Factors of Soil Formation

Soils are formed through the complex interaction of parent material, climate, living organisms, topography, and time—the five factors of soil formation (*5*). Climate and living organisms are the active factors. They act on parent material and change it from an inert mass to a body that has definite morphology. The effects of climate and living organisms on parent material are modified by topography and time (the length of time that climate and living organisms have been acting on the parent material).

Parent material

Most of the soils in Henderson County developed either from loess or from alluvium; a few developed from weathered sandstone and shale.

The original deposits of loess were as much as 50 feet deep in the northern part of the county and about 5 to 10 feet deep in the southern part. The loess rode the prevailing winds from the north and west. Possibly some came from the glacial till plains and the outwash plains of the North Central States and some from the flood plains of the Mississippi River and its tributaries, but a large amount came from the flood plains of the Ohio and Wabash Rivers. The loess, identified as Peorian (*20*), is composed mainly of silt-sized particles. Apparently it was calcareous at the time of deposition, for calcium carbonate has leached from the soil material, and calcium-carbonate nodules are present in a few places near the bottom of the deepest deposits. In Henderson County, most of the upland soils, including the Memphis, Loring, Grenada, and Calloway, developed from loess.

TABLE 4.—*Brief description of the soils and*

Map symbol	Soil	Description of soil	Depth from surface
			Inches
Ad	Adler silt loam.	Silt loam underlain by silt loam; moderately well drained alluvial soil generally on wide bottoms downstream from headwaters; depth to seasonal high water table, 2 feet; depth to bedrock, more than 10 feet.	0 to 8 8 to 35+
As	Ashton silt loam.	Silt loam underlain by silty clay loam that, in turn, is underlain by light silty clay loam or silt loam; well-drained alluvial soil on low terraces of Ohio River and Green River flood plains; depth to seasonal high water table, more than 3 feet; depth to bedrock, more than 20 feet.	0 to 10 10 to 40 40 to 50+
Bc Bd	Birds silty clay loam. Birds silt loam.	Silt loam or silty clay loam underlain by silty clay loam that, in turn, is underlain by silt loam; poorly drained soils on bottom land along streams; developed from alluvium of neutral or calcareous loess derivation; depth to seasonal high water table, 1 foot or less; depth to bedrock, more than 20 feet.	0 to 9 9 to 24 24 to 36+
BrA BrC	Bruno loamy fine sand, 0 to 4 percent slopes. Bruno loamy fine sand, 4 to 10 percent slopes.	Loamy fine sand underlain by fine sandy loam; excessively drained alluvial soils on bottoms adjacent to Ohio River; depth to seasonal high water table, 5 to 10 feet; depth to bedrock, more than 20 feet.	0 to 32 32 to 48+
CaA CaB	Calloway silt loam, 0 to 2 percent slopes. Calloway silt loam, 2 to 6 percent slopes.	Silt loam underlain by silty clay loam that, in turn, is underlain by silt loam; somewhat poorly drained soils on flat ridgetops and on gentle slopes at base of better drained uplands; developed from loess more than 42 inches thick; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, 4 to 20 feet.	0 to 7 7 to 20 20 to 32 32 to 48+
CnA CnB	Captina silt loam, 0 to 2 percent slopes. Captina silt loam, 2 to 6 percent slopes.	Silt loam underlain by silty clay loam that, in turn, is underlain by fine silt loam and, below that, by silty clay loam; moderately well drained alluvial soils on terraces of Green River flood plain; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 7 7 to 18 18 to 38 38 to 40+
Co	Collins silt loam.	Silt loam underlain by silty clay loam; moderately well drained alluvial soil in small areas on narrow bottoms; depth to seasonal high water table, 2½ feet or more; depth to bedrock, more than 20 feet.	0 to 22 22 to 27 27 to 35+
De Dk	Dekoven silt loam. Dekoven silty clay loam.	Silt loam or silty clay loam underlain by silty clay loam that may be slightly plastic; very poorly drained alluvial soils on bottom lands along streams; depth to seasonal high water table, 1 foot or less; depth to bedrock, more than 20 feet.	0 to 8 8 to 26 26 to 42+
Dw	Dekoven and Wakeland silt loams.	See Dekoven (De, Dk) and Wakeland (Wa).	
Ea Ec	Egam silt loam. Egam silty clay loam.	Silty clay loam or silt loam underlain by silt loam that, in turn, is underlain by silty clay loam; well drained and moderately well drained alluvial soils on bottom land along Ohio River; depth to seasonal high water table, 2½ feet or more; depth to bedrock, more than 20 feet.	0 to 7 7 to 18 18 to 30+
EkA EkB	Elk silt loam, 0 to 2 percent slopes. Elk silt loam, 2 to 6 percent slopes.	Silt loam underlain by silty clay loam; well-drained soils on stream terraces; developed from mixed alluvium, a large part of which is limestone that was deposited by the Green River; depth to seasonal high water table, 3 feet or more; depth to bedrock, more than 20 feet.	0 to 8 8 to 48+
Fa	Falaya silt loam.	Silt loam underlain by silt loam; somewhat poorly drained soil on bottom land; developed from sediments that were derived from acid loess; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 7 7 to 35+

their estimated physical and chemical properties

Classification			Permeability	Available water capacity	Reaction
USDA texture	Unified	AASHO			
			Inches per hour	*Inches per inch of soil*	*pH*
Silt loam	ML	A-4	0.63 to 2.0	0.22	6.1 to 6.5
Silt loam	ML	A-4	0.63 to 2.0	0.20	6.6 to 7.3
Silt loam	ML	A-4	0.63 to 2.0	0.22	6.1 to 6.5
Silty clay loam	CL	A-6	0.63 to 2.0	0.19	5.6 to 6.8
Silty clay loam or silt loam	CL	A-6	0.63 to 2.0	0.19 to 0.21	5.1 to 5.5
Silt loam or silty clay loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	6.1 to 6.5
Silty clay loam	CL	A-6	0.63 to 2.0	0.19	6.1 to 7.3
Silt loam	CL	A-6	0.63 to 2.0	0.22	6.6 to 7.3
Loamy fine sand	SM	A-2	>6.3	0.08	7.4 to 7.8
Fine sandy loam	SM or ML	A-2 or A-4	>6.3	0.12	7.4 to 7.8
Silt loam	ML	A-4	0.63 to 2.0	0.22	4.5 to 5.0
Silt loam	ML or CL	A-4 or A-6	0.2 to 0.63	0.22	4.5 to 5.0
Silty clay loam	CL	A-6	<0.2	0.19	4.5 to 5.0
Silt loam	CL	A-6	0.2 to 0.63	0.22	5.6 to 7.8
Silt loam	ML	A-4	0.63 to 2.0	0.22	5.6 to 6.0
Silty clay loam	CL	A-6	0.2 to 0.63	0.19	4.5 to 5.0
Fine silt loam	CL	A-6	<0.2	0.13	4.5 to 5.0
Silty clay loam	CL	A-6 or A-7	0.2 to 0.63	0.19	4.5 to 5.0
Silt loam	ML	A-4	0.63 to 2.0	0.22	5.6 to 6.0
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	5.5 to 6.0
Silty clay loam	CL	A-6	0.63 to 2.0	0.20	5.6 to 7.2
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	6.6 to 7.3
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.20	7.4 to 7.8
Silty clay loam	CL	A-6 or A-7	0.2 to 0.63	0.19	7.4 to 7.8
Silty clay loam or silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.19	6.1 to 6.5
Silt loam	ML or CL	A-6	0.2 to 0.63	0.22	6.1 to 6.5
Silty clay loam	CL or CH	A-6 or A-7	0.2 to 0.63	0.19	6.1 to 6.5
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	6.6 to 7.3
Silty clay loam	CL	A-6 or A-7	0.2 to 0.63	0.19	5.1 to 6.0
Silt loam	ML or CL	A-4 or A-6	0.2 to 0.63	0.22	5.1 to 5.5
Silt loam	ML or CL	A-4 or A-6	0.2 to 0.63	0.22	5.1 to 5.5

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TABLE 4.—*Brief description of the soils and*

Map symbol	Soil	Description of soil	Depth from surface
			Inches
GeE	Gilpin-Wellston silt loam, 20 to 30 percent slopes.	Gilpin—Silt loam underlain by silty clay loam that, in turn, is underlain by clay loam; well-drained soil on uplands; developed from thin mantle of loess overlying sandstone and shale; depth to seasonal high water table, 3 feet or more; depth to bedrock, 1½ to 3 feet. Wellston—See Wellston (WnD2, WoC3, WoD3).	0 to 12 12 to 20 20 to 24
Gn Go	Ginat silt loam. Ginat silty clay loam.	Silt loam or silty clay loam underlain by silty clay loam; poorly drained alluvial soils on terraces in Ohio River Valley; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 24 24 to 28 28 to 48
GrA GrB GrB2 GrC2 GrC3	Grenada silt loam, 0 to 2 percent slopes. Grenada silt loam, 2 to 6 percent slopes. Grenada silt loam, 2 to 6 percent slopes, eroded. Grenada silt loam, 6 to 12 percent slopes, eroded. Grenada silt loam, 6 to 12 percent slopes, severely eroded.	Silt loam underlain by silty clay loam that, in turn, is underlain by silt loam; moderately well drained soils generally on uplands but some on toe slopes or terraces; developed from loess; depth to seasonal high water table, 1½ to 3 feet; depth to bedrock, 4 to 20 feet or more.	0 to 22 22 to 30 30 to 50+
He	Henshaw silt loam.	Silt loam underlain by silty clay loam that, in turn, is underlain by silt loam; somewhat poorly drained soil on terraces; developed from moderately fine textured, water-deposited material; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 16 16 to 26 26 to 48+
HnA	Huntington fine sandy loam, 0 to 4 percent slopes.	Fine sandy loam underlain by fine sandy loam or loamy sand; deep, well-drained soil on bottoms along Ohio River; depth to seasonal high water table, 3 feet or more; depth to bedrock, more than 20 feet.	0 to 20 20 to 48+
HsA HsC	Huntington silt loam, 0 to 4 percent slopes. Huntington silt loam, 4 to 16 percent slopes.	Silt loam underlain by silt loam or silty clay loam that, in turn, is underlain by silt loam; well-drained alluvial soils on bottoms along Ohio and Green Rivers; depth to seasonal high water table, 3 feet or more; depth to bedrock, more than 20 feet.	0 to 8 8 to 18 18 to 42+
LaB	Lakin loamy fine sand, 2 to 6 percent slopes.	Loamy fine sand underlain by fine sand; excessively drained soil on stream terraces; developed from sandy alluvium deposited mainly by the Ohio River; depth to seasonal high water table, more than 10 feet; depth to bedrock, more than 20 feet.	0 to 18 18 to 40+
Ld Le	Lindside silt loam. Lindside silty clay loam.	Silt loam or silty clay loam underlain by silt loam or silty clay loam; moderately well drained alluvial soils on bottoms along Ohio and Green Rivers; depth to seasonal high water table, 1½ to 3 feet; depth to bedrock, more than 20 feet.	0 to 7 7 to 40+
LmF	Litz-Muskingum silt loams, 30 to 50 percent slopes.	Litz—Silt loam underlain by silty clay loam that, in turn, is underlain by very fine sandy loam; well drained to excessively drained soil on uplands; developed in thin mantle of loess over sandstone and shale; depth to seasonal high water table, more than 3 feet; depth to bedrock, 1 to 2 feet. Muskingum—Silt loam underlain by clay loam; excessively drained soil on uplands; depth to seasonal high water table, 5 to 10 feet; depth to bedrock, 1½ to 3 feet.	0 to 4 4 to 10 10 to 15 0 to 10 10 to 22 22 to 26
LnA LnB LnB2 LnC2 LnD2 LoB3 LoC3 LoD3	Loring silt loam, 0 to 2 percent slopes. Loring silt loam, 2 to 6 percent slopes. Loring silt loam, 2 to 6 percent slopes, eroded. Loring silt loam, 6 to 12 percent slopes, eroded. Loring silt loam, 12 to 20 percent slopes, eroded. Loring silty clay loam, 2 to 6 percent slopes, severely eroded. Loring silty clay loam, 6 to 12 percent slopes. severely eroded. Loring silty clay loam, 12 to 20 percent slopes, severely eroded.	Silt loam or silty clay loam underlain by silty clay loam that, in turn, is underlain by heavy silt loam; well drained and moderately well drained soils on uplands, developed from loess; depth to seasonal high water table, 2½ to 5 feet; depth to bedrock, 4 to 20 feet.	0 to 16 16 to 28 28 to 36 36 to 46+

their estimated physical and chemical properties—Continued

Classification			Permeability	Available water capacity	Reaction
USDA texture	Unified	AASHO	*Inches per hour*	*Inches per inch of soil*	*pH*
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	4.5 to 5.0
Silty clay loam	CL	A-6 or A-7	0.63 to 2.0	0.18	4.5 to 5.0
Clay loam	CL	A-7	0.2 to 0.63	0.16	4.5 to 5.0
Silt loam or silty clay loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.19 to 0.22	5.1 to 5.5
Silty clay loam	CL	A-6 or A-7	0.2 to 0.63	0.19	5.1 to 5.5
Silty clay loam	CL	A-7	<0.2	0.19	4.5 to 5.5
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	5.1 to 6.0
Silty clay loam	CL	A-6	<0.2	0.20	5.6 to 6.0
Silt loam	CL	A-6	0.63 to 2.0	0.22	5.1 to 7.3
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	5.1 to 5.5
Silty clay loam	CL	A-6	0.2 to 0.63	0.20	5.6 to 6.0
Silt loam	CL	A-6	0.2 to 0.63	0.22	6.1 to 7.3
Fine sandy loam	SM or ML	A-2 or A-4	>6.3	0.13	6.1 to 6.5
Fine sandy loam or loamy sand	SM or ML	A-2 or A-4	>6.3	0.06 to 0.12	6.1 to 6.5
Silt loam	ML or CL	A-4 or A-6	2.0 to 6.3	0.22	6.1 to 6.5
Silt loam or silty clay loam	ML or CL	A-4 or A-6	2.0 to 6.3	0.19 to 0.21	6.1 to 6.5
Silt loam	ML or CL	A-4 or A-6	2.0 to 6.3	0.22	6.6 to 7.3
Loamy fine sand	SM	A-2	<6.3	0.09	5.1 to 5.5
Fine sand	SM	A-2	<6.3	0.07	5.6 to 6.0
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	6.1 to 6.5
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	6.1 to 6.5
Silt loam	ML	A-4 or A-6	0.63 to 2.0	0.22	5.1 to 5.5
Silty clay loam	CL	A-6	0.63 to 2.0	0.19	5.1 to 5.5
Very fine sandy loam	SM or SC	A-2 or A-4	2.0 to 6.3	0.12	4.5 to 5.0
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.22	4.5 to 5.0
Silt loam	ML or CL	A-4 or A-6	0.63 to 2.0	0.20	4.5 to 5.0
Clay loam	CL	A-6	0.2 to 0.63	0.18	4.5 to 5.0
Silt loam or silty clay loam	ML or CL	A-6	0.63 to 2.0	0.22	4.5 to 5.5
Silty clay loam	CL	A-6 or A-7	0.63 to 2.0	0.19	4.5 to 5.0
Silty clay loam	CL	A-6 or A-7	0.2 to 0.63	0.18	5.1 to 5.5
Silt loam	CL	A-6	0.2 to 0.63	0.20	5.1 to 5.5

TABLE 4.—*Brief description of the soils and*

Map symbol	Soil	Description of soil	Depth from surface
			Inches
MdB	Markland silt loam, 2 to 6 percent slopes.	Silt loam, silty clay, or silty clay loam underlain by plastic silty clay; well drained and moderately well drained soils on terraces; developed in calcareous, water-deposited clays; depth to seasonal high water table, 2½ to 5 feet; depth to bedrock, more than 20 feet.	0 to 8
MeC3	Markland silty clay, 6 to 12 percent slopes, severely eroded.		8 to 30
MhB2	Markland silty clay loam, 2 to 6 percent slopes, eroded.		30 to 40+
MhC2	Markland silty clay loam, 6 to 12 percent slopes, eroded.		
MkE	Markland soils, 12 to 35 percent slopes.		
Ml	McGary silt loam.	Silt loam underlain by plastic silty clay; somewhat poorly drained soil on terraces along tributaries of Ohio River; developed from calcareous, water-deposited silt and clay; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 6 6 to 14 14 to 42+
Mm	Melvin silt loam.	Silty clay loam or silt loam underlain by plastic silty clay loam; poorly drained alluvial soils on bottom land along Ohio and Green Rivers; depth to seasonal high water table, less than 1 foot; depth to bedrock, more than 20 feet.	0 to 24 24 to 36+
Mn	Melvin silty clay loam.		
MoB	Memphis silt loam, 2 to 6 percent slopes.	Silt loam or silty clay loam underlain by slightly plastic silty clay loam that, in turn, is underlain by silt loam; well-drained soils on uplands; developed from loess more than than 42 inches thick; depth to seasonal high water table, more than 10 feet; depth to bedrock, 4 to 20 feet.	0 to 17 17 to 34 34 to 50+
MoB2	Memphis silt loam, 2 to 6 percent slopes, eroded.		
MoC2	Memphis silt loam, 6 to 12 percent slopes, eroded.		
MoD2	Memphis silt loam, 12 to 20 percent slopes, eroded.		
MoE	Memphis silt loam, 20 to 30 percent slopes.		
MoF	Memphis silt loam, 30 to 50 percent slopes.		
MpB3	Memphis silty clay loam, 2 to 6 percent slopes, severely eroded.		
MpC3	Memphis silty clay loam, 6 to 12 percent slopes, severely eroded.		
MpD3	Memphis silty clay loam, 12 to 25 percent slopes, severely eroded.		
Mr	Morganfield silt loam.	Silt loam underlain by silt loam; well-drained alluvial soil on stream flood plains; depth to seasonal high water table, more than 3 feet; depth to bedrock, more than 20 feet.	0 to 10 10 to 36+
Ne	Newark silt loam.	Silt loam underlain by silt loam; somewhat poorly drained soil of the bottom land; developed from sediment deposited by Ohio and Green Rivers; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 6 6 to 36+
Ns	Newark silty clay loam.	Silty clay loam underlain by silty clay loam; somewhat poorly drained soil of the bottom land; developed from sediment deposited by Ohio and Green Rivers; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 6 6 to 36+
Pa	Patton silt loam.	Silt loam or silty clay loam underlain by silty clay loam that, in turn, is underlain by silt loam; very poorly drained soils on terraces; developed from alluvium primarily of calcareous loess derivation; depth to seasonal high water table, less than 1 foot; depth to bedrock, more than 20 feet.	0 to 24 24 to 36 36 to 42+
Po	Patton silt loam, overwash.		
Ps	Patton silty clay loam.		
Rn	Robertsville silt loam.	Silt loam underlain by silty clay loam; poorly drained alluvial soil on stream terraces in Green River flood plain; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 6 6 to 20 20 to 30 30 to 40+
ScA	Sciotoville fine sandy loam, 0 to 2 percent slopes.	Fine sandy loam underlain by clay loam that, in turn, is underlain by loam and, below that, by clay loam; moderately well drained soils on river terraces; developed from mixed alluvium deposited by Ohio River; depth to seasonal high water table, 1½ to 3 feet; depth to bedrock, more than 20 feet.	0 to 8 8 to 20 20 to 36 36 to 42+
ScB	Sciotoville fine sandy loam, 2 to 6 percent slopes.		

their estimated physical and chemical properties—Continued

Classification			Permeability	Available water capacity	Reaction
USDA texture	Unified	AASHO	*Inches per hour*	*Inches per inch of soil*	*pH*
Silt loam, silty clay, or silty clay loam	ML, CL, or CH	A–6 or A–7	0.63 to 2.0	0.22	5.1 to 5.5
Silty clay	CL or CH	A–6 or A–7	0.63 to 2.0	0.18	5.1 to 6.0
Silty clay	CL or CH	A–7	0.2 to 0.63	0.15	6.6 to 7.3
Silt loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.21	4.5 to 5.5
Silty clay	CL or CH	A–7	<0.2	0.16	4.5 to 5.5
Silty clay	CL or CH	A–7	<0.2	0.16	5.6 to 7.4
Silty clay loam or silt loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.19 to 0.22	5.6 to 6.0
Silty clay loam	CL	A–7	0.2 to 0.63	0.19	5.6 to 6.0
Silt loam or silty clay loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.22	5.1 to 6.0
Silty clay loam	CL	A–6 or A–7	0.63 to 2.0	0.20	5.1 to 6.0
Silt loam	CL	A–6	2.0 to 6.3	0.22	4.5 to 6.5
Silt loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.22	6.6 to 7.3
Silt loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.22	6.6 to 7.3
Silt loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.22	6.6 to 7.3
Silt loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.22	5.6 to 6.5
Silty clay loam	CL	A–6	0.63 to 2.0	0.19	6.6 to 7.3
Silty clay loam	CL	A–6	0.63 to 2.0	0.19	5.6 to 6.5
Silt loam or silty clay loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.22	6.1 to 7.3
Silty clay loam	CL	A–6 or A–7	0.2 to 0.63	0.19	6.1 to 6.5
Silt loam	CL	A–6	0.2 to 0.63	0.22	6.6 to 7.3
Silt loam	ML or CL	A–4 or A–6	0.63 to 2.0	0.22	6.1 to 6.5
Silt loam	ML or CL	A–6	0.2 to 0.63	0.20	5.1 to 6.0
Silt loam	CL	A–6	<0.2	0.20	5.1 to 5.5
Silty clay loam	CL	A–6 or A–7	<0.2	0.19	5.1 to 5.5
Fine sandy loam	SM	A–2 or A–4	2.0 to 6.3	0.14	5.6 to 6.0
Clay loam	CL	A–6	0.63 to 2.0	0.17	4.5 to 5.0
Loam	ML or CL	A–4 or A–6	<0.2	0.18	4.5 to 5.0
Clay loam	CL	A–6	0.2 to 0.63	0.17	4.5 to 5.0

TABLE 4.—*Brief description of the soils and*

Map symbol	Soil	Description of soil	Depth from surface
			Inches
SeA	Sciotoville silt loam, 0 to 2 percent slopes.	Silt loam underlain by silty clay loam, that, in turn, is underlain by silt loam; moderately well drained soils on river terraces; developed from mixed alluvium deposited by Ohio River; depth to seasonal high water table, 1½ to 3 feet; depth to bedrock, more than 20 feet.	0 to 8
SeB	Sciotoville silt loam, 2 to 6 percent slopes.		8 to 19
SeB2	Sciotoville silt loam, 2 to 6 percent slopes, eroded.		19 to 30
			30 to 36+
ShA	Sequatchie loam, 0 to 2 percent slopes.	Loam underlain by fine sandy loam that, in turn, is underlain by loamy fine sand; well-drained soils on terraces; developed from alluvium deposited by Ohio and Green Rivers; depth to seasonal high water table, 5 to 10 feet; depth to bedrock, more than 20 feet.	0 to 15
ShB	Sequatchie loam, 2 to 6 percent slopes.		15 to 25
			25 to 48+
Sk	Sharkey silty clay.	Silty clay or silty clay loam underlain by clay that, in turn, is underlain by silty clay; very poorly drained alluvial soils along tributaries of Ohio River; developed from fine-textured, slack-water sediments; depth to seasonal high water table, less than 1 foot; depth to bedrock more than 20 feet.	0 to 6
So	Sharkey silty clay loam, overwash.		6 to 28
			28 to 42+
Ta	Taft silt loam.	Silt loam underlain by silty clay loam that, in turn, is underlain by silt loam; somewhat poorly drained soils on stream terraces; developed from Green River alluvium; depth to seasonal high water table, less than 2 feet; depth to bedrock, more than 20 feet.	0 to 4
			4 to 18
			18 to 45
			45 to 50+
UnA	Uniontown silt loam, 0 to 2 percent slopes.	Silt loam or silty clay loam underlain by silty clay loam, that in turn, is underlain by silt loam; well drained and moderately well drained soils on terraces; developed from medium textured to moderately fine textured, water-deposited material; depth to seasonal high water table, 2½ to 5 feet; depth to bedrock, more than 20 feet.	0 to 8
UnB	Uniontown silt loam, 2 to 6 percent slopes.		8 to 36
UnB2	Uniontown silt loam, 2 to 6 percent slopes, eroded.		36 to 40+
UnC2	Uniontown silt loam, 6 to 12 percent slopes, eroded.		
UoB3	Uniontown silty clay loam, 2 to 6 percent slopes, severely eroded.		
UoC3	Uniontown silty clay loam, 6 to 12 percent slopes, severely eroded.		
UtE	Uniontown soils, 12 to 35 percent slopes.		
Wa	Wakeland silt loam.	Silt loam underlain by silt loam; somewhat poorly drained soil of the bottom land; developed from sediment of neutral or calcareous loess origin; depth to seasonal high water table, 1 to 2 feet; depth to bedrock, more than 20 feet.	0 to 8
			8 to 35+
We	Waverly silt loam.	Silt loam underlain by silty clay loam; poorly drained soil on bottom land; developed from alluvial sediment that washed from loess uplands; depth to seasonal high water table, less than 1 foot; depth to bedrock, more than 20 feet.	0 to 20
			20 to 32+
Wh	Weinbach silt loam.	Silt loam underlain by fine silt loam that, in turn, is underlain by silty clay loam; somewhat poorly drained alluvial soils on stream terraces in Ohio River valley; depth to seasonal high water table, less than 1 foot; depth to bedrock, more than 20 feet.	0 to 5
			5 to 24
			24 to 40
			40 to 42+
WnD2	Wellston silt loam, 12 to 20 percent slopes, eroded.	Silt loam or silty clay loam underlain by silty clay loam that, in turn, is underlain by sandy clay loam and, below that, by sandy loam; well-drained soils on uplands; developed from loess overlying sandstone and shale residuum; depth to seasonal high water table, more than 3 feet; depth to bedrock, 3 to 4 feet.	0 to 6
WoC3	Wellston silty clay loam, 6 to 12 percent slopes, severely eroded.		6 to 26
WoD3	Wellston silty clay loam, 12 to 20 percent slopes, severely eroded.		26 to 34
			34 to 40+
WpA	Wheeling silt loam, 0 to 2 percent slopes.	Silt loam or silty clay loam underlain by silty clay loam that, in turn, is underlain by fine silt loam; well-drained soils on river terraces; developed from alluvium deposited by Ohio River; depth to seasonal high water table, 5 to 10 feet; depth to bedrock, more than 20 feet.	0 to 9
WpB	Wheeling silt loam, 2 to 6 percent slopes.		9 to 38
WpB2	Wheeling silt loam, 2 to 6 percent slopes, eroded.		38 to 50+
WpC2	Wheeling silt loam, 6 to 12 percent slopes, eroded.		
WsC3	Wheeling silty clay loam, 6 to 12 percent slopes, severely eroded.		
WtE	Wheeling soils, 12 to 30 percent slopes.		
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded.	Silt loam underlain by silty clay loam that, in turn, is underlain by plastic silty clay loam and, below that, by clay loam; well drained and moderately well drained soils on uplands; developed from loess overlying sandstone and shale; depth to seasonal high water table, 2½ to 5 feet; depth to bedrock, 4 to 8 feet.	0 to 7
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded.		7 to 19
ZaD2	Zanesville silt loam, 12 to 20 percent slopes, eroded.		19 to 31
ZaD3	Zanesville silt loam, 12 to 20 percent slopes, severely eroded.		31 to 40
			40 to 60+

their estimated physical and chemical properties—Continued

Classification			Permeability	Available water capacity	Reaction
USDA texture	Unified	AASHO			
			Inches per hour	*Inches per inch of soil*	*pH*
Silt loam	ML	A–4	0. 63 to 2. 0	0. 22	5. 6 to 6. 0
Silty clay loam	CL	A–4 or A–6	0. 63 to 2. 0	0. 19	4. 5 to 5. 0
Silt loam	ML or CL	A–4 or A–6	<0. 2	0. 20	4. 5 to 5. 0
Silt loam	ML or CL	A–4 or A–6	0. 2 to 0. 63	0. 20	4. 5 to 5. 0
Loam	ML or CL	A–4 or A–6	0. 63 to 2. 0	0. 18	5. 6 to 6. 5
Fine sandy loam	SM or ML	A–2 or A–4	2. 0 to 6. 3	0. 13	6. 1 to 6. 5
Loamy fine sand	SM	A–2	>6. 3	0. 09	5. 6 to 6. 0
Silty clay or silty clay loam	CL or CH	A–7	0. 2 to 0. 63	0. 15 to 0. 19	5. 6 to 7. 3
Clay	CL or CH	A–7	<0. 063	0. 14	6. 6 to 7. 8
Silty clay	CL or CH	A–7	<0. 063	0. 16	6. 6 to 7. 8
Silt loam	ML	A–4	0. 63 to 2. 0	0. 22	5. 6 to 6. 0
Silt loam	ML or CL	A–4 or A–6	0. 63 to 2. 0	0. 20	5. 1 to 5. 5
Silty clay loam	CL	A–6 or A–7	<0. 2	0. 19	4. 5 to 5. 0
Silt loam	CL	A–6	0. 2 to 0. 63	0. 20	6. 1 to 6. 5
Silt loam or silty clay loam	ML or CL	A–4 or A–6	0. 63 to 2. 0	0. 19 to 0. 22	5. 6 to 6. 0
Silty clay loam	CL	A–6	0. 63 to 2. 0	0. 19	5. 6 to 6. 5
Silt loam	CL	A–6	0. 2 to 0. 63	0. 18	6. 6 to 7. 5
Silt loam	ML	A–4	0. 63 to 2. 0	0. 22	6. 6 to 7. 3
Silt loam	ML or CL	A–4	0. 63 to 2. 0	0. 20	6. 1 to 6. 5
Silt loam	ML or CL	A–4 or A–6	0. 63 to 2. 0	0. 22	5. 1 to 6. 0
Silty clay loam	CL	A–6	0. 63 to 2. 0	0. 19	5. 1 to 5. 5
Silt loam	ML or CL	A–4 or A–6	0. 63 to 2. 0	0. 22	4. 5 to 5. 0
Silt loam	ML or CL	A–4 or A–6	0. 2 to 0. 63	0. 20	4. 5 to 5. 0
Fine silt loam	CL	A–4 or A–6	<0. 2	0. 18	4. 5 to 5. 0
Silty clay loam	CL	A–6 or A–7	<0. 2	0. 19	4. 5 to 5. 0
Silt loam or silty clay loam	ML or CL	A–4 or A–6	0. 63 to 2. 0	0. 18 to 0. 22	5. 1 to 5. 5
Silty clay loam	CL	A–6	0. 63 to 2. 0	0. 19	4. 5 to 5. 0
Sandy clay loam	SC or CL	A–4 or A–6	0. 63 to 2. 0	0. 16	4. 5 to 5. 0
Sandy loam	SM or SC	A–2 or A–4	2. 0 to 6. 3	0. 14	5. 1 to 5. 5
Silt loam	ML or CL	A–4 or A–6	0. 63 to 2. 0	0. 18 to 0. 22	6. 1 to 6. 5
Silty clay loam	CL	A–6	0. 63 to 2. 0	0. 19	4. 5 to 5. 0
Fine silt loam	ML or CL	A–4 or A–6	2. 0 to 6. 3	0. 18	4. 5 to 5. 5
Silt loam	ML	A–4	0. 63 to 2. 0	0. 22	4. 5 to 5. 0
Silt loam	ML or CL	A–6	0. 63 to 2. 0	0. 20	4. 5 to 5. 0
			0. 2 to 0. 63	0. 19	4. 5
Silty clay loam	CL or CH	A–7	<0. 2	0. 19	4. 5 to 5. 0
Silty clay loam	CL or CH	A–7	<0. 2	0. 17	4. 5 to 5. 0
Clay loam	CL or CH	A–6 or A–7			

TABLE 5.—*Engineering*

Soil series and map symbols	Susceptibility to frost action	Suitability as source of topsoil	Suitability for road subgrade when not subject to frost action	Degree of and cause of limitation for—	
				Low-building site (undisturbed)	Domestic septic tank sewage disposal area
Adler (Ad)	Moderate to high.	Good	Poor to fair	Severe: subject to frequent flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table; moderate permeability.
Ashton (As)	Moderate to high.	Good	Poor to fair	Severe: subject to frequent flooding; moderate shrink-swell potential.	Severe: subject to flooding; moderate permeability.
Birds (Bc, Bd)	Moderate to high.	Fair	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to flooding; seasonal high water table; moderate permeability.
Bruno (BrA, BrC)	Low to high	Poor	Poor to good	Severe: subject to frequent flooding.	Severe: subject to flooding; rapid permeability.
Calloway (CaA, CaB)	Moderate	Fair	Poor to fair	Moderate: seasonal high water table; moderate to low shrink-swell potential.	Severe: seasonal high water table; slow permeability.
Captina (CnA, CnB)	Moderate to high.	Fair	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; moderate shrink-swell potential.	Severe: subject to flooding; seasonal high water table; slow permeability.
Collins (Co)	Moderate to high.	Good	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to flooding; seasonal high water table; moderate permeability.
Dekoven (De, Dk, Dw) For interpretations for Wakeland part of Dw, see Wakeland series.	Moderate to high.	Fair to good	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; moderate to high shrink-swell potential.	Severe: subject to flooding; seasonal high water table; moderately slow permeability.
Egam (Ea, Ec)	Moderate to high.	Fair	Poor to fair	Severe: subject to frequent flooding; moderate to high shrink-swell potential; seasonal high water table.	Severe: subject to flooding; seasonal high water table; moderately slow permeability.
Elk (EkA, EkB)	Moderate to high.	Good	Poor to fair	Severe: subject to frequent flooding; moderate to high shrink-swell potential.	Severe: subject to flooding; moderately slow permeability.

interpretations

Soil features that limit suitability for—						
Highways	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Subject to flooding; seasonal high water table; susceptible to frost action.	Excessive seepage because of pervious substratum; subject to flooding.	Slight piping hazard; instability.	Subject to flooding; seasonal high water table.	Needs drainage in places.	Generally not needed.	Subject to flooding.
Subject to flooding; susceptible to frost action.	Subject to seepage; subject to flooding.	Instability	Not needed	None	Generally not needed.	None.
Subject to flooding; seasonal high water table; susceptible to frost action.	Excessive seepage because of pervious substratum; subject to flooding.	Instability; subject to piping; seasonal high water table.	Subject to flooding; seasonal high water table.	Seasonal high water table; needs drainage.	Generally not needed.	Subject to flooding; seasonal high water table.
Subject to flooding; highly erodible on embankments; susceptible to frost action in places.	Rapid seepage rate; subject to flooding.	Instability; low resistance to piping.	Not needed	Low water-holding capacity; rapid intake rate.	Generally not needed.	High erodibility; low water-holding capacity.
Seasonal high water table; susceptible to frost action.	None	Instability; subject to piping.	Slow permeability; fragipan at depth of about 20 inches.	Slow permeability; seasonal high water table.	Difficult to vegetate channel.	Seasonal high water table; difficult to vegetate.
Subject to flooding; seasonal high water table; susceptible to frost action.	Subject to flooding.	Instability	Slow permeability; fragipan at depth of 15 to 30 inches.	Slow permeability; needs drainage in places.	Difficult to vegetate channel.	Seasonal high water table; difficult to vegetate.
Subject to flooding; susceptible to frost action.	Pervious substratum in places.	Subject to slight piping.	Subject to flooding; seasonal high water table.	Moderate permeability; needs drainage in places.	None	None.
Subject to flooding; seasonal high water table; susceptible to frost action.	Subject to seepage.	Subject to slight piping and sliding.	Subject to flooding; seasonal high water table.	Moderately low permeability; needs drainage.	Not needed	None.
Subject to flooding; susceptible to frost action; seasonal high water table.	Subject to flooding.	Instability	Subject to flooding.	Subject to flooding; moderately slow permeability.	Generally not needed.	None.
Subject to flooding; susceptible to frost action.	Subject to flooding.	None	Subject to flooding.	Moderately slow permeability.	Generally not needed.	Subject to flooding.

TABLE 5.—*Engineering*

Soil series and map symbols	Susceptibility to frost action	Suitability as source of topsoil	Suitability for road subgrade when not subject to frost action	Degree of and cause of limitation—	
				Low-building site (undisturbed)	Domestic septic tank sewage disposal area
Falaya (Fa)	Moderate to high.	Good	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to flooding; seasonal high water table.
Gilpin (GeE) For interpretations for Wellston part of GeE, see Wellston series.	Moderate to high.	Fair	Poor to fair	Severe: moderately steep slopes; shallow to rock.	Severe: moderately steep slopes; shallow to rock.
Ginat (Gn, Go)	Moderate to high.	Fair	Poor to fair	Severe: subject to infrequent flooding; seasonal high water table; moderate to high shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; slow permeability.
Grenada (GrA, GrB, GrB2, GrC2, GrC3).	Moderate to high.	Poor to fair	Poor to fair	Moderate: seasonal high water table; moderate shrink-swell potential.	Severe: seasonal high water table; slow permeability; some steep slopes.
Henshaw (He)	Moderate to high.	Fair	Poor to fair	Severe: subject to infrequent flooding; seasonal high water table; moderate shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; moderately slow permeability.
Huntington (HnA)	Low to high	Good	Poor to good	Severe: subject to frequent flooding.	Severe: subject to flooding; rapid permeability.
Huntington (HsA, HsC)	Moderate to high.	Good	Poor to fair	Severe: subject to frequent flooding; low to moderate shrink-swell potential.	Severe: subject to flooding.
Lakin (LaB)	Low to high	Poor	Fair to good	Slight: subject to infrequent flooding.	Slight: subject to infrequent flooding; rapid permeability.
Lindside (Ld, Le)	Moderate to high.	Fair to good	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to flooding; seasonal high water table.
Litz (LmF) For interpretations for Muskingum part of LmF, see Muskingum series.	Low to high	Fair	Poor to good	Severe: steep slopes; shallow to rock; low to moderate shrink-swell potential.	Severe: steep slopes; shallow to rock.
Loring (LnA, LnB, LnB2, LnC2, LnD2, LoB3, LoC3, LoD3).	Moderate to high.	Fair to good	Poor to fair	Moderate: moderate to high shrink-swell potential.	Severe: moderately slow permeability.

interpretations—Continued

Soil features that limit suitability for—						
Highways	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Subject to flooding; seasonal high water table; susceptible to frost action.	Rapid seepage rate.	Subject to piping; high erodibility.	Subject to flooding; seasonal high water table.	Subject to flooding; moderately slow permeability.	Generally not needed.	Seasonal high water table; subject to flooding.
Shallow to rock; moderately steep slopes; susceptible to frost action.	Shallow to rock; moderately steep slopes.	Shortage of fill material in places.	Generally not needed.	Generally not needed.	Moderately steep slopes.	Moderately steep slopes; shallow to rock.
Subject to flooding; seasonal high water table; susceptible to frost action.	Highly permeable substratum in places.	Seasonal high water table.	Slow permeability; high water table; subject to flooding.	Slow permeability; needs drainage in places.	Seasonal high water table.	Wetness limits kinds of vegetation.
Seasonal high water table; susceptible to frost action.	Generally not needed.	Subject to piping; instability.	Fragipan; slow permeability.	Slow permeability.	Generally not needed.	Generally not needed.
Subject to infrequent flooding; seasonal high water table; susceptible to frost action.	None	Seasonal high water table.	Seasonal high water table.	Moderately slow permeability; needs drainage in places.	None	Seasonal high water table.
Subject to flooding; highly erodible on embankments; susceptible to frost action in places.	Rapid seepage rate.	Subject to piping; high erodibility.	Generally not needed.	Rapid permeability.	Generally not needed.	Subject to flooding.
Subject to flooding; susceptible to frost action.	Excessive seepage in many places because of moderately rapid permeability.	Subject to piping.	Generally not needed.	Moderately rapid permeability.	Subject to flooding.	Subject to flooding.
Subject to infrequent flooding; highly erodible on embankments; susceptible to frost action in places.	Rapid permeability.	Subject to piping.	Generally not needed.	Rapid permeability.	Generally not needed.	High erodibility.
Subject to flooding; seasonal high water table; susceptible to frost action.	Subject to some seepage.	Subject to piping; instability.	Seasonal high water table; subject to flooding.	Seasonal high water table; needs drainage in places.	Generally not needed.	Generally not needed.
Steep slopes; shallow to rock; susceptible to frost action in places.	Highly pervious subsoil; shallow to rock.	Shortage of fill material in places.	Generally not needed.	Generally not needed.	Steep slopes; shallow to rock.	Steep slopes; shallow to rock.
Slightly plastic clay subsoil; susceptible to frost action.	None	Instability; subject to piping.	Moderately slow permeability.	Moderately slow permeability.	None	None.

TABLE 5.—*Engineering*

Soil series and map symbols	Susceptibility to frost action	Suitability as source of top soil	Suitability for road subgrade when not subject to frost action	Degree of and cause of limitation—	
				Low-building site (undisturbed)	Domestic septic tank sewage disposal area
Markland (MdB, MeC3, MhB2, MhC2, MkE).	Moderate to high.	Poor to fair	Poor to fair	Slight to severe: [1] subject to infrequent flooding; high shrink-swell potential; seasonal high water table.	Severe: subject to infrequent flooding; moderately slow permeability.
McGary (Ml)	Moderate to high.	Poor	Poor to fair	Moderate: subject to infrequent flooding; seasonal high water table; high shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; slow permeability.
Melvin (Mm, Mn)	Moderate to high.	Poor to fair	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; moderate to high shrink-swell potential.	Severe: subject to flooding; seasonal high water table; moderately slow permeability.
Memphis (MoB, MoB2, MoC2, MoD2, MoE, MoF, MpB3, MpC3, MpD3).	Moderate to high.	Good	Poor to fair	Slight to severe: [1] moderate to high shrink-swell potential.	Slight to severe: [2] moderate permeability.
Morganfield (Mr)	Moderate to high.	Good	Poor to fair	Severe: subject to frequent flooding; low to moderate shrink-swell potential.	Severe: subject to flooding.
Muskingum (LmF)	Moderate to high.	Poor	Poor to fair	Severe: steep slopes; shallow to rock.	Severe: steep slopes; shallow to rock.
Newark (Ne, Ns)	Moderate to high.	Fair to good	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; moderate shrink-swell potential.	Severe: subject to flooding; seasonal high water table.
Patton (Pa, Po, Ps)	Moderate to high.	Fair to good	Poor to fair	Severe: subject to infrequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; moderately slow permeability.
Robertsville (Rn)	Moderate to high.	Fair	Poor to fair	Severe: subject to infrequent flooding; seasonal high water table; moderate shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; slow permeability.
Sciotoville (ScA, ScB, SeA, SeB, SeB2).	Moderate to high.	Fair	Poor to fair	Moderate: subject to infrequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; slow permeability.

See footnotes at end of table.

interpretations—Continued

Soil features that limit suitability for—						
Highways	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Embankment				
Subject to infrequent flooding; some slopes are steep; plastic subsoil; susceptible to frost action; seasonal high water table.	None	Plastic soil material (good for core).	Plastic subsoil; moderately slow permeability.	Moderately slow permeability.	None	None.
Subject to infrequent flooding; seasonal high water table; plastic subsoil; susceptible to frost action.	None	Plastic soil material (good for core).	Slow permeability; therefore, field tests should be made to determine feasibility of tiling.	Slow permeability; needs drainage in places.	Plastic soil material.	Wetness limits kinds of plants.
Subject to flooding; seasonal high water table; subsoil is plastic in some places; susceptible to frost action.	Highly permeable sandy loam in subsoil, in some places; subject to flooding.	Subject to piping in places.	Subject to flooding; moderately slow permeability.	Generally not needed.	Generally not needed.	Seasonal high water table.
Some steep slopes; slightly plastic subsoil; susceptible to frost action.	None	Instability; subject to piping.	Generally not needed.	None	None	None.
Subject to flooding; susceptible to frost action.	Subject to some seepage.	Subject to some piping.	Subject to flooding.	None	Generally not needed.	Subject to flooding.
Steep slopes; shallow to bedrock; susceptible to frost action.	Shallow to rock	Shortage of fill material in places.	Generally not needed.	Generally not needed.	Steep slopes; shallow to rock.	Steep slopes; shallow to rock.
Subject to flooding; seasonal high water table; susceptible to frost action.	Excessive seepage in subsoil.	Subject to piping.	Subject to flooding; seasonal high water table.	Needs drainage in some places.	Generally not needed.	Subject to flooding; seasonal high water table.
Subject to infrequent flooding; seasonal high water table; susceptible to frost action.	Generally not needed.	Instability; subject to piping.	Moderately slow permeability.	Moderately slow permeability; needs drainage in places.	Generally not needed.	Subject to infrequent flooding; seasonal high water table.
Subject to infrequent flooding; seasonal high water table; susceptible to frost action.	Subject to flooding.	None	Slow permeability; subject to infrequent flooding.	Slow permeability.	Generally not needed.	Subject to infrequent flooding; seasonal high water table.
Subject to infrequent flooding; seasonal high water table; susceptible to frost action.	None	Instability; subject to piping.	Fragipan; slow permeability.	Slow permeability below a depth of 18 inches.	None	None.

TABLE 5.—*Engineering*

Soil series and map symbols	Susceptibility to frost action	Suitability as source of topsoil	Suitability for road subgrade when not subject to frost action	Degree of and cause of limitation—	
				Low-building site (undisturbed)	Domestic septic tank sewage disposal area
Sequatchie (ShA, ShB)	Low to high	Good	Poor to good	Slight: subject to infrequent flooding.	Slight: subject to infrequent flooding; rapid permeability.
Sharkey (Sk, So)	Moderate to high.	Poor	Poor	Severe: subject to frequent flooding; seasonal high water table; high shrink-swell potential.	Severe: subject to flooding; seasonal high water table; slow permeability.
Taft (Ta)	Moderate to high.	Poor	Poor to fair	Severe: subject to infrequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; slow permeability.
Uniontown (UnA, UnB, UnB2, UnC2, UoB3, UoC3, UtE).	Moderate to high.	Fair to good	Poor to fair	Slight to severe: [1] subject to infrequent flooding; low to moderate shrink-swell potential; seasonal high water table.	Severe: subject to infrequent flooding; seasonal high water table; moderately slow permeability.
Wakeland (Wa, Dw)	Moderate to high.	Fair	Poor to fair	Severe: subject to frequent flooding; seasonal high water table.	Severe: subject to flooding; seasonal high water table; moderate permeability.
Waverly (We)	Moderate to high.	Fair	Poor to fair	Severe: subject to frequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to flooding; seasonal high water table; moderate permeability.
Weinbach (Wh)	Moderate to high.	Poor	Poor to fair	Moderate: subject to infrequent flooding; seasonal high water table; low to moderate shrink-swell potential.	Severe: subject to infrequent flooding; seasonal high water table; slow permeability.
Wellston (WnD2, WoC3, WoD3, GeE).	Low to high	Fair to good	Poor to good	Moderate: strong slopes; moderately shallow to rock.	Moderate: strong slopes; moderately shallow to rock.
Wheeling (WpA, WpB, WpB2, WpC2, WsC3, WtE):	Moderate to high.	Good	Poor to fair	Slight to severe: [1] Subject to infrequent flooding; moderate permeability.	Slight: subject to infrequent flooding; moderate permeability.
Zanesville (ZaC2, ZaC3, ZaD2, ZaD3).	Moderate to high.	Fair to good	Poor to fair	Moderate: strong slopes; moderate to high shrink-swell potential.	Severe: slow permeability.

[1] Limitation is slight on slopes of 0 to 8 percent, moderate on slopes of 8 to 20 percent, and severe on slopes of more than 20 percent.

interpretations—Continued

Soil features that limit suitability for—						
Highways	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterway
	Reservoir area	Embankment				
Subject to infrequent flooding; highly erodible on embankments; susceptible to frost action in places.	Excessive seepage because of pervious substratum.	Subject to piping.	Generally not needed.	Rapid permeability.	Generally not needed.	Highly erodible subsoil.
Subject to flooding; seasonal high water table; plastic subsoil with high shrink-swell potential; susceptible to frost action.	Subject to flooding.	Very plastic soil material.	Very slow permeability; subject to flooding.	Very slow permeability; subject to flooding.	None	Seasonal high water table.
Subject to infrequent flooding; seasonal high water table; susceptible to frost action.	None	Instability; subject to piping.	Slow permeability; therefore, field tests should be made to determine feasibility of tiling.	Slow permeability; subject to infrequent flooding.	None	Subject to infrequent flooding; slow permeability.
Subject to infrequent flooding; susceptible to frost action.	None	Instability; subject to piping.	Seasonal high water table.	Moderately slow permeability.	None	None.
Subject to flooding; seasonal high water table; susceptible to frost action.	Subject to some seepage.	Subject to some piping.	Seasonal high water table.	Seasonal high water table; needs drainage.	Generally not needed.	Seasonal high water table; subject to flooding.
Subject to flooding; seasonal high water table; susceptible to frost action.	Subject to some seepage.	Subject to some piping.	Seasonal high water table; subject to flooding.	Seasonal high water table; needs drainage in places.	Generally not needed.	Seasonal high water table; subject to flooding.
Subject to infrequent flooding; seasonal high water table; susceptible to frost action.	None	None	Fragipan; slow permeability; seasonal high water table.	Slow permeability; needs drainage in places.	None	Seasonal high water table.
Strong slopes; moderately shallow to rock; susceptible to frost action in places.	Moderately shallow to rock.	Instability; subject to piping.	Generally not needed.	Strong slopes	Strong slopes	Strong slopes.
Subject to infrequent flooding; some moderately steep slopes; susceptible to frost action.	Pervious substratum permits excessive seepage.	Instability; subject to piping.	Generally not needed.	Moderate permeability.	None	Moderately steep slopes in some places.
Strong slopes; firm subsoil; susceptible to frost action.	None	Instability; subject to piping.	Slow permeability.	Slow permeability; strong slopes.	Some strong slopes.	Some strong slopes.

[2] Limitation is slight on slopes of 0 to 8 percent, moderate on slopes of 8 to 15 percent, and severe on slopes of more than 15 percent.

The underlying sandstone and interbedded shale are of the Pennsylvanian formation (*11*). Limestone makes up only a minor part of the bedrock; it outcrops in a few places. Soils that developed from the weathered sandstone and shale include the Muskingum, Litz, Gilpin, Wellston, and Zanesville. Probably, some loess covered the sandstone and shale and thus figured in the development of these soils.

Alluvial deposits of variable origins are extensive along the major streams. The Ohio River and the Green River have large drainage basins and have brought in sediment from all of the parent materials in their drainage area. Sedimentary rocks, consisting of sandstone, shale, and limestone, are extensive in the watersheds of both rivers; loess covers large areas of both watersheds; and glacial drift is prominent north of the Ohio River. Other parent materials in the drainage area of these rivers have contributed mineral sediments that have been weathered to varying degrees.

Accordingly, the soils on the bottom lands along the Ohio and Green Rivers vary widely in texture. Those nearest to the river channel are sandy, for the most part. Those soils that are some distance from the river channel generally are finer textured. Those soils nearest to the limestone regions reflect the influence of the limestone in their dark color and nearly neutral reaction. These productive soils belong to the Huntington, Lindside, Newark, and Egam series.

The small streams have small drainage basins, and therefore the deposits along these streams consist of sediment from the nearby loess-covered uplands. The soils that formed on these stream bottom lands are silty, like the loess. These soils belong to the Adler, Birds, Collins, Falaya, Morganfield, Wakeland, and Waverly series.

The alluvial deposits on terraces of the major streams gave rise to fine-textured soils, including the Markland and the McGary. The soils that formed on terraces of the smaller streams generally are more silty because of their proximity to the loess uplands. These soils include the Uniontown, Henshaw, and Patton.

Climate

The temperate, humid climate of Henderson County is uniform and, therefore, does not account for major differences among the soils. Such a climate, however, induces rapid chemical reactions in a soil.

Rainfall is enough to cause the movement of soluble substances and clayey substances downward through the soil. Some of these substances are relocated in the soil, and others are leached completely out of the soil. The soils are frozen for only short periods; consequently, translocation and leaching of material goes on most of the time.

In addition to their effect on chemical reactions, rainfall and temperature influence plant growth and microbiological activity.

Living organisms

Before the soils were cleared by frontiersmen, the native vegetation in the county was mostly hardwoods. The proportion of the various species differed, as did the density of the stands and the rate of growth, mainly because of differences in parent material and in topography. But the forest cover was similar and therefore caused only minor differences among the soils in this county, though it had a great influence on specific characteristics common to all the soils.

The older soils reflect the influence of the native vegetation. These soils are acid in reaction and have a thin, dark-colored surface layer, a leached subsurface layer, and a subsoil that is more clayey than their surface layer and their substratum. These differences between the various layers are not apparent in the younger alluvial soils.

Some soils—specifically, the Sharkey, Patton, and Dekoven—are nearly neutral in reaction and high in content of organic matter and have a thick, dark-colored surface layer, all of which suggests that early in their development these soils were under grasses, sedges, lilies, canes, or other marshy vegetation.

Organisms, such as insects, earthworms, crayfish, rodents, protozoans, bacteria, and fungi, have had less effect on soil development than has vegetation. Macro-organisms, especially the burrowing animals, have caused some mixing of the soil material, mostly that of the surface layer. Micro-organisms have helped to decompose organic matter.

Man has influenced soil formation for only a short time, and his influence has been minor. Nevertheless, he has greatly altered soils by clearing them of trees and by plowing, grading, and leveling them. His alterations, however, have been restricted mainly to the surface layer.

Topography

Through its effect on drainage, runoff, erosion, and soil depth, topography has not only influenced soil development in Henderson County but also accounts for some of the major differences among the soils in the county.

The range in topography is from level to steep. Poorly drained and very poorly drained soils generally are level; somewhat poorly drained soils are nearly level or gently sloping; and well-drained to excessively drained soils are strongly sloping to steep.

On the level and nearly level soils, surface runoff is slow, and a large amount of water enters the soil and percolates downward through it. Little or no soil material is lost through geologic erosion, and there is a continuing accumulation of weathered soil material.

At the other extreme, only a small amount of water infiltrates a steep soil and a considerable amount is lost through runoff. As a result, geologic erosion is rapid. On the loess-covered uplands in this county, steep soils have a thinner mantle of loess than less steep soils because of rapid geologic erosion.

Time

Geologically, most of the soils in Henderson County are relatively young. The oldest soils date from the time of the continental glaciers of the Pleistocene epoch. The glaciers did not reach Henderson County. During the Illinoian glaciation, about 150,000 years ago, the ice extended to a point within 7 miles of the northwestern corner of the county (*17*). In the last glacial stage, the Wisconsin, which started about 25,000 years ago and ended about 11,000 years ago, the most forward advance of the ice was to about 100 miles north of the county (*12*). Nevertheless, the streams that drained away from the ice sheets carried glacial sediment into this area and left it on the old terraces. The wind also carried glacial sediment and left it on the uplands.

Loess was deposited during the waning of the ice sheets. Most of the Peorian loess was deposited during the Wisconsin glacial stage, and probably the greatest and last deposition came late in this stage. Hence, the Memphis, Loring, Grenada, and Calloway soils are about 11,000 to 14,000 years old.

The Wellston and Zanesville soils probably began to develop late in the Wisconsin glacial stage. The upper part of these soils developed from loess, and their lower part from sandstone and shale.

The soils on terraces along tributaries of the Ohio River developed from sediment that was deposited no later than the end of the Wisconsin glacial stage (*17*). These soils are the Uniontown, Henshaw, Patton, Markland, and McGary.

The soils on terraces along the Ohio River apparently began to develop late in the Wisconsin glacial stage. These soils, which include the Wheeling, Sciotoville, Weinbach, and Ginat, generally are at a lower elevation than the terrace soils along tributaries of the Ohio River. For this reason, it is believed that the Ohio River terrace soils are remnants of soils that developed from the material left by the river as it receded from its highest water level.

Similarities in profile development between the Ohio River terrace soils and the soils on the loess uplands indicate that both began to develop at about the same time.

The Elk, Captina, Taft, and Robertsville soils on the narrow terraces along the Green River are at a lower elevation than the other terrace soils in the county. Their position seems to indicate that they are the youngest of the terrace soils.

The soils on the bottom lands are the youngest in the county, as is indicated by their weak profile development. The dominant profile characteristics of these soils reflect the order in which the layers were laid rather than later changes that have taken place. Some of these soils frequently receive new sediment. The Morganfield, Adler, Wakeland, Birds, Collins, Falaya, Waverly, Huntington, Lindside, Newark, Melvin, and Bruno are the soils of the bottom land in Henderson County.

Morphology of the Soils

The morphology of soils is expressed in the kind and prominence of their horizons. In Henderson County, the soils have either distinct or faint horizons. Nearly all of the soils on uplands and along stream terraces have well-developed, distinct horizons. The soils on bottom lands, because of their youth, have faint horizons.

Horizonation in soils is the result of several processes. The most important of these processes are: (1) accumulation of organic matter, (2) leaching of calcium carbonate and other bases, (3) downward movement of silicate clay, and (4) reduction and transfer of iron. In most soils, two or more of these processes are active.

Organic matter has accumulated in the surface horizon of most soils in the county. The humus that results from the decay of plant and animal residues remains in the soil and gives a dark color to the surface horizon. Forested soils, for example, have a loose layer of leaf litter over a thin, dark-colored A1 mineral horizon. The underlying horizons are lighter colored and contain small amounts of organic matter. The very poorly drained Sharkey, Patton, and Dekoven soils are exceptions. They have a much thicker A1 horizon than is normal for forested soils.

Calcium carbonate and other bases have been leached from most of the soils in the county. The soils of the uplands and terraces are essentially free of calcium carbonate throughout their solum. Some terrace soils, however, and upland soils that have a thick mantel of loess have an accumulation of calcium carbonate below their solum. Even the young alluvial soils have lost some calcium carbonate and other bases, as is indicated by their acid reaction. The leaching of bases preceded the translocation of silicate clay in some soils.

Percolating water in the soils of the uplands and terraces has moved silicate clay downward from the surface horizon into the subsoil, giving rise to A and B horizons. The eluviated A2 horizon has a low content of clay. The illuviated B horizon is finer textured than the A2 horizon and has clay coatings on the surface of its blocky peds and in its pores. There has been very little downward movement of clay in the young alluvial soils.

Reduction and transfer of iron have occurred in the very poorly drained, poorly drained, and somewhat poorly drained soils. The characteristic gray color of these soils is indicative of the chemical reduction of iron oxide (*16*), a soil- forming process called gleization. Also, on uplands and terraces, the yellowish-brown color of the moderately well drained soils and the brown or reddish-brown color of the well drained soils and of the excessively drained soils is due largely to iron oxides. Some transfer of iron and cementation of iron into concretions is often associated with gleization.

Horizons form in a soil because of gains, losses, and alterations (*14*). To illustrate, a typical well-drained soil has a thin A1 horizon that is largely the result of gains in organic matter. Its A2 horizon is distinguishable mainly because of the loss of silicate clay by eluviation, and its B horizon formed because it gained silicate clay by illuviation, the reverse of eluviation. Furthermore, sesquioxides (iron and aluminum) may have been lost from the surface horizon and accumulated in deeper horizons; and, due to leaching, the entire profile likely has lost carbonates and other bases. If the soil is cultivated, the A1 and A2 horizons are altered by plowing, and the result is a plow layer. In less well drained soils, the reduction of iron oxide and the formation of iron concretions would further differentiate the horizons.

Commonly, a characteristic of poorly drained to moderately well drained, older soils on level and gently sloping terraces and uplands is a compact, brittle horizon of high bulk density and slow permeability. This horizon occurs in the lower part of the profile and is called a fragipan. It is leached of carbonates and other bases, is low in organic-matter content, and is gleyed to varying degrees. Its genesis is obscure. Perhaps its formation was a result of the downward movement of clay and silt, although the fragipan in places shows less evidence of clay concentration than the overlying B2 horizon. Pressure from the weight of the upper horizons may have been a contributing factor.

Alluvial soils, because of their youth, have little horizon differentiation. They have a very thin A1 horizon and have no A2 or B horizons because sufficient clay and sesquioxides have not moved from the surface horizon into the

subsoil. The leaching of carbonates and other bases, which apparently must precede the downward movement of silicate clay, has progressed to varying degrees. The wet alluvial soils have developed gleyed horizons, and some of the moderately well drained soils are gleyed deep in their profile.

In some alluvial soils, organic matter has decayed, and the humus has darkened the A1 horizon. This horizon is thicker than normal for alluvial soils. Some leaching of carbonates and of other bases has taken place, but little clay and little organic matter have moved downward in the profile. In places, calcium carbonate has accumulated as concretions in the substratum.

Soil Classification

One of the objectives of soil classification is to establish a basis for common understanding of soils. Classification helps to organize knowledge of soils and to apply that knowledge to areas that range from plots of several acres to large geographic bodies, including continents.

The system of soil classification used here was developed in 1938 (*2*). It consists of six major categories. Beginning with the highest and most inclusive, the categories are the order, the suborder, the great soil group, the family, the series, and the type. The higher categories, the order, the suborder, and the great soil group, were revised in 1949 (*18*). In the highest category, soils are grouped into three orders, zonal, intrazonal, and azonal, whereas thousands of soil types are recognized in the lowest category. The suborder and family categories are seldom used and are not discussed in this report. Attention has been given mainly to the classification of soils into soil types and series within counties or comparable areas and to the subsequent grouping of series into great soil groups and soil orders.

The lower categories, the series and the type, are explained in the section "How This Soil Survey Was Made." The soil phase, a subdivision of the soil type, is also explained in that section.

In table 6 the soil series of this county are arranged by order and great soil group, and some distinguishing characteristics of each soil series are shown. In the pages that follow, the characteristics of each order, great soil group, and series are described. A representative profile of a soil in each series and the permissible range of characteristics for each series are given.

Zonal order

The zonal order consists of soils that generally have well-developed characteristics. Zonal soils have been exposed to the influence of living organisms and climate for a long period of time. The major changes that accompany soil development have taken place, and in the oldest soils an apparent state of equilibrium has been reached. Zonal soils develop on undulating topography, under good drainage, and from parent materials that are not extreme in either texture or composition. They generally have well-differentiated horizons. The degree of differentiation commonly is moderate to strong.

The zonal soils in Henderson County are classified in three of the great soil groups—Gray-Brown Podzolic, Red-Yellow Podzolic, and Sol Brun Acide.

GRAY-BROWN PODZOLIC SOILS

This great group consists of soils that have, where undisturbed, a thin organic cover over a thin organic-mineral horizon that, in turn, is over a grayish-brown leached horizon. Below the leached horizon is a brown illuviated horizon.

In Henderson County the Elk, Henshaw, Markland, Memphis, Uniontown, and Wheeling series are representative of the central concept of this great soil group. The Elk, Memphis, and Wheeling soils are well drained; the Markland and Uniontown soils are well drained and moderately well drained; and the Henshaw soils are somewhat poorly drained. All of these soils have an A horizon of silt loam and a B horizon of clay accumulation. The A and B horizons are acid. The C horizon of the well-drained soils generally is acid, and that of the less well drained soils generally is alkaline and may be calcareous.

Soils of the Grenada, Loring, and Sciotoville series also belong to the Gray-Brown Podzolic great soil group, but they have a fragipan at a depth of about 20 to 30 inches. Generally, the fragipan is mottled and has gray streaks that define polygons. It ranges from several inches to about 2 feet in thickness. It is hard when dry and is compact, firm or very firm, and brittle when moist. Consequently, it impedes water and root penetration. It is very low in content of organic matter and has high bulk density.

The Loring soil has a weaker developed fragipan than the Grenada and Sciotoville soils, and it is better drained. All of these soils are better drained than the Planosols, which also have a fragipan.

Gray-Brown Podzolic soils that intergrade to Alluvial soils are represented in Henderson County by the Ashton and Sequatchie series. Ashton and Sequatchie soils developed in relatively young alluvium and, therefore, have weak profile development. Ashton soils have finer texture, stronger structure, and firmer consistence than Sequatchie soils, and they have slightly stronger horizon development. The more mature Ashton soils grade to soils in the Wheeling and Elk series. Sequatchie soils have a small amount of clay in their B horizon. This clay is an indication that illuviation is taking place. The sand in the Sequatchie soils probably is quartz.

Gray-Brown Podzolic soils that intergrade to Red-Yellow Podzolic soils are represented by the Gilpin and Wellston series. Gilpin and Wellston soils have some of the characteristics of both great soil groups. They have a thin A1 horizon over a grayish-brown leached A2 horizon that, in turn, is over a brown B horizon. They have some sand in the C horizon. Base saturation generally is low. Wellston soils are deeper than Gilpin soils.

Elk series.—This series consists of well-drained Gray-Brown Podzolic soils that developed on terraces from mixed alluvium. The alluvium washed, to a large extent, from limestone areas and was deposited by the Green River. The slope range is 0 to 6 percent.

The Elk and Captina soils are members of the same catena. Elk soils differ from Captina soils in that they are redder and have no fragipan. They have slightly more uniform characteristics and a higher content of clay in their B horizon than Wheeling soils, which developed from slightly coarser textured sediment deposited by the Ohio River. They are redder, less mottled, and coarser textured than Uniontown, Markland, and Henshaw soils, and are more acid in their subsoil.

TABLE 6.—*Classification of soil series into higher categories and significant characteristics of each series*

Order, great soil group, and soil series	Brief profile description	Topographic position	Drainage class	Slope range	Parent material	Degree of profile development
ZONAL ORDER						
A. Gray-Brown Podzolic group:						
1. Central concept—				*Percent*		
Elk	Dark-brown, very friable silt loam over brown, friable silty clay loam.	Terraces	Well drained	0 to 6	Green River alluvium.	Medium.
Henshaw	Brown, very friable silt loam over mottled yellowish-brown and light brownish-gray, firm silty clay loam.	Terraces	Somewhat poorly drained.	0 to 4	Alluvium derived from calcareous loess.	Medium to strong.
Markland	Brown, very friable silt loam over dark yellowish-brown, firm silty clay.	Terraces	Well drained and moderately well drained.	2 to 35	Calcareous water-deposited clay.	Strong.
Memphis	Brown, very friable silt loam over reddish-brown, slightly firm silty clay loam.	Uplands	Well drained	2 to 50	Loess	Medium to strong.
Uniontown	Grayish-brown, very friable silt loam over yellowish-brown, firm silty clay loam.	Terraces	Well drained and moderately well drained.	0 to 35	Alluvium derived from calcareous loess.	Strong.
Wheeling	Brown, very friable silt loam over brown, firm silty clay loam.	Terraces	Well drained	0 to 30	Ohio River alluvium.	Medium to strong.
2. With a fragipan—						
Grenada	Brown, very friable silt loam over yellowish-brown, firm silt loam; a fragipan is at a depth of about 24 inches.	Uplands	Moderately well drained.	0 to 12	Loess	Medium to strong.
Loring	Brown, very friable silt loam over dark-brown, firm silty clay loam; a fragipan is at a depth of about 30 inches.	Uplands	Well drained and moderately well drained.	0 to 20	Loess	Medium to strong.
Sciotoville	Brown, very friable silt loam over yellowish-brown, firm silty clay loam; a fragipan is at a depth of about 24 inches.	Terraces	Moderately well drained.	0 to 6	Ohio River alluvium.	Medium to strong.
3. Intergrading to Alluvial soils—						
Ashton	Dark-brown, very friable silt loam over dark-brown, firm silty clay loam.	Terraces	Well drained	0 to 4	Ohio River and Green River alluvium.	Weak.
Sequatchie	Dark-brown, very friable loam over brown, friable fine sandy loam.	Terraces	Well drained	0 to 6	Ohio River and Green River alluvium.	Weak.
4. Intergrading to Red-Yellow Podzolic soils—						
Gilpin	Brown, very friable silt loam over strong-brown, friable silty clay loam.	Uplands	Well drained	20 to 30	Thin mantle of loess over sandstone and shale residuum.	Medium.
Wellston	Brown, friable silt loam over brown or reddish-brown, firm silty clay loam.	Uplands	Well drained	6 to 30	Thin mantle of loess over sandstone and shale residuum.	Medium.

TABLE 6.—*Classification of soil series into higher categories and significant characteristics of each series*—Continued

Order, great soil group, and soil series	Brief profile description	Topographic position	Drainage class	Slope range	Parent material	Degree of profile development
ZONAL—ORDER Continued						
B. Red-Yellow Podzolic group:						
1. With a fragipan—				*Percent*		
Captina	Brown, very friable silt loam over yellowish-brown, friable silty clay loam; a fragipan is at a depth of about 24 inches.	Terraces	Moderately well drained.	0 to 6	Green River alluvium.	Medium to strong.
Zanesville	Brown, friable silt loam over brown, firm silty clay loam; a fragipan is at a depth of about 24 to 30 inches.	Uplands	Well drained and moderately well drained.	6 to 25	Thin mantle of loess over sandstone and shale residuum.	Medium to strong.
2. Intergrading to Lithosols—						
Litz	Brown, very friable silt loam over brown, friable silty clay loam.	Uplands	Somewhat excessively drained.	30 to 50	Thin mantle of loess over sandstone and shale residuum.	Medium.
C. Sol Brun Acide group:						
1. Intergrading to Lithosols—						
Muskingum	Pale-brown, very friable silt loam that grades to partly weathered bedrock, which is at a depth of about 22 inches.	Uplands	Somewhat excessively drained.	30 to 50	Loess over sandstone and shale.	Weak.
INTRAZONAL ORDER						
A. Humic Gley group:						
Dekoven	Nearly black, very friable silt loam over mottled dark grayish-brown and light olive-brown, firm silty clay loam.	Bottom lands.	Very poorly drained.	0 to 2	Alluvium derived from alkaline loess.	Very weak.
Patton	Black, very friable silt loam or silty clay loam over mottled dark-gray and light olive-brown, friable silty clay loam.	Terraces	Very poorly drained.	0 to 2	Alluvium derived from calcareous loess.	Weak.
B. Low-Humic Gley group:						
Birds	Grayish-brown, very friable silt loam over mottled gray and brown, friable or firm light silty clay loam.	Bottom lands.	Poorly drained	0 to 2	Alluvium derived from neutral loess.	Very weak.
Melvin	Grayish-brown, friable silty clay loam or silt loam over mottled gray and brown silty clay loam.	Bottom lands.	Poorly drained	0 to 2	Ohio River and Green River alluvium.	Very weak.
Waverly	Brown, friable silt loam over mottled gray and brown, very friable silt loam.	Bottom lands.	Poorly drained	0 to 3	Alluvium derived from acid loess.	Very weak.
C. Planosol group:						
Calloway	Brown, very friable silt loam over mottled yellowish-brown and light brownish-gray, very friable silt loam; a fragipan is at a depth of about 20 inches.	Uplands and terraces.	Somewhat poorly drained.	0 to 6	Loess	Medium.
Ginat	Brown, very friable silt loam over mottled gray and brown, friable silt loam or silty clay loam; a fragipan is at a depth of about 28 inches.	Terraces	Poorly drained	0 to 2	Ohio River alluvium.	Medium.

TABLE 6.—*Classification of soil series into higher categories and significant characteristics of each series*—Continued

Order, great soil group, and soil series	Brief profile description	Topographic position	Drainage class	Slope range	Parent material	Degree of profile development
INTRAZONAL ORDER—Con.						
C. Planosol group—Con.				*Percent*		
McGary	Grayish-brown, very friable silt loam over mottled light olive-brown and brownish-gray silty clay that is plastic when wet.	Terraces	Somewhat poorly drained.	0 to 2	Calcareous water-deposited clay.	Medium to strong.
Robertsville	Brown, very friable silt loam over mottled gray and brown, friable silt loam; a fragipan is at a depth of about 24 inches.	Terraces	Poorly drained	0 to 1	Green River alluvium.	Medium to weak.
Taft	Brown, very friable silt loam over mottled pale-brown and yellowish-brown, friable silt loam or silty clay loam; a fragipan is at a depth of about 24 inches.	Terraces	Somewhat poorly drained.	0 to 2	Green River alluvium.	Medium.
Weinbach	Brown, very friable silt loam over mottled brown and light-gray, friable silt loam; a fragipan is at a depth of about 24 inches.	Terraces	Somewhat poorly drained.	0 to 2	Ohio River alluvium.	Medium.
D. Grumusol group:						
1. Intergrading to Alluvial soils—						
Sharkey	Very dark gray, very sticky and plastic silty clay over mottled gray and yellowish-brown, very sticky and plastic clay.	Bottom lands.	Very poorly drained.	0 to 1	Slack-water alluvium.	Very weak.
AZONAL ORDER						
A. Alluvial group:						
1. Central concept—						
Adler	Brown, very friable silt loam that grades to mottled gray and brown silt loam, which is at a depth of about 28 inches.	Bottom lands.	Moderately well drained.	0 to 4	Alluvium derived from neutral loess.	Very weak.
Bruno	Brown, very friable loamy fine sand.	Bottom lands.	Excessively drained.	0 to 10	Sandy alluvium	Very weak.
Collins	Brown, very friable silt loam that grades to mottled gray and brown silt loam, which is at a depth of about 22 inches.	Bottom lands.	Moderately well drained.	0 to 5	Alluvium derived from acid loess.	Very weak.
Egam	Dark-brown, friable silty clay loam over dark yellowish-brown, firm silty clay loam.	Bottom lands.	Well drained and moderately well drained.	0 to 10	Ohio River alluvium.	Weak.
Huntington	Dark-brown, friable silt loam or fine sandy loam.	Bottom lands.	Well drained	0 to 16	Ohio River and Green River alluvium.	Very weak.
Lindside	Brown, friable silt loam or silty clay loam that grades to mottled brown and gray silt loam, which is at a depth of 28 inches.	Bottom lands.	Moderately well drained.	0 to 4	Ohio River and Green River alluvium.	Very weak.
Morganfield	Brown, very friable silt loam.	Bottom lands.	Well drained	0 to 3	Alluvium derived from neutral loess.	Very weak.

TABLE 6.—*Classification of soil series into higher categories and significant characteristics of each series*—Continued

Order, great soil group, and soil series	Brief profile description	Topographic position	Drainage class	Slope range	Parent material	Degree of profile development
ZONAL ORDER—Con.						
A. Alluvial group—Con.						
2. Intergrading to Low-Humic Gley soils—						
Falaya	Dark yellowish-brown, very friable silt loam that grades to mottled brown and grayish-brown, friable silt loam, which is at a depth of about 12 inches.	Bottom lands.	Somewhat poorly drained.	*Percent* 0 to 4	Alluvium derived from acid loess.	Very weak.
Newark	Brown, very friable silt loam or silty clay loam that grades to mottled dark-brown and gray silt loam, which is at a depth of 12 inches.	Bottom lands.	Somewhat poorly drained.	0 to 3	Ohio River and Green River alluvium.	Very weak.
Wakeland	Brown, very friable silt loam that grades to mottled gray and brown silt loam, which is at a depth of 12 inches.	Bottom lands.	Somewhat poorly drained.	0 to 3	Alluvium derived from neutral loess.	Very weak.
B. Regosol group:						
Lakin	Dark yellowish-brown, loose loamy fine sand over strong-brown, loose loamy fine sand.	Terraces	Excessively drained.	2 to 6	Ohio River alluvium.	Weak.

Corn, soybeans, and hay are grown on Elk soils in Henderson County.

Representative profile of Elk silt loam, 0 to 2 percent slopes, in a cultivated field 2 miles south of Beals and ½ mile east of the Green River:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary; 6 to 8 inches thick.

B21t—8 to 22 inches, brown (7.5YR 4/4) silty clay loam; moderate, fine, subangular blocky structure; friable; continuous clay films; strongly acid; diffuse, smooth boundary; 12 to 15 inches thick.

B22t—22 to 40 inches, brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; continuous clay films and black stains on surface of peds; friable; strongly acid; gradual, smooth boundary; 17 to 20 inches thick.

C—40 to 48 inches+, dark yellowish-brown (10YR 4/4) to yellowish-brown (10YR 5/6) silty clay loam; few, fine, faint mottles of light yellowish brown (10YR 6/4); massive; friable; common mica flakes and black stains; strongly acid.

Range in characteristics: The solum ranges from 36 to 50 inches in thickness, and from medium acid to very strongly acid in reaction. The upper part is less acid or neutral in places that have been limed. In places the B horizons are firm, and in some places the C horizon is dominantly strong brown.

Henshaw series.—This series consists of somewhat poorly drained soils on terraces. These soils formed in alluvium derived primarily from calcareous loess. The slope is mostly less than 4 percent.

Henshaw soils are part of a catena that includes Uniontown soils. They are not so brown as Uniontown soils and not so well drained. They have a coarser textured B horizon and substratum than the McGary soils, and they differ from the Captina, Taft, Sciotoville, Weinbach, Grenada, and Calloway soils in not having a fragipan and in having a finer textured B horizon and a less acid substratum.

In Henderson County, Henshaw soils are used primarily for corn, soybeans, hay, and pasture.

A profile that is representative of the series is described in the subsection "Laboratory Data."

Markland series.—The Markland series consists of well drained and moderately well drained Gray-Brown Podzolic soils that developed in calcareous, water-deposited clay. These soils are on terraces along the edge of wide flats. Their slope range is 2 to 35 percent.

Markland soils differ from the McGary soils of the same catena in being browner and less mottled near the surface. They have a higher clay content in the subsurface horizons than Uniontown soils. They differ from the Captina, Loring, and Grenada soils in that they are finer textured and have no fragipan.

In Henderson County, some of the Markland soils have been cleared and are used for general crops. Others, the steeper ones, are in hardwood trees or are idle.

Representative profile of Markland silt loam, 2 to 6 percent slopes, in a cultivated field 1 mile northwest of Ranger's Landing on the Green River and ½ mile west of Ky. Highway No. 136:

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure or weak, thin, platy structure; very friable; many roots; strongly acid; clear, smooth boundary; 6 to 8 inches thick.

B21t—8 to 16 inches, dark yellowish-brown (10YR 4/4) silty clay; common, fine, faint mottles of olive brown (2.5Y 4/4); moderate, very fine or fine, angular blocky struc-

ture; firm, plastic, and sticky; few roots; strongly acid; gradual, wavy boundary; 7 to 9 inches thick.

B22t—16 to 30 inches, dark yellowish-brown (10YR 4/4) silty clay; moderate or strong, fine or very fine, angular blocky structure; firm, plastic, and sticky; medium acid; gradual, wavy boundary; 12 to 15 inches thick.

C—30 to 40 inches+, dark grayish-brown (2.5Y 4/2) or grayish-brown (2.5Y 5/2) silty clay; few, fine, faint mottles of olive brown (2.5Y 4/4); strong, fine or medium, angular blocky structure; firm when moist, plastic and sticky when wet, hard when dry; neutral.

Range in characteristics: The Ap horizon is brown (10YR 4/3) in some places. The color of the matrix in the B horizons ranges from the normal, or typical, color to yellowish brown (10YR 5/4) or olive brown (2.5Y 4/4). The C horizon generally is alkaline with depth and may be calcareous below a depth of 48 inches. Some profiles have an A2 horizon of pale-brown (10YR 6/3) silt loam. This horizon occurs immediately below the Ap horizon and is up to 4 inches thick.

Memphis series.—This series consists of well-drained Gray-Brown Podzolic soils that developed in more than 42 inches of loess. Unlike the Loring soils, which also developed in loess, these soils have no fragipan. They are deeper than Wellston soils, which developed in thin loess underlain by sandstone and shale residuum. They are not sandy like some Wheeling soils, and they are redder, less mottled, and coarser textured than Uniontown soils.

Memphis soils are widely distributed throughout the uplands in the northern part of the county. Their slope range is to 2 to 50 percent. Most areas are used for corn, soybeans, tobacco, hay, pasture, and woods.

Representative profile of Memphis silt loam, 2 to 6 percent slopes, in a cultivated field 200 feet east of the Cairo School:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; medium acid or strongly acid; clear, smooth boundary; 7 to 9 inches thick.

A2—8 to 12 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine or medium, granular structure; friable; medium acid or strongly acid; clear, smooth boundary; 4 to 5 inches thick.

B1—12 to 17 inches, dark yellowish-brown (10YR 4/4) silt loam; ped interiors are strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; firm or friable; medium acid or strongly acid; gradual, smooth boundary; 4 to 6 inches thick.

B2t—17 to 34 inches, brown (7.5YR 4/4) silty clay loam; ped interiors are dark yellowish brown (10YR 4/4); moderate, medium, subangular blocky structure; firm when moist, slightly plastic and slightly sticky when wet; few, small, soft, brown concretions; medium acid or strongly acid; continuous clay films; gradual, smooth boundary; 16 to 19 inches thick.

B3—34 to 44 inches, brown (7.5YR 4/4) silt loam; moderate, medium, subangular blocky structure; friable; very strongly acid; diffuse, smooth boundary; 7 to 11 inches thick.

C—44 to 50 inches+, brown (7.5YR 4/4) silt loam; massive; friable; strongly acid.

Range in characteristics: Some profiles do not have an A2 horizon. The B1 horizon ranges from silt loam to silty clay loam. In some places the B1 and B2 horizons are reddish brown (5YR 4/4). A few fine faint mottles of light yellowish brown (10YR 6/4) occur in some B3 horizons, and a weak fragipan may develop below a depth of 42 inches. In some areas the structure of the B3 horizon is moderate, medium platy. The C horizon generally is strongly acid but in places is alkaline.

Uniontown series.—This series consists of well drained and moderately well drained Gray-Brown Podzolic soils that developed in medium textured or moderately fine textured alluvium derived primarily from calcareous loess.

Uniontown soils are redder, less mottled, and better drained than the Henshaw soils of the same catena. They have a coarser textured subsoil and substratum than Markland soils. They differ from the Loring, Grenada, Wheeling, Sciotoville, and Captina soils in having a finer textured subsoil, in not having a fragipan, and in being less acid in the substratum.

The slope range of Uniontown soils in Henderson County is 0 to 35 percent. Most areas are used for corn, soybeans, hay, and pasture. Some of the steeper areas are wooded, and some are idle. A representative profile is described in the subsection "Laboratory Data."

Wheeling series.—This series consists of well-drained Gray-Brown Podzolic soils that developed in alluvium deposited by the Ohio River. These soils differ from Sciotoville soils, which are of the same catena, in that they are redder and do not have a fragipan. They have a lighter colored and thinner surface horizon than Ashton soils, and they have a coarser textured B horizon and a more acid C horizon than the Uniontown and Markland soils. They are less clayey, are more mature, and have slightly less uniform characteristics than Elk soils, which developed in Green River alluvium.

In Henderson County, Wheeling soils are on stream terraces and have a slope range of 0 to 30 percent. Most of their acreage is used for corn, soybeans, tobacco, hay, and pasture.

Representative profile of Wheeling silt loam, 0 to 2 percent slopes, in a cultivated field 2 miles northeast of Reed and 1 mile east of Ky. Highway No. 811:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; slightly acid; abrupt, smooth boundary; 5 to 7 inches thick.

B1—6 to 9 inches, brown (7.5YR 4/4) silt loam; weak, fine, subangular blocky structure; friable; few brown (10YR 4/3) stains on ped surfaces; slightly acid; gradual, smooth boundary; 3 to 4 inches thick.

B2t—9 to 38 inches, brown (7.5YR 4/4) light silty clay loam; moderate or strong, fine, subangular blocky structure; firm; common mica flakes; some black stains on ped surfaces; continuous clay films; medium acid or strongly acid; gradual, smooth boundary; 25 to 28 inches thick.

C—38 to 50 inches+, brown (7.5YR 4/4) or strong-brown (7.5YR 5/6) fine silt loam; massive; friable; strongly acid.

Range in characteristics: Normally, mica flakes occur throughout the profile. The C horizon typically is silt loam but ranges from silty clay loam to fine sandy loam. Some profiles near the adjacent loess bluffs contain sand that likely is eolian.

Grenada series.—This series consists of moderately well drained Gray-Brown Podzolic soils that have a fragipan. These soils developed in loess on uplands. They belong to the Memphis catena, and generally occur adjacent to other soils of this catena. Some, however, are on toe slopes or on terraces adjacent to Uniontown and Henshaw soils or to some alluvial soils.

Grenada soils are intermediate in drainage between Loring and Calloway soils, which are members of the same catena as the Grenada. Grenada soils differ from Loring soils in being less red, and from Calloway soils in

having fewer mottles from the surface down to the fragipan. They have a coarser textured subsoil than the Uniontown soils.

In Henderson County, most of the Grenada soils are used for corn, soybeans, hay, and pasture.

Representative profile of Grenada silt loam, 2 to 6 percent slopes, in a cultivated field half a mile south of Pond Creek bridge on Ky. Higway No. 136 and a mile east of Smith Mills:

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary; 7 to 9 inches thick.

B1—9 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, angular blocky structure; firm; strongly acid; clear, smooth boundary; 5 to 6 inches thick.

B2t—14 to 22 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, medium and fine, angular blocky structure; firm; few fine concretions at a depth of 18 inches; light-gray (10YR 7/2) silt between peds; few faint clay skins; medium acid; clear, wavy boundary; 7 to 9 inches thick.

Bx1—22 to 30 inches, mottled light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/8 and 5/4) silty clay loam; mottles are fine and faint; weak, medium, angular blocky structure; firm, brittle, and compact; light-gray (10YR 7/2) silt surrounding peds; some pale clay films and dark-brown concretions; medium acid; gradual, smooth boundary; 7 to 8 inches thick.

Bx2—30 to 38 inches, mottled yellowish-brown (10YR 5/4), brownish-yellow (10YR 6/6), and grayish-brown (10YR 5/2) fine silt loam; crushes to yellowish brown (10YR 5/4); browner than Bx1 horizon; weak, coarse, prismatic structure and weak, medium, angular blocky microstructure; common, olive-brown clay films; coarse, vertical streaks of light-gray silt; very firm, brittle, and compact; many, fine and medium, brown concretions; medium acid; gradual, smooth boundary; 7 to 9 inches thick.

C—38 to 50 inches+, mottled dark yellowish-brown (10YR 4/4) and yellowish-brown (10YR 5/6) silt loam; few, fine, distinct mottles of light brownish gray (10YR 6/2); massive; friable; few, small, dark-brown concretions; neutral.

Range in characteristics: The loess ranges from about 4 to more than 6 feet in depth. In some profiles, an A2 horizon occurs in place of a B1 horizon. The Bx horizon, the fragipan, is at a depth of about 20 to 30 inches in the uneroded areas and ranges from 1 foot to 3 feet in thickness. It is silty clay loam in some places. In the southern part of the county, the Bx horizon overlies residuum of sandstone and shale origin. The C horizon ranges from neutral to strongly acid.

Loring series.—This series consists of well drained and moderately well drained Gray-Brown Podzolic soils that have a fragipan. These soils developed in loess.

Loring soils are intermediate in drainage between Memphis and Grenada soils, which are members of the same catena as the Loring. They differ from Memphis soils in that they have a fragipan, and from Grenada soils in that they are redder and have a more weakly developed fragipan. They differ from Uniontown soils in that they have a fragipan and are coarser textured. Loring soils are somewhat similar to Zanesville soils.

In Henderson County, Loring soils are extensive on the uplands. They have a slope range of 0 to 20 percent and are used for corn, tobacco, soybeans, orchards, hay, and pasture.

Representative profile of Loring silt loam, 2 to 6 percent slopes, in a cultivated field 650 feet east of Ky. Highway No. 283, and 325 feet south of its junction with Ky. Highway No. 416:

Ap—0 to 9 inches, brown (10YR 4/3) or dark-brown silt loam; weak, fine, granular structure; very friable; very strongly acid; clear, smooth boundary; 7 to 9 inches thick.

B1—9 to 16 inches, dark-brown (7.5YR 4/4) silt loam; weak, fine, subangular blocky structure; friable; strongly acid; gradual, smooth boundary; 6 to 9 inches thick.

B2t—16 to 28 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; firm, slightly plastic, and slightly sticky; continuous clay films; very strongly acid; clear, wavy boundary; 10 to 13 inches thick.

Bx—28 to 36 inches, mottled yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) silty clay loam; common, medium, faint mottles of light yellowish brown (10YR 6/4); moderate, medium, subangular blocky structure; firm, brittle, and compact; few small dark-colored concretions; strongly acid; clear, smooth boundary; 7 to 9 inches thick.

C1x—36 to 42 inches, light yellowish-brown (10YR 6/4) heavy silt loam; common, medium, distinct mottles of pale brown (10YR 6/3), dark yellowish brown (10YR 4/4), and light brownish gray (10YR 6/2); moderate, medium or coarse, angular blocky structure; firm, brittle, and compact; medium and large, brown concretions; strongly acid; gradual, wavy boundary; 6 to 8 inches thick.

C2—42 to 46 inches+, mottled dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/6), and brownish-yellow (10YR 6/6) heavy silt loam; few fine mottles of yellow (10YR 7/6); some concretions; strongly acid.

Range in characteristics: The B1 horizon is light silty clay loam in some places, and the B2t horizon ranges from its normal color to dark yellowish brown (10YR 4/4). The ped faces, in many areas, are stained darker than the crushed mass. The depth to the fragipan averages 30 inches, but the range is 26 to 42 inches. The loess ranges from about 4 to more than 6 feet in thickness. The C horizon generally is strongly acid but is alkaline in some places.

Sciotoville series.—This series consists of moderately well drained Gray-Brown Podzolic soils that have a fragipan. These soils developed in mixed alluvium that was deposited by the Ohio River. They differ from the well-drained Wheeling soils in that they are less red and have a fragipan. They are more red and less mottled than the somewhat poorly drained Weinbach soils. They differ from the soils of the Uniontown and Markland catena in that they are coarser textured in the subsurface horizons, more acid in the C horizon, and located closer to the Ohio River. They are at a higher elevation and are more distant from the Green River than Captina soils.

In Henderson County, Sciotoville soils occur on stream terraces. They are on a slope of 0 to 6 percent and are used for corn, soybeans, tobacco, hay, and pasture. Some of the acreage is used for homesites.

Representative profile of Sciotoville silt loam, 2 to 6 percent slopes, in a cultivated field 1 mile northwest of Reed and 200 feet northeast of a turn in a gravel road:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; medium acid; abrupt, smooth boundary; 7 to 9 inches thick.

B2t—8 to 19 inches, dark yellowish-brown (10YR 4/4) to strong-brown (7.5YR 5/6) coarse silty clay loam; moderate, medium or fine, subangular blocky structure; firm; continuous clay films; very strongly acid; clear, wavy boundary; 10 to 13 inches thick.

Bx—19 to 30 inches, brown (7.5YR 4/4) fine silt loam; common, fine, distinct mottles of light brownish gray (10YR 6/2); moderate, fine, subangular blocky structure; firm, brittle, and compact; very strongly acid; gradual, wavy boundary; 10 to 13 inches thick.

C—30 to 36 inches+, brown (7.5YR 4/4) silt loam; few, fine, faint mottles of pale brown (10YR 6/3); massive; friable; very strongly acid.

Range in characteristics: A fine sandy loam type also occurs in the county. The Ap horizon is dark yellowish brown in some places. The B2t is yellowish brown in some places, and it can consist of loam or light clay loam. In some profiles it has pale-brown mottles in the lower part. In the B2t horizon the ped surface is commonly darker colored than the ped interior. Mica flakes are common in the B horizons. The fragipan ranges from 10 to 25 inches in thickness and is at a depth that ranges from 18 to 30 inches.

Ashton series.—This series consists of well-drained Gray-Brown Podzolic soils that intergrade to Alluvial soils. These soils developed in alluvium of mixed origin. Their slope range is 0 to 4 percent.

Ashton soils occupy low terraces on the flood plain of the Ohio and Green Rivers. Their position generally is between that of the terrace soils of the Wheeling and Elk catena and that of the first-bottom soils along the Ohio and Green Rivers. Ashton soils are intermediate in development between the Huntington and Egam soils of the bottoms and the Wheeling and Elk soils of the terraces. Locally, they are important agriculturally because they are good soils for corn and soybeans.

Representative profile of Ashton silt loam in a cultivated field about 1 mile south of the Alcoa plant in Indiana and 3 miles north of Reed in Kentucky:

Ap—0 to 10 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; very friable; slightly acid; clear, wavy boundary; 7 to 10 inches thick.

B1t—10 to 18 inches, dark-brown (10YR 4/3 or 3/3) light silty clay loam; weak, fine, subangular blocky structure; ped surfaces are slightly darker than ped interiors; friable; few clay films; neutral; clear, smooth boundary; 6 to 8 inches thick.

B21t—18 to 26 inches, dark-brown (7.5YR 4/4) light silty clay loam; moderate, fine, subangular blocky structure; firm; few clay films; slightly acid; gradual, smooth boundary; 8 inches thick.

B22t—26 to 40 inches, brown (7.5YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; friable; medium acid; gradual, smooth boundary; 13 to 16 inches thick.

C—40 to 50 inches+, brown (7.5YR 4/4) light silty clay loam or silt loam; massive; friable; black stains; strongly acid.

Range in characteristics: The reaction range is medium acid to neutral. The A horizon in places includes some overwash of recent alluvium. Generally, it ranges from 7 to 10 inches in thickness but is as much as 16 inches thick in some places. The B21t and B22t horizons may be strong brown (7.5YR 5/6), reddish brown (5YR 4/4), or dark yellowish brown (10YR 4/4). The C horizon is clay loam or loam in some places.

Sequatchie series.—This series consists of well-drained Gray-Brown Podzolic soils that intergrade to Alluvial soils. These soils developed in mixed alluvium deposited by the Ohio and Green Rivers. They are coarser textured and have weaker profile development than the Wheeling and Elk soils. They differ from Huntington soils of the bottom lands in that they have a B horizon. They are less sandy than Lakin soils.

Sequatchie soils occur on terraces that have a slope range of 0 to 6 percent. Most areas are used for corn, soybeans, hay, and pasture.

A representative profile is described in the subsection "Laboratory Data."

Gilpin series.—This series consists of well-drained soils that developed in sandstone and shale residuum. In Henderson County, these soils are covered by a thin mantle of loess. They belong to the Gray-Brown Podzolic great soil group, but they intergrade to the Red-Yellow Podzolic great soil group.

Gilpin soils differ from Zanesville soils in that they have no fragipan and are not so deep. They differ from Muskingum soils in that they have an illuvial B horizon and are deeper. They are intermediate in depth between Wellston and Litz soils.

In this county, Gilpin soils have a slope range of 20 to 30 percent. Some areas are wooded, others are pastured, and still others are idle.

Representative profile of Gilpin silt loam, 20 to 30 percent slopes, in a wooded area 2 miles south of Hebbardsville and 1,000 feet north of the Green River:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; many roots and twigs; very strongly acid; abrupt, smooth boundary; 1 to 2 inches thick.

A2—1 inch to 6 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; very friable; very strongly acid; gradual, smooth boundary; 4 to 5 inches thick.

B1—6 to 12 inches, yellowish-brown (10YR 5/4) fine silt loam; weak, fine, subangular blocky structure; very friable; very strongly acid; gradual, smooth boundary; 5 to 7 inches thick.

B2t—12 to 20 inches, strong-brown (7.5YR 5/6) silty clay loam; weak, fine, subangular blocky structure; friable; patchy clay films; very strongly acid; gradual, smooth boundary; 8 to 9 inches thick.

IIC—20 to 24 inches, brown (7.5YR 4/4) clay loam; common, fine, faint mottles of yellowish brown (10YR 5/4); moderate, fine, subangular blocky structure; friable; few sandstone fragments; very strongly acid; 4 to 7 inches thick.

R—24 inches+, partly weathered sandstone.

Range in characteristics: Cultivated areas generally have a brown (10YR 4/3) Ap horizon. The B horizons are brown (7.5YR 4/4) or dark yellowish brown (10YR 4/4) in some places, and they range from 9 to 18 inches in thickness.

Wellston series.—This series consists of well-drained soils that developed in loess overlying residuum of sandstone and shale. These soils belong to the Gray-Brown Podzolic great soil group, but they intergrade to the Red-Yellow Podzolic great soil group.

Wellston and Zanesville soils are members of the same catena. Wellston soils differ from Zanesville soils in that they have no fragipan and are not so deep. They have a thicker B horizon than Gilpin soils and are deeper. They developed in a thinner layer of loess than Memphis and Loring soils, and they have a more sandy C horizon.

In this county, Wellston soils have a slope range of 6 to 30 percent. They are used chiefly for pasture and woods, but a considerable acreage is idle.

Representative profile of Wellston silt loam, 12 to 20 percent slopes, eroded, in a cultivated field half a mile southeast of Pleasant Valley Church:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak, fine and medium, granular structure; friable; strongly acid; abrupt, smooth boundary; 5 to 7 inches thick.
B2t—6 to 26 inches, brown (7.5YR 4/4) or reddish-brown (5YR 4/4) silty clay loam; moderate, medium and coarse, subangular blocky structure; firm; scattered clay films on ped faces; very strongly acid; clear, smooth boundary; 19 to 23 inches thick.
IIB3—26 to 34 inches, brown (7.5YR 4/4) sandy clay loam; moderate, medium, angular blocky structure; firm; very strongly acid; clear, smooth boundary; 7 to 10 inches thick.
IIC—34 to 40 inches, brown (10YR 5/3) or yellowish-brown (10YR 5/4) sandy loam; massive in place; few sandstone fragments; strongly acid; 5 to 7 inches thick.
R—40 inches+, sandstone (acid).

Range in characteristics: The B horizon ranges from 18 to 30 inches in thickness. It is dark yellowish brown (10YR 4/4) or strong brown (7.5YR 5/6) in some places.

RED-YELLOW PODZOLIC SOILS

This great soil group consists of well-developed, acid soils that have a thin organic horizon over a thin organic-mineral horizon. Below that is a light-colored bleached horizon. The subsoil is red, yellowish red, or yellow and is more clayey than the other horizons. The parent materials are all more or less siliceous. Red-Yellow Podzolic soils are more strongly leached than Gray-Brown Podzolic soils, and they are richer in kaolinitic minerals.

There are no true Red-Yellow Podzolic soils in Henderson County. Soils of the Captina and Zanesville series are Red-Yellow Podzolic soils, but they have a fragipan. The fragipan is a firm, brittle, compact layer of high bulk density. It impedes water movement and restricts root growth. The boundary between the fragipan and the overlying B horizon is abrupt.

The fragipan of the Captina soil generally is 1 or 2 feet thick and is underlain by friable silt loam. The fragipan of the Zanesville soil generally rests on partly weathered sandstone and shale.

Red-Yellow Podzolic soils that intergrade to Lithosols are represented by the Litz series. Lithosols consist of a freshly or imperfectly weathered mass of rock fragments that has no clearly expressed morphology. Red-Yellow Podzolic soils, on the other hand, have well-developed soil horizons. The Litz soils have a thinner solum than is normal for Red-Yellow Podzolic soils; otherwise they are typical of that great soil group. They generally occupy the steeper slopes of the uplands where either loess did not accumulate or geologic erosion removed most of the loess.

Captina series.—This series consists of moderately well drained Red-Yellow Podzolic soils that have a fragipan. These soils developed in mixed alluvium that washed mainly from limestone areas. In Henderson County they occupy terraces along the Green River. Their slope range is 0 to 6 percent.

The Captina, Elk, and Taft soils are members of the same catena. Captina soils differ from Elk soils in that they are less red and have a fragipan. They differ from Taft soils in that they have fewer mottles in their B horizon. Captina soils have coarser textured B and C horizons and a more acid C horizon than Uniontown and Markland soils; they differ further from these soils in having a fragipan. They are brighter colored and appear to have slightly weaker profile development than Sciotoville soils, which developed in sediment from the Ohio River.

Captina soils, for the most part, are used for corn and soybeans.

Representative profile of Captina silt loam, 0 to 2 percent slopes, in a cultivated field 1,000 feet west of the Green River and 50 feet south of Ky. Highway No. 258:

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; very friable; medium acid; abrupt, smooth boundary; 7 to 8 inches thick.
B21t—7 to 14 inches, yellowish-brown (10YR 5/6) or strong-brown (7.5YR 5/6) light silty clay loam; weak, fine, subangular blocky structure; friable; patchy clay films; very strongly acid; gradual, smooth boundary; 6 to 8 inches thick.
B22t—14 to 18 inches, yellowish-brown (10YR 5/6) light silty clay loam; few, fine, faint mottles of pale brown (10YR 6/3); weak, fine, subangular blocky structure; friable; patchy clay films; very strongly acid; clear, smooth boundary; 4 to 5 inches thick.
B3t—18 to 26 inches, yellowish-brown (10YR 5/4) fine silt loam; common, fine, faint mottles of pale brown (10YR 6/3) and brown (7.5YR 4/4); weak, fine, subangular blocky structure; friable; very strongly acid; clear, wavy boundary; 7 to 9 inches thick.
Bx—26 to 38 inches, mottled light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/6), and dark-brown (7.5YR 4/4) fine silt loam; weak, fine, subangular blocky structure; very firm, brittle, and compact; very strongly acid; gradual, smooth boundary; 11 to 14 inches thick.
Cx—38 to 40 inches+, mottled light-gray (10YR 6/1) and dark yellowish-brown (10YR 4/4) silty clay loam; moderate, very fine, angular blocky structure; very firm, brittle, and compact; very strongly acid.

Range in characteristics: The Ap horizon is brown (10YR 4/3) in some places. The B2 horizons range from their normal color to dark yellowish brown (10YR 4/4). The mottles in the B2 horizons range from pale brown (10YR 6/3) to brown (10YR 5/3 or 7.5YR 4/4). The depth to the fragipan ranges from 15 to 30 inches. The fragipan is weakly expressed in some profiles.

Zanesville series.—This series consists of well drained and moderately well drained Red-Yellow Podzolic soils that have a fragipan. These soils developed in less than 42 inches of loess, which is underlain by sandstone and shale residuum.

Zanesville soils are intermediate in drainage between Wellston and Grenada soils. They differ further from Wellston soils in that they have an evident fragipan, and from Grenada soils in that they have a redder B horizon. Zanesville soils are similar in morphology to Loring soils, which developed entirely in loess.

In Henderson County, Zanesville soils are dominantly on a slope that ranges from 6 to 20 percent. They are used chiefly for woods and pasture. Much of their acreage is idle.

Representative profile of Zanesville silt loam, 12 to 20 percent slopes, eroded, in a cultivated field 1 mile southeast of Pleasant Valley Church, on the east side of a gravel road:

Ap—0 to 7 inches, brown (7.5YR 4/4) silt loam; weak, fine, angular blocky structure; friable; very strongly acid; abrupt, smooth boundary; 4 to 8 inches thick.
B21t—7 to 19 inches, brown (7.5YR 4/4) heavy silt loam; moderate, fine and medium, angular blocky structure; firm; few clay films; very strongly acid; clear, smooth boundary; 3 to 12 inches thick.

B22t—19 to 31 inches, brown (7.5YR 4/4) silty clay loam; few, medium, distinct mottles of light yellowish brown (10YR 6/4); moderate, medium and coarse, angular blocky structure; firm; pore space filled with light yellowish-brown silt; extremely acid; distinct, wavy boundary; 10 to 25 inches thick.

Bx—31 to 40 inches, mottled dark-brown (7.5YR 3/4), light yellowish-brown (10YR 6/4), and light brownish-gray (10YR 6/2) silty clay loam; weak, coarse, angular blocky structure; brittle and very firm when moist, sticky and plastic when wet; a little sand is evident; very strongly acid; diffuse, smooth boundary; 6 to 12 inches thick.

IIC—40 to 60 inches+, dark-brown (7.5YR 4/4) clay loam; common, medium, distinct mottles of light yellowish brown (10YR 6/4); moderate, coarse, angular blocky structure; firm; much more sandy than the Bx; very strongly acid.

Range in characteristics: In some places the Ap horizon is brown (10YR 4/3), and in places its structure is granular. In many profiles a 2-inch horizon of light brownish-gray (10YR 6/2) friable silt loam overlies the Bx horizon. The fragipan contains varying amounts of sand, and its range of colors includes various shades of gray and brown. The C horizon ranges from clay loam to sand. Near the foot of some slopes, the solum is thinner than typical.

Litz series.—The Litz series consists of somewhat excessively drained soils that developed in residuum derived from sandstone and shale. In Henderson County, Litz soils are covered by a thin mantle of loess.

These soils have a thinner solum than the Gilpin, Wellston, and Zanesville soils. They do not have a fragipan like the Zanesville. They differ from Muskingum soils in that they have a clayey B horizon.

In this county, Litz soils have a slope range of 30 to 50 percent. They are used primarily for pasture and woods. Some areas are idle.

Representative profile of Litz silt loam, 30 to 50 percent slopes, in a cultivated field 3 miles southwest of Niagara and ¼ mile west of Ky. Highway No. 416:

Ap—0 to 4 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary; 2 to 6 inches thick.

B2t—4 to 10 inches, brown (7.5YR 4/4) silty clay loam; moderate, medium, subangular blocky structure; friable; few clay films; strongly acid; clear, smooth boundary; 2 to 9 inches thick.

IIC1—10 to 15 inches, strong-brown (7.5YR 5/6) very fine sandy loam; weak, medium, subangular blocky structure; friable; few, small, brown concretions and few fragments of sandstone; very strongly acid, clear, smooth boundary; 4 to 14 inches thick.

IIC2—15 inches+, partly disintegrated sandstone and shale; fragments are loose and hard, brown and gray in color, and very strongly acid.

Range in characteristics: The B horizon is strong brown or dark yellowish brown in some places. The IIC1 horizon ranges from clay loam to loamy sand. Depth to bedrock ranges from 15 to 24 inches. Forested soils have an A1 horizon about 2 inches thick and an A2 horizon about 3 inches thick.

SOLS BRUNS ACIDES

This great soil group consists of leached soils that have a very dark brown, friable surface layer and a color B horizon. These soils have not developed textural horizons to any great extent. Their B horizon has no significant accumulation of clay, as compared to their A horizon, and has little structural development.

Sols Bruns Acides in Henderson County are the soils of the Muskingum series, though these soils intergrade to Lithosols. Lithosols have an incomplete solum or no clearly expressed soil morphology. They consist of a freshly and imperfectly weathered mass of hard rock or rock fragments. They are largely confined to steeply sloping areas, have a thin and stony surface layer, and show little or no illuviation.

Muskingum soils have a thin, dark-colored A1 horizon. Their B horizon shows no significant accumulation of clay. It contains a few stones in some places.

Muskingum series.—This series consists of somewhat excessively drained soils that formed in residuum derived from sandstone and shale. These soils have faint horizons. They differ from the Litz, Gilpin, and Wellston soils in having less distinct horizons and in not having a clayey B horizon.

The slope range of Muskingum soils in Henderson County is 30 to 50 percent. Woods and pasture are the main uses, but some areas are idle.

Representative profile of Muskingum silt loam, 30 to 50 percent slopes, in a forested area 2 miles south of Hebbardsville and 1,000 feet north of the Green River:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine, granular structure; very friable; many roots; very strongly acid; abrupt, smooth boundary; 1 to 2 inches thick.

A2—1 inch to 10 inches, pale-brown (10YR 6/3) or brown (10YR 5/3) silt loam; weak, fine, granular structure; very friable; very strongly acid; diffuse, smooth boundary; 8 to 9 inches thick.

B—10 to 22 inches, yellowish-brown (10YR 5/4) silt loam; few, fine, faint mottles of pale brown (10YR 6/3); weak, fine, subangular blocky structure; friable; few pieces of sandstone gravel; very strongly acid; clear, smooth boundary; 11 to 13 inches thick.

C—22 to 26 inches, mottled light-gray (10YR 7/2), yellowish-brown (10YR 5/6), and brown (10YR 5/3) clay loam; weak, medium, subangular blocky structure; firm; few pieces of sandstone gravel and noticeable amount of coarse sand; very strongly acid; 4 to 6 inches thick.

R—26 inches+, partly weathered, interbedded sandstone and shale.

Range in characteristics: The depth to bedrock ranges from 15 to 30 inches and varies appreciably within short distances. Profile development is faint. In some profiles there is a B horizon of clay accumulation less than 2 inches thick, but in most profiles the only evidence of such a horizon is the slightly stronger chroma in the B horizon position. The A and B horizons range from silt loam to sandy loam.

Intrazonal order

Intrazonal soils have many of the characteristics of the associated zonal soils, but some local influence has been dominant in their development. In Henderson County this influence is the level or nearly level topography. The horizon differentiation generally is weak or medium but is strong in some places.

The intrazonal soils in Henderson County are classified in four of the great soil groups—Humic Gley, Low-Humic Gley, Planosol, and Grumusol.

HUMIC GLEY SOILS

This great soil group consists of intrazonal soils that developed in marshes and swamps under very poor drainage. Because of an accumulation of considerable organic

matter, these soils are characterized by a thick, dark-colored mineral (nonpeaty) surface horizon. They have a gleyed subsoil.

Soils of the Dekoven and Patton series are the only Humic Gley soils so classified in Henderson County. Dekoven and Patton soils formed in alluvium derived from loess. Dekoven soils are on bottom lands and do not have a B horizon. Patton soils are on stream terraces and have a weakly developed B horizon. Both have a much thicker A1 horizon than the Low-Humic Gley soils.

Dekoven series.—This series consists of very poorly drained soils on bottom lands. The soils developed in alluvium derived chiefly from alkaline loess. Their slope range is 0 to 2 percent.

Dekoven soils are associated with upland soils of the Memphis catena and terrace soils of the Uniontown catena. They belong to the Morganfield catena and differ from the other members of this catena in that they are much darker in color in the upper part of their profile and are more poorly drained. They differ from Sharkey soils in being coarser textured and differ from Patton soils in having weaker profile development.

In Henderson County, Dekoven soils are of importance because they are good for corn and soybeans.

Representative profile of Dekoven silt loam in a cultivated field 3 miles east of U.S. Highway No. 41, and 100 feet north of Ky. Highway No. 812:

Ap1—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; very friable; neutral; clear, smooth boundary; 7 to 8 inches thick.

A12—8 to 16 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; very friable; mildy alkaline; gradual, smooth boundary; 7 to 9 inches thick.

C1g—16 to 26 inches, dark grayish-brown (10YR 4/2) fine silt loam; few, fine, faint mottles of light olive brown (2.5Y 5/4); massive; friable; mildly alkaline; gradual, smooth boundary; 10 inches thick.

C2g—26 to 42 inches+, mottled dark grayish-brown (2.5Y 4/2) and light olive-brown (2.5Y 5/4 and 5/6) silty clay loam; weak, fine, angular blocky structure; firm; mildly alkaline.

Range in characteristics: The A horizon ranges from 6 to 30 inches in thickness. Normally it is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2), but in overwash areas the Ap horizon ranges from the normal to dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). In some places the C horizon is yellowish brown (10YR 5/4) mottled with dark gray or light olive brown (2.5Y 5/6), or it is mottled light olive brown and gray. It may be silt loam or light silty clay loam, and slightly plastic. The A horizon ranges from slightly acid to mildly alkaline, and the C horizon from neutral to mildly alkaline.

Patton series.—This series consists of very poorly drained Humic Gley soils that developed in alluvium derived primarily from calcareous loess. These soils are much darker in the upper part of the profile and more poorly drained than the Uniontown and Henshaw soils of the same catena. They have stronger profile development than the dark-colored Dekoven and Sharkey soils of the bottom lands.

In Henderson County, Patton soils are on wide, level terraces and generally are bordered on one side by the Memphis soils of the uplands. They are productive soils and are used mostly for corn and soybeans.

Representative profile of Patton silt loam in a cultivated field 2 miles west of Henderson, 200 feet north of Ky. Highway No. 136, and 1/4 mile west of its junction with U.S. Highway No. 60:

Ap1—0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; very friable; slightly acid; clear, smooth boundary; 5 to 8 inches thick.

A12—6 to 24 inches, very dark gray (10YR 3/1) silt loam; few, fine faint mottles of dark yellowish brown (10YR 4/4); weak, fine, granular structure; friable; neutral; gradual, smooth boundary; 16 to 20 inches thick.

B2g—24 to 36 inches, dark-gray (10YR 4/1) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6); weak, medium, angular blocky structure; friable; slightly acid; clear, smooth boundary; 10 to 13 inches thick.

Cg—36 to 42 inches+, mottled dark grayish-brown (10YR 4/2) and light olive-brown (2.5Y 5/6) silt loam; massive; friable; neutral.

Range in characteristics: The A horizon ranges from 6 to 24 inches in thickness. It is commonly very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) but is black (10YR 2/1) in some areas. The uppermost 15 inches in some places consists of overwash of dark-gray (10YR 4/1) or dark grayish-brown (10YR 4/2) silt loam. Ped surfaces in the B horizon are commonly coated with dark-colored soil material from the A horizon. The C horizon is silty clay loam in some profiles. Reaction ranges from medium acid to neutral in the B horizon, and from slightly acid to alkaline in the C horizon. Nodules of calcium carbonate generally occur at a depth of about 4 feet.

LOW-HUMIC GLEY SOILS

This great soil group consists of intrazonal soils that developed in swamps under poor drainage. These soils have a very thin surface horizon that is low in organic-matter content. Their subsoil is a mottled gray and brown gleyed horizon that has a low degree of textural differentiation. These soils are dominantly gray or mottled with gray because of the reduction of iron. Some of these soils are acid, and some are neutral or slightly alkaline and contain calcium carbonate. In time, many of these soils will be leached, will develop a B horizon and a fragipan, and thereby will be Planosols. Low-Humic Gley soils generally are medium textured, but the texture varies. They are lower in expanding-type clay than Grumusols, and they lack the thick, dark-colored A1 horizon that is characteristic of Humic Gley soils.

The Birds, Melvin, and Waverly soils are representative of the Low-Humic Gley group in Henderson County. Waverly and Birds soils formed in alluvium that washed from loess. The acid Waverly soils are more leached of carbonates and other bases than the Birds soils. Possibly the sediment they formed in was leached before it was deposited. Melvin soils are medium acid to neutral and are leached to varying degrees. All of these soils are strongly gleyed. These are young soils that have not been in place long enough for a B horizon to form.

Birds series.—This series consists of poorly drained Low-Humic Gley soils that formed in alluvium derived from neutral or calcareous loess. Their slope range is 0 to 2 percent.

These soils are part of a catena that includes Wakeland and Dekoven soils. They are adjacent to upland soils

that, for the most part, are members of the Memphis catena. Birds soils are grayer and have a more mottled surface layer than the somewhat poorly drained Wakeland soils. They have a lighter colored surface layer and lighter gray subsurface layers than Dekoven soils. Birds soils are less acid in reaction than Waverly soils, and generally they are more silty than Melvin soils, which developed from sediment of the Ohio and Green Rivers.

Birds soils are used mainly for corn and soybeans, and to a lesser extent for hardwoods.

Representative profile of Birds silt loam in a cultivated field three-fourths of a mile southwest of Geneva on the west side of Trigg Turner Road:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint mottles of very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/6); weak, fine, granular structure; very friable; slightly acid; clear, smooth boundary; 8 to 10 inches thick.

C1g—9 to 18 inches, grayish-brown (2.5Y 5/2) light silty clay loam; few, fine, faint mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); weak, fine, granular structure; friable or firm; slightly acid; few, small, brown concretions; gradual, smooth boundary; 7 to 9 inches thick.

C2g—18 to 24 inches, dark-gray (10YR 4/1) light silty clay loam; common, fine, faint mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); massive; firm; neutral; gradual, smooth boundary; 5 to 7 inches thick.

C3g—24 to 36 inches+, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/4); massive; firm; neutral.

Range in characteristics: In some places, sandy overwash from sandstone uplands or 6 to 8 inches of yellowish-brown silt loam overwash lie on the soil. The Ap horizon ranges from grayish brown (10YR 5/2) to gray (10YR 5/1). In some places it is neutral in reaction. The C1g, C2g, and C3g horizons range from slightly acid to mildly alkaline, and from their normal color to gray (5Y 5/1 or N 5/0) or dark gray (N 4/0). The mottles in these horizons range from their normal color to light olive brown (2.5Y 5/4).

Melvin series.—This series consists of poorly drained Low-Humic Gley soils. These soils developed in mixed alluvium that washed to a large extent from limestone areas. They differ from Newark soils, which are of the same catena, in that they are mottled in the surface layer and are gray. They are commonly less silty than Birds and Waverly soils, and they do not have a B horizon or a fragipan like that in the Ginat and Robertsville soils.

In Henderson County, Melvin soils occur on level bottoms along the Ohio and Green Rivers. They are used for corn, soybeans, hay, pasture, and hardwoods.

Representative profile of Melvin silt loam in a wooded area 2 miles northwest of Hamilton Ferry on the Green River and 1 mile north of Ky. Highway No. 54:

O1—½ inch to 0, loose forest litter and partly decomposed organic matter.

A1—0 to 1 inch, mottled dark-gray (10YR 4/1) and yellowish-brown (10YR 5/6) silt loam; weak, fine, granular structure; very friable; many roots and twigs; medium acid; abrupt, smooth boundary; 0 to 1½ inches thick.

C1g—1 inch to 24 inches, gray (10YR 5/1) silty clay loam; common, fine, distinct mottles of brown (7.5YR 4/4); moderate, medium, angular blocky structure; friable; few roots; medium acid; diffuse, smooth boundary; 22 to 25 inches thick.

C2g—24 to 40 inches+, light-gray (10YR 6/1) silty clay loam; few, fine, distinct, brown (7.5YR 4/4) mottles; moderate, medium, angular blocky structure; plastic; medium acid; 15 to 18 inches thick.

Range in characteristics: A thin layer of silt loam, like the A1 horizon of the representative profile, is common in wooded areas. In cultivated areas, the Ap horizon generally is dark grayish-brown or brown silty clay loam. The C horizon generally is silty clay loam but may be silt loam. In some places, it is light gray or light brownish gray and has mottles of strong brown, light yellowish brown, dark yellowish brown, or brown. In some places, layers of sandy loam and silty clay occur below a depth of 50 inches. Reaction ranges from strongly acid to slightly acid.

Waverly series.—This series consists of poorly drained Low-Humic Gley soils on bottom lands. These soils formed in sediment that washed from acid loess. They differ from the somewhat poorly drained Falaya soils, which are of the same catena, in that they have a more mottled surface layer and are grayer throughout. They are more acid than Birds soils and, generally, are more silty than Melvin soils, which formed in sediment deposited by the Ohio and Green Rivers.

In Henderson County, Waverly soils are on a slope of 0 to 3 percent. Much of their acreage is still wooded; the cleared areas are used for corn and soybeans.

Representative profile of Waverly silt loam in a cultivated field 2 miles southwest of Anthoston on Zimmerman Road and 300 feet north of the East Fork of Canoe Creek:

Ap—0 to 5 inches, brown (10YR 5/3) silt loam; few, fine, distinct light brownish-gray (2.5Y 6/2) mottles; weak, fine, granular structure; friable; medium acid; gradual, wavy boundary; 4 to 6 inches thick.

C1g—5 to 9 inches, grayish-brown (10YR 5/2) silt loam; common, fine, faint, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) mottles; weak, fine, granular structure; very friable; medium acid; clear, wavy boundary; 4 to 7 inches thick.

C2g—9 to 12 inches, light brownish-gray (10YR 6/2) silt loam; few or common, fine, faint mottles of pale brown (10YR 6/3) and gray (10YR 5/1); weak, fine, subangular blocky structure; firm or friable; some streaks of strong brown; medium acid; gradual, smooth boundary; 3 to 5 inches thick.

C3g—12 to 20 inches, grayish-brown (10YR 5/2) silt loam; common, fine, distinct mottles of pale brown (10YR 6/3) and yellowish brown (10YR 5/6); weak, medium or fine, granular structure; very friable; few small brown concretions; medium acid; gradual, wavy boundary; 7 to 9 inches thick.

C4g—20 to 32 inches, light brownish-gray (2.5Y 6/2) silty clay loam; common, medium, distinct mottles of olive (5Y 5/8) and yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable; strongly acid; gradual, wavy boundary; 10 to 15 inches thick.

Range in characteristics: The matrix color in the Ap horizon ranges from brown (10YR 5/3) to grayish brown (10YR 5/2 or 2.5Y 5/2), and the mottles are light gray in some places. The C3g horizon ranges from silt loam to silty clay loam, and from grayish brown (10YR 5/2) to gray (N 5/0). In this horizon, the prominence of the brown mottles varies. The reaction of the C horizon to a depth of 20 inches is strongly acid or medium acid. Below a depth of 32 inches, the soil material gets finer textured as the depth increases, and the mottles are more prominent.

PLANOSOLS

Planosols are intrazonal soils that developed under poor or somewhat poor drainage in flat or depressed areas. They

have a thin surface horizon over a pale, mottled subsoil that contains a large amount of clay or a subsoil that is underlain by a fragipan. In many places the fragipan underlies a moderately well developed B horizon.

Soils of the Calloway, Ginat, McGary, Robertsville, Taft, and Weinbach series represent the Planosol great soil group in Henderson County. All of these soils, except the McGary, have a fragipan. Robertsville and Ginat soils, however, have a thin and weakly developed fragipan in some places. McGary soils have fine-textured B and C horizons and generally are considered claypan soils. The B horizon of the Calloway, Taft, Weinbach, and McGary soils shows more evidence of illuviation than that of the more poorly drained Robertsville and Ginat soils.

Calloway series.—This series consists of somewhat poorly drained Planosols that have a fragipan. These soils developed in more than 42 inches of loess. They occupy flat ridgetops, gentle slopes at the base of better drained uplands, and stream terraces. The slope range is 0 to 6 percent.

Calloway soils are more mottled and more pale than the moderately well drained Grenada soils, which are in the same catena as the Calloway. They differ from the poorly drained Robertsville soils in being less gray and less mottled. Compared to the Henshaw soils of the terraces, the Calloway soils have a fragipan and are coarser textured.

Ordinarily, Calloway soils are used for corn, soybeans, hay, and pasture.

Representative profile of Calloway silt loam, 0 to 2 percent slopes, in a cultivated field 1½ miles west of Zion and ¼ mile south of Ky. Highway No. 54:

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; few, fine, faint mottles of light brownish gray (10YR 6/2); weak, fine, granular structure; very friable; few, small, brown concretions; very strongly acid; clear, smooth boundary; 6 to 8 inches thick.

A2—7 to 12 inches, yellowish-brown (10YR 5/4) silt loam; common, fine, distinct mottles of light brownish gray (10YR 6/2); weak, fine, granular structure; very friable; few, small, brown concretions; very strongly acid; gradual, smooth boundary; 3 to 8 inches thick.

B2—12 to 20 inches, yellowish-brown (10YR 5/6) silt loam; common, fine, distinct mottles of light brownish gray (10YR 6/2); moderate, medium, subangular blocky structure; friable; few, small, brown concretions; strongly acid; gradual, wavy boundary; 6 to 10 inches thick.

Bx—20 to 32 inches, mottled yellowish-brown (10YR 5/6), light brownish-gray (10YR 6/2), and dark-brown (7.5YR 4/4) silty clay loam; weak, medium, subangular blocky structure; many, small, soft, brown concretions; firm, compact, and brittle; very strongly acid; gradual, smooth boundary; 6 to 25 inches thick.

C—32 to 48 inches+, mottled yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) silt loam; moderate, medium, angular blocky structure; friable; medium acid.

Range in characteristics: The Bx horizon ranges from silt loam to silty clay loam. The C horizon is medium acid in most places, but normally it is mildly alkaline on stream terraces and on toe slopes.

Ginat series.—This series consists of poorly drained Planosols that have a fragipan. These soils developed in alluvium of mixed origin. They occupy terraces in the Ohio River valley. The slope range is 0 to 2 percent.

Ginat soils are more gray and more mottled than the somewhat poorly drained Weinbach soils, which are in the same catena as the Ginat. They are farther away from the Green River than Robertsville soils, and they differ from Melvin soils in that they have a fragipan and a B horizon.

In Henderson County, Ginat soils are used for corn, soybeans, hay, and pasture. Some areas are wooded.

Representative profile of Ginat silt loam in a cultivated field a mile north of Reed and a half mile west of Ky. Highway No. 811:

Ap—0 to 8 inches, brown (10YR 5/3 or 4/3) silt loam; weak, fine, granular structure; very friable; strongly acid; abrupt, smooth boundary; 8 to 9 inches thick.

B21g—8 to 24 inches, light-gray (10YR 7/2) fine silt loam; common, fine, distinct mottles of yellowish brown (10YR 5/4) and brown (7.5YR 4/4); weak, fine, subangular blocky structure; friable; strongly acid; gradual, smooth boundary; 14 to 17 inches thick.

B22g—24 to 28 inches, light brownish-gray (10YR 6/2) silty clay loam; common, fine, faint mottles of brown (10YR 5/3) and yellowish brown (10YR 5/6); weak, fine, angular blocky structure; firm; strongly acid; clear, wavy boundary; 4 to 6 inches thick.

Bx—28 to 36 inches, mottled light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4 and 5/8) silty clay loam; weak, fine, subangular blocky structure; firm, brittle, and compact; strongly acid; gradual, smooth boundary; 7 to 10 inches thick.

Cg—36 to 48 inches, dark yellowish-brown (10YR 4/4) silty clay loam; few, fine, distinct mottles of light brownish gray (10YR 6/2) and few, fine, distinct mottles of strong brown (7.5YR 5/8); massive; friable; very strongly acid.

Range in characteristics: The Ap horizon ranges from its normal color to dark gray (10YR 4/1), and the B2 horizons are dominantly light gray (10YR 7/2) to gray (10YR 5/1). The Bx and C horizons are silt loam in some places. The Bx horizon generally is weakly developed. Some profiles do not have a Bx horizon but have a C horizon of silty clay loam or silty clay through which water moves slowly.

McGary series.—This series consists of somewhat poorly drained Planosols that have an argipan. These soils developed in calcareous, fine-textured sediments. They differ from Henshaw soils in being finer textured and in having an argipan. They are more mottled with gray and less well drained than Markland soils, which are of the same catena. They differ from the Taft, Weinbach, and Calloway soils in being finer textured in the subsurface horizons, in having an argipan, and in being less acid.

McGary soils in Henderson County occur on terraces along tributaries of the Ohio River. They are on a slope ranging from 0 to 2 percent. Most of the acreage is used for corn, soybeans, pasture, and hardwood trees. Some is idle.

Representative profile of this series is described in the subsection "Laboratory Data."

Robertsville series.—The Robertsville series consists of poorly drained Planosols that have a fragipan. These soils developed in mixed alluvium largely of limestone origin. They are more gray and more mottled than the somewhat poorly drained Taft soils of the same catena. They differ from Melvin soils in having a fragipan. They are at a lower elevation and closer to the Green River than Ginat soils.

Robertsville soils occur on level terraces in the flood plain of the Green River. They are used for corn, soybeans, hay, pasture, and hardwood trees.

Representative profile of Robertsville silt loam in a cultivated field 1 mile east of Ky. Highway No. 258 and ¾ mile north of the Green River:

Ap—0 to 6 inches, brown (10YR 5/3) silt loam; few, fine, faint mottles of light yellowish brown (10YR 6/4); weak, fine, granular structure; very friable; slightly acid; clear, smooth boundary; 6 to 8 inches thick.

A2—6 to 11 inches, brown (10YR 5/3) silt loam; common, medium, distinct mottles of light gray (10YR 7/2); weak, fine, granular structure; very friable; medium acid; clear, wavy boundary; 4 to 7 inches thick.

B2g—11 to 20 inches, light-gray (10YR 7/2) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/4); weak, fine, subangular blocky structure; friable; strongly acid; gradual, wavy boundary; 8 to 11 inches thick.

Bx1—20 to 30 inches, mottled light-gray (2.5YR 7/2) and yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; firm and brittle; strongly acid; gradual, smooth boundary; 9 to 12 inches thick.

Bx2—30 to 34 inches, mottled light-gray (2.5Y 7/2), strong-brown (7.5YR 5/6), and yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, angular blocky structure; firm, brittle, and compact; strongly acid; gradual, smooth boundary; 3 to 6 inches thick.

C—34 to 40 inches+, light gray (2.5YR 7/2) silty clay loam; few, fine, faint mottles of yellowish brown (10YR 5/4); massive; firm; strongly acid.

Range in characteristics: In some places the Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). The B horizon generally is light gray (10YR 7/2) to gray (10YR 6/1) with mottles of brown (7.5YR 4/4), strong brown (7.5YR 5/6), or brown (10YR 5/3). The depth to the fragipan, or to a moderately fine textured horizon, ranges from about 18 to 26 inches.

Taft series.—This series consists of somewhat poorly drained Planosols that have a fragipan. These soils developed in mixed alluvium largely of limestone origin. They are more pale in color and more mottled than the moderately well drained Captina soils; they are browner and less mottled than the poorly drained Robertsville soils; and they differ from the Henshaw and McGary soils in having a fragipan and a coarser textured subsoil. Taft soils are at a lower elevation and closer to the Green River than the Weinbach, Henshaw, and McGary soils.

Taft soils are on level terraces in the flood plain of the Green River. They are used mainly for corn and soybeans.

Representative profile of Taft silt loam in a cultivated field 1 mile northeast of Ky. Highway No. 258 and 1 mile southeast of Cash Creek Church:

Ap—0 to 4 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; very friable; medium acid; abrupt, smooth boundary; 4 to 7 inches thick.

B2—4 to 18 inches, pale-brown (10YR 6/3) silt loam; many, medium, distinct mottles of yellowish brown (10YR 5/6) and few, fine, faint mottles of light brownish gray (10YR 6/2); moderate, medium, subangular blocky structure; friable; strongly acid; clear, wavy boundary; 12 to 15 inches thick.

Bx1—18 to 30 inches, pale-brown (10YR 6/3) silty clay loam; many, fine, faint mottles of light yellowish brown (10YR 6/4) and light brownish gray (10YR 6/2); moderate, fine, subangular blocky structure; very firm, brittle, and compact; soft, brown concretions; very strongly acid; gradual, smooth boundary; 12 to 14 inches thick.

Bx2—30 to 45 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) silty clay loam; moderate, fine, subangular blocky structure; firm, brittle, and compact; common, small, black concretions; very strongly acid; gradual, smooth boundary; 12 to 16 inches thick.

C—45 to 50 inches+, mottled dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/6), and light-gray (10YR 7/2) silt loam; massive; friable; slightly acid.

Range in characteristics: The fragipan is 5 to 30 inches thick and is at a depth of 15 to 30 inches. It is weakly expressed in some profiles.

Weinbach series.—This series consists of somewhat poorly drained Planosols that have a fragipan. These soils developed in mixed alluvium on stream terraces in the Ohio River valley. Their slope range is 0 to 2 percent.

Weinbach soils are browner and less mottled than the poorly drained Ginat soils; and they are more pale in color and more mottled than the moderately well drained Sciotoville soils. They differ from the McGary and Henshaw soils in that they have a fragipan, a coarser textured subsoil, and a more acid C horizon.

Corn, soybeans, and hay are the principal crops grown on Weinbach soils in Henderson County. Some areas are pastured.

Representative profile of Weinbach silt loam in a cultivated field 1 mile northwest of Reed and 0.6 mile north of U.S. Highway No. 60:

Ap—0 to 5 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; few, soft, brown concretions; very strongly acid; abrupt, smooth boundary; 5 to 7 inches thick.

B1—5 to 13 inches, brown (10YR 5/3) silt loam; weak, medium, subangular blocky structure; friable; few, soft, brown concretions; very strongly acid; clear, smooth boundary; 7 to 9 inches thick.

B2g—13 to 24 inches, mottled brown (10YR 5/3), strong-brown (7.5YR 5/6), and light-gray (2.5Y 7/2) silt loam; weak, medium, subangular blocky structure; friable; few, soft, brown concretions; very strongly acid; gradual, wavy boundary; 10 to 13 inches thick.

Bx—24 to 40 inches, mottled yellowish-brown (10YR 5/4), light-gray (2.5Y 7/2), and dark-brown (10YR 4/3) fine silt loam; moderate, fine, subangular blocky structure; firm, brittle, and compact; few, soft, brown concretions; very strongly acid; gradual, smooth boundary; 14 to 18 inches thick.

C—40 to 42 inches+, dark yellowish-brown (10YR 4/4) silty clay loam; common, fine, faint mottles of pale brown (10YR 6/3); massive; friable; very strongly acid.

Range in characteristics: The Ap horizon is grayish brown (10YR 5/2) in some places. The reaction ranges from very strongly acid to medium acid. The fragipan ranges from weakly compacted to very firm and very compact. It is at a depth of 20 to 30 inches.

GRUMUSOLS

The Grumusol great soil group consists of intrazonal soils that consist dominantly of montmorillonitic clay. This type of clay has a high coefficient of expansion, that is, it swells when wet and shrinks and cracks when dry. When it shrinks, surface material falls into the cracks. The resulting churning effect offsets horizon differentiation. Grumusols have a thick, dark-colored A1 horizon and have no B horizon. They are calcareous in some places. Their colors are low in chroma and, thus, indicate poor drainage.

The Sharkey series represents this great soil group in Henderson County, though Sharkey soils intergrade to Alluvial soils. Sharkey soils are rich in clay of high shrink-swell potential; wide cracks form when these soils

dry. These soils are gleyed to a degree; otherwise they have weakly expressed genetic horizons. They differ from Low-Humic Gley soils in having a thicker, darker colored A1 horizon and more expanding clay. A high content of organic matter has given Sharkey soils their dark color.

Sharkey series.—The Sharkey series consists of very poorly drained Grumusols that intergrade to Alluvial soils. These soils formed in fine-textured, alkaline sediment. Generally, they occur adjacent to soils of the Uniontown and Markland catenas. Sharkey soils are finer textured than the dark-colored Dekoven soils, and they are finer textured and darker colored than the Birds, Waverly, and Melvin soils.

Sharkey soils occur in slack-water areas of the tributaries of the Ohio River. They are used mostly for corn and soybeans, but some of the lowest areas are wooded.

Representative profile of Sharkey silty clay in a cultivated field ¼ mile east of Ky. Highway No. 1217 and ¼ mile south of Barrett Ditch:

Ap1—0 to 6 inches, very dark gray (10YR 3/1) silty clay; common, fine, distinct mottles of dark brown (7.5YR 3/2); weak, fine, angular blocky structure; extremely hard when dry, very plastic when wet; medium acid; abrupt boundary; 6 to 8 inches thick.

A12—6 to 18 inches, very dark gray (10YR 3/1) clay; few, fine, faint mottles of very dark brown (10YR 2/2); strong, fine, angular blocky structure; extremely hard when dry, very plastic when wet; brown (10YR 5/3) coatings on the sides of cracks are common; slightly acid; gradual boundary; 10 to 13 inches thick.

C1g—18 to 28 inches, very dark gray (N 3/0) or dark-gray (N 4/0) clay; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; strong, fine, angular blocky structure; extremely hard when dry, very plastic when wet; neutral; gradual boundary; 9 to 12 inches thick.

C2g—28 to 42 inches+, dark-gray (5Y 4/1) or gray (5Y 5/1) silty clay; common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, fine, angular blocky structure; extremely hard when dry, very plastic when wet; lime nodules are common; mildly alkaline.

Range in characteristics: The A horizon ranges from 4 to 24 inches in thickness. Normally, the A horizon is clay or silty clay, and its color value is 3.5 or darker. In some places, up to 15 inches of dark grayish-brown (10YR 4/2) silty clay loam overwash lies on the soil. Normally, the C horizon is silty clay or clay, and its color range includes gray (5Y 5/1 to 10YR 5/1), yellowish brown (10YR 5/6), olive, light olive brown (2.5Y 5/6), dark yellowish brown (10YR 4/4), and olive brown (2.5Y 4/4). Reaction ranges from medium acid to neutral in the A horizon, and is neutral or mildly alkaline in the C horizon. When frozen, Sharkey soils tend to have platy structure.

Azonal order

The azonal order consists of soils that have little or no horizon development because of their youth, steep topography, or parent materials very low in weatherable minerals, or all three.

The azonal soils in Henderson County are classified in two of the great soil groups—Alluvial and Regosol.

ALLUVIAL SOILS

This great soil group consists of azonal soils that formed in recent deposits of alluvium. These soils have little or no horizon development and are considered youthful in all respects. Differences between horizons are due more to stratification than to any soil-forming process. Leaching of carbonates and other bases is minimal. Some soils are gleyed in the lower part of the subsoil to varying degrees. In forested areas the surface horizon generally is thin, dark-colored, and high in content of organic matter. In cultivated areas the Ap horizon generally has an accumulation of organic matter.

In Henderson County the Adler, Bruno, Collins, Egam, Huntington, Lindside, and Morganfield series represent the central concept of this great soil group. Of these, only Egam soils show slight clay accumulation in the lower part of the profile.

Some alluvial soils in this county intergrade to Low-Humic Gley soils. They are young soils that formed in alluvium but are less well drained than typical alluvial soils. They are better drained than Low-Humic Gley soils but are less gleyed in the lower part of the subsoil. They have no horizon development resulting from illuviation. These are the soils of the Falaya, Newark, and Wakeland series.

Adler series.—This series consists of moderately well drained soils on bottom lands. These soils formed in alluvium derived from neutral or calcareous loess. Their slope range is 0 to 4 percent.

Adler soils are part of a catena that includes Morganfield, Wakeland, Birds, and Dekoven soils. They are associated with these soils and with the soils of the Memphis catena on the uplands. Adler soils differ from the well-drained Morganfield soils in that they are mottled and are more gray in the lower part of their profile. They differ from the somewhat poorly drained Wakeland soils in that they are less gray and less mottled. They are less acid than Collins soils, which also developed from loess sediment, and they have more uniform silty texture than Lindside soils, which developed from stratified alluvium of the Ohio and Green Rivers.

Ordinarily, Adler soils are on the wide bottoms along the larger streams and downstream from the headwaters. They are used mostly for corn and soybeans, but in a few places they are pastured or wooded.

Representative profile of Adler silt loam in a cultivated field 100 feet east of House Bridge Road and 350 feet north of Camp Creek:

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; very friable; slightly acid; clear, smooth boundary; 7 to 9 inches thick.

C1—8 to 20 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; very friable; common fine roots; neutral; gradual, smooth boundary; 10 to 13 inches thick.

C2—20 to 24 inches, dark yellowish-brown (10YR 4/4) silt loam; few, fine, faint mottles of light yellowish brown (10YR 6/4); friable; neutral; gradual, smooth boundary; 3 to 5 inches thick.

C3—24 to 28 inches, light olive-brown (2.5Y 5/4) silt loam; common, medium, distinct mottles of light brownish gray (10YR 6/2); massive; friable; few concretions of dark brown (7.5YR 4/4); neutral; clear, smooth boundary, 3 to 5 inches thick.

C4—28 to 35 inches, mottled light olive-brown (2.5Y 5/4), light brownish-gray (2.5Y 6/2), and dark yellowish-brown (10YR 4/4) silt loam; massive; friable; neutral.

Range in characteristics: The Ap and C1 horizons range from dark yellowish brown (10YR 4/4) to yellowish brown (10YR 5/4), dark brown (10YR 3/3), or dark grayish brown (10YR 4/2). In places there may be no C2 horizon, or it may range from dark yellowish brown

(10YR 4/4) to light brownish gray (10YR 6/2). In places, instead of a C4 horizon, there is a buried A1 horizon of a Sharkey or a Dekoven soil. The reaction range is slightly acid to moderately alkaline. Mottles are common at a depth of 18 to 28 inches.

Bruno series.—The Bruno series consists of excessively drained soils that formed in sandy alluvium. These soils are mostly on bottom lands adjacent to the Ohio River. They have a slope range of 0 to 10 percent but are mostly level.

Bruno soils generally are adjacent to Huntington fine sandy loam. They differ from the Huntington soil in that they are more sandy. They lack the horizon development of the Lakin soils, which are on terraces.

Most areas are used for corn, some are used for soybeans or hay, and a few either are idle or are in johnsongrass.

Representative profile of Bruno loamy fine sand, 0 to 4 percent slopes, in a cultivated field 3 miles north of Audubon Memorial State Park and 100 feet west of Horseshoe Bend Road:

Ap—0 to 10 inches, brown (10YR 4/3) loamy fine sand; single grain; very friable; mildly alkaline; clear boundary; 9 to 13 inches thick.

C1—10 to 32 inches, brown (10YR 4/3) loamy fine sand; a few thin strata of sand and silt loam; single grain; loose; midly alkaline; diffuse boundary; 7 to 30 inches thick.

C2—32 to 48 inches+, brown (10YR 4/3) fine sandy loam; weak, medium, subangular blocky structure; very friable; mildly alkaline.

Range in characteristics: The Ap horizon is dark brown (10YR 3/3) in some places. In many places it consists of stratified fine sandy loam to sand. Stratified layers of sand, silt loam, and in a few places silty clay loam, may be at a depth below 20 inches.

Collins series.—This series consists of moderately well drained soils on bottom lands. These soils formed in alluvium derived from acid loess. Their slope range is 0 to 5 percent.

Collins soils are part of a catena that includes Falaya and Waverly soils. They are adjacent to these soils and to the soils of the Memphis catena on the uplands. Collins soils are less gray and less mottled in the lower part of their profile than the somewhat poorly drained Falaya soils. They are more acid than Adler soils.

Ordinarily, Collins soils are in small areas on the narrow bottoms in the southern part of the county. They are used mostly for corn, hay, and pasture.

Representative profile of Collins silt loam in a cultivated field ¾ mile northeast of the intersection of Trigg Turner Road and Ky. Highway No. 266, 200 feet east of a gravel road, and 1,000 feet north of the intersection of an old county road:

Ap—0 to 8 inches, brown (7.5YR 4/4) silt loam; weak, fine, granular structure; very friable; medium acid; clear, smooth boundary; 7 to 8 inches thick.

C1—8 to 18 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; very friable; medium acid; clear, smooth boundary; 9 to 12 inches thick.

C2—18 to 22 inches, dark yellowish-brown (10YR 4/4) silt loam; common, fine, faint mottles of yellowish brown (10YR 5/4) and pale brown (10YR 6/3); massive; friable; medium acid; gradual, smooth boundary; 4 to 6 inches thick.

C3g—22 to 27 inches, light yellowish-brown (10YR 6/4) silt loam; common, fine, faint mottles of dark brown (10YR 3/3 and 4/3) and light brownish gray (2.5Y 6/2); massive; friable; slightly acid; clear, smooth boundary; 4 to 7 inches thick.

A1b—27 to 35 inches+, black (10YR 2/1) silty clay loam with streaks of dark brown (10YR 3/3); weak to moderate, fine and medium, subangular blocky structure; firm; mildly alkaline.

Range in characteristics: The Ap horizon ranges from brown (7.5YR 4/4) to yellowish brown (10YR 5/4). The C1 and C2 horizons are olive brown (2.5Y 4/4) or yellowish brown (10YR 5/4) in some areas. The C horizons range from strongly acid to slightly acid. The buried A1b horizon does not occur in all profiles. The gray mottles are common at a depth of 18 to 32 inches.

Egam series.—This series consists of well drained and moderately well drained soils that formed in sediment deposited by the Ohio River. These soils are on bottom lands and are mostly level, but their slope range is 0 to 10 percent.

Generally, Egam soils are adjacent to soils of the Huntington catena. They are finer textured than those soils and have a firmer and more compact subsoil. Furthermore, they are browner and less mottled than all the soils of the Huntington catena except the Huntington soils. The compact layer in the Egam soils, in most places, is less permeable and probably has fewer pores than layers at a comparable depth in a profile of the Huntington soils. Egam soils differ from Ashton soils in not having a B horizon.

In Henderson County, Egam soils are used almost entirely for corn and soybeans.

Representative profile of Egam silty clay loam in a cultivated field 1¼ miles south of the Newburgh dam on the Ohio River and 500 feet east of a junction of two gravel roads:

Ap—0 to 7 inches, brown (10YR 4/3) silty clay loam; weak, fine, granular structure; friable; slightly acid; clear, smooth boundary; 6 to 8 inches thick.

C—7 to 18 inches, dark grayish-brown (10YR 4/2) fine silt loam; weak, fine, granular structure; friable; slightly acid; clear, smooth boundary; 10 to 12 inches thick.

A1b—18 to 27 inches, very dark grayish-brown (10YR 3/2) silty clay loam; moderate, medium, angular blocky structure or moderate, fine, prismatic structure; firm or very firm and compact; slightly acid; clear, smooth boundary; 7 to 10 inches thick.

Cb—27 to 40 inches+, dark yellowish-brown (10YR 4/4 or 3/4) silty clay loam; moderate, medium, angular blocky structure or moderate, fine, prismatic structure; firm or very firm and compact; slightly acid.

Range in characteristics: The texture of the Ap horizon is silt loam in some places, that of the A1b horizon is silty clay, and that of the Cb horizon is heavy silty clay loam. The Ap horizon ranges from brown (10YR 4/3) to very dark grayish brown (10YR 3/2), and the Cb horizon has a hue of 7.5YR in some profiles. The depth to the firm, compact horizon ranges from 10 to 25 inches. Generally the A1b horizon is the most compact, but the horizons below it may be equally compact. Normally the A1b horizon is 5 to 10 inches thick, but some profiles do not have an A1b horizon. The Cb horizon may have some weak properties of a B horizon. All horizons are either slightly acid or neutral in reaction.

Huntington series.—This series consists of well-drained Alluvial soils on bottom lands. These soils formed in alluvium deposited by the Ohio and Green Rivers. Generally they are level, but their slope range is 0 to 16 percent.

Huntington soils are part of a catena that includes Lindside, Newark, and Melvin soils. They are associated with the Lindside soils, as well as with Bruno, Egam, Ashton,

205-946—66——7

and Morganfield soils. Huntington soils differ from the moderately well drained Lindside soils in being more brown and less mottled in the lower horizons. They differ from the excessively drained Bruno soils in being less sandy throughout their profile. They have a less compact subsoil than Egam soils. They do not have a B horizon like Ashton soils, and they are darker colored and less silty than Morganfield soils.

In this county, Huntington soils are agriculturally important. They are used almost entirely for corn and soybeans.

Representative profile of Huntington silt loam, 0 to 4 percent slopes, in a cultivated field 1.2 miles north of Ky. Highway No. 811 toward Scuffletown, 0.5 mile south of the Ohio River, and 200 feet east of Cypress Ferry Road:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) or dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable; slightly acid; clear boundary; 6 to 8 inches thick.

C1—8 to 18 inches, dark-brown (10YR 3/3 and 4/3) silt loam or silty clay loam; weak, fine, granular structure; friable or firm; slightly acid; gradual boundary; 9 to 11 inches thick.

C2—18 to 42 inches+, brown or dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; neutral.

Range in characteristics: The Ap horizon ranges from silt loam to fine sandy loam. It is mostly silt loam in the flood plain of the Green River. The C horizons range from silty clay loam to fine sandy loam and are stratified in some places. Thin strata of loamy sand occur below a depth of 20 inches in some profiles, and mottles may occur at a depth below 30 inches. The reaction ranges from medium acid to neutral along the Green River, and from slightly acid to mildly alkaline along the Ohio River.

Lindside series.—This series consists of well-drained Alluvial soils on bottom lands. These soils formed in alluvium deposited by the Ohio and Green Rivers. Their slope range is 0 to 4 percent.

These soils are part of a catena that includes Huntington, Newark, and Melvin soils. They have a more brown, less gray, and less mottled subsoil than the somewhat poorly drained Newark soils. They are less brown and more mottled in the lower part of the profile than Huntington soils. They are darker colored in the upper part of the profile than Adler and Collins soils, and they are slightly finer textured. Lindside soils do not have a B horizon or a fragipan like Sciotoville and Captina soils.

Lindside soils in Henderson County are used mostly for corn and soybeans.

Representative profile of Lindside silt loam in a cultivated field ¾ mile southwest of the Daviess County line, 500 feet west of the Green River, and 3 miles south of Newman:

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary; 7 to 8 inches thick.

C1—7 to 16 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; slightly acid; clear, smooth boundary; 8 to 10 inches thick.

C2—16 to 28 inches, brown (10YR 4/3) silt loam; few, fine, faint mottles of grayish brown (10YR 5/2); massive; friable; slightly acid; clear, smooth boundary; 12 to 14 inches thick.

C3—28 to 40 inches+, dark yellowish-brown (10YR 4/4) silt loam; common, medium, distinct mottles of light gray (10YR 7/2); massive; friable; slightly acid.

Range in characteristics: The Ap horizon ranges from dark brown (10YR 3/3) to dark yellowish brown (10YR 4/4) in color, and from silty clay loam to silt loam in texture. The C horizons range from silty clay loam to fine sandy loam. They are stratified in some places. The reaction is slightly acid or neutral in the Ohio River flood plain and medium acid or slightly acid near the Green River.

Morganfield series.—This series consists of well-drained Alluvial soils that formed in sediment derived from neutral or calcareous loess. These soils occur mainly, in association with soils of the Memphis catena, in the belt of deep loess that borders the Ohio River. The slope range is 0 to 3 percent.

Morganfield soils are browner and less mottled in the lower horizons than Adler and Collins soils. Furthermore, they are less acid than Collins soils. They differ from Huntington soils, which were derived from sediment deposited by the Ohio and Green Rivers, in that they are more silty and generally lighter in color.

In Henderson County, Morganfield soils are used primarily for corn, soybeans, hay, and pasture.

Representative profile of Morganfield silt loam (0 to 2 percent slopes), in a cultivated field along Canoe Creek, 3 miles southwest of the Henderson city limits and ¼ mile south of U.S. Highway No. 60:

Ap—0 to 10 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; neutral; clear, smooth boundary; 8 to 12 inches thick.

C1—10 to 32 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, granular structure; friable; neutral; gradual, smooth boundary; 15 to 24 inches thick.

C2—32 to 36 inches+, brown (10YR 5/3) silt loam; weak, medium, subangular blocky structure; friable; neutral.

Range in characteristics: The reaction ranges from slightly acid to mildly alkaline. Some mottling occurs below a depth of 30 inches in places. The Ap horizon ranges from yellowish brown (10YR 5/4) to dark brown (10YR 3/3). The C horizons range from their normal color to olive brown (2.5Y 4/4), yellowish brown (10YR 5/4), or dark grayish brown (10YR 4/2).

Falaya series.—This series consists of somewhat poorly drained soils that formed in sediment derived from acid loess. The soils belong to the Alluvial great soil group, but they intergrade to the Low-Humic Gley great soil group.

Falaya and Collins soils are members of the same catena. Falaya soils are less well drained than Collins soils and are grayer and more mottled in their subsoil. They are browner in their surface layer than the poorly drained Waverly soils and are less gray and mottled in the upper part of their profile. They are more acid than Wakeland soils, which also formed in sediment derived from loess, and they are more silty than Newark soils, which formed in Ohio River and Green River alluvium.

In this county, Falaya soils are on bottom lands and generally are adjacent to upland soils that formed in shallow loess. The slope range is 0 to 4 percent. These soils, for the most part, have been cleared and are used mainly for corn, soybeans, hay, and pasture.

Representative profile of Falaya silt loam in a cultivated field 1¼ miles southeast of Corydon, along lower Rock Springs Road, on the west side of a road intersection:

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary; 7 to 8 inches thick.

C1—7 to 12 inches, dark yellowish-brown (10YR 4/4) silt loam; common, fine, faint mottles of light brownish gray (2.5Y 6/2); weak, fine, granular structure; very friable; strongly acid; clear, smooth boundary; 5 to 7 inches thick.

C2g—12 to 35 inches+, grayish-brown (2.5Y 5/2) silt loam; common, medium, faint mottles of light brownish gray (2.5Y 6/2) and common, medium, distinct mottles of brown (7.5YR 5/4); weak, subangular blocky structure breaking to weak, fine, granular structure; friable; strongly acid.

Range in characteristics: The Ap horizon is fine sandy loam in a few places near some buffs where sand from material of sandstone origin has been deposited. The C horizons generally are strongly acid or medium acid. They range from light yellowish brown (10YR 6/4) to dark yellowish brown (10YR 4/4) mottled with gray. In some places the C1 horizon has a few fine mottles of very pale brown (10YR 7/3) or light yellowish brown (10YR 6/4). This horizon extends to a depth of 12 to 15 inches. The C2g horizon is massive in some places. Thin strata of silty clay loam may occur in the lower horizons.

Newark series.—This series consists of somewhat poorly drained Alluvial soils that intergrade to Low-Humic Gley soils. These soils formed in sediment deposited by the Ohio and Green Rivers. Generally, they are bordered by soils of the Elk and Wheeling catenas, which are at a slightly higher elevation. Newark soils differ from the moderately well drained Lindside soils of the same catena in having more grayish mottles at a lesser depth. They have a browner surface horizon and are less gray and less mottled in the upper part of the profile than the poorly drained Melvin soils. They are less silty than the Falaya and Wakeland soils, both of which formed in loess sediment.

In Henderson County, Newark soils are mostly on a slope of 0 to 3 percent. Most areas are used for corn and soybeans; some are used for hay, pasture, or hardwood trees.

Representative profile of Newark silt loam in a cultivated field 3 miles south of Newman, 1 mile southwest of the Daviess County line, and 500 feet west of the Green River:

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; neutral; abrupt, smooth boundary; 6 to 8 inches thick.

C1—6 to 12 inches, brown (10YR 4/3 and 5/3) silt loam; weak, fine, granular structure; very friable; slightly acid; clear, smooth boundary; 5 to 8 inches thick.

C2g—12 to 36 inches+, mottled light brownish-gray (2.5Y 6/2) and dark-brown (10YR 3/4) silt loam; massive; very friable; medium acid.

Range in characteristics: The Ap horizon is dark yellowish brown (10YR 4/4) or dark brown (10YR 3/3) in some places, and it can consist of silty clay loam. Thin strata of silty clay loam and fine sandy loam are common below the Ap horizon. The reaction ranges from medium acid or slightly acid along the Green River to slightly acid or neutral along the Ohio River. In this county, silt from the nearby loess uplands can occur throughout the profile.

Wakeland series.—This series consists of somewhat poorly drained soils that formed in sediment derived from neutral or calcareous loess. These soils are adiacent to upland soils of the Memphis catena. They differ from the moderately well drained Adler soils, which are of the same catena as the Wakeland, in that they are lighter colored and more mottled at a lesser depth. Wakeland soils are less gray and less mottled than the poorly drained Birds soils. They are less acid than Falaya soils, which also formed in loess sediment; and they are more silty than Newark soils, which formed in sediment deposited by the Ohio and Green Rivers.

In Henderson County, Wakeland soils are rare on the narrow bottoms but are common on the broad, level bottoms that lie a few miles below the headwaters. The slope range is 0 to 3 percent. Most areas are used for corn, soybeans, hay, or pasture.

Representative profile of Wakeland silt loam in a cultivated field ½ mile north of Ky. Highway No. 54, ¼ mile west of Lick Creek, and 100 feet west of gravel road at small iron bridge:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; very friable; nearly neutral; gradual, smooth boundary; 7 to 9 inches thick.

C1—8 to 12 inches, dark yellowish-brown (10YR 4/4) silt loam; few or common, fine, faint mottles of light brownish gray (10YR 6/2); weak, fine, granular structure; very friable; slightly acid; gradual, smooth boundary; 4 to 5 inches thick.

C2g—12 to 18 inches, brown (10YR 5/3) silt loam; common, medium, distinct mottles of light brownish gray (2.5Y 6/2); weak, fine, granular structure; very friable; few black concretions; slightly acid; gradual, smooth boundary; 5 to 8 inches thick.

C3g—18 to 35 inches+, mottled light brownish-gray (2.5Y 6/2), brown (10YR 5/3), and light olive-gray (5Y 6/2) heavy silt loam; weak, subangular blocky structure or weak, fine, granular structure; very friable; medium and large, soft, black concretions; slightly acid.

Range in characteristics: The surface layer, in some places, is dark yellowish brown (10YR 4/4). The second layer varies considerably in color but generally is some shade of brown mottled with grayish brown. The third layer ranges from its normal color to very dark gray (10YR 3/1); it is a silty clay loam in some profiles. In some places a buried profile similar to that of Dekoven soils occurs at a depth below 20 inches. The reaction of the C horizons ranges from slightly acid to mildly alkaline.

REGOSOLS

The Regosol great soil group consists of azonal soils that are composed of deep unconsolidated rock (soft mineral deposits) in which few or no clearly expressed soil characteristics have developed. These soils develop mostly in recent deposits of sand, loess, Coastal Plain materials, and glacial drift.

Lakin soils are the only Regosols in this county. They have a weakly developed C&B horizon that is distinguishable because of its color, which is brighter than that of the A horizon. In the C&B horizon there is some evidence of translocation of clay. The clay content of these soils, however, is very low.

Lakin series.—This series consists of excessively drained Regosols on stream terraces. These soils developed in sandy alluvium deposited mainly by the Ohio River.

Lakin soils generally occur adjacent to Wheeling soils. They are coarser textured than Wheeling soils and have

weaker horizonation. They are slightly better developed than Bruno soils.

In Henderson County, Lakin soils generally occupy low and, in places, hummocky ridges. The slope range is 2 to 6 percent. Lakin soils are either farmed or used as building sites. The principal crops are corn, soybeans, hay, and pasture.

Representative profile of Lakin loamy fine sand, 2 to 6 percent slopes, in a cultivated field 2 miles north of Geneva, 50 feet south of a house, and 200 feet west of a paved road:

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; single grain; loose; strongly acid; clear, smooth boundary; 6 to 8 inches thick.

C&B—7 to 18 inches, strong-brown (7.5YR 5/6) loamy fine sand; single grain; loose; medium acid; gradual, smooth boundary; 10 to 13 inches thick.

C—18 to 40 inches+, yellowish-brown (10YR 5/6) fine sand; single grain; loose; slightly acid.

Range in characteristics: The Ap horizon is brown (10YR 4/3) or dark brown (10YR 3/3) in some places. The C&B horizon generally has a redder hue than the C horizon and generally is higher in chroma than the A horizon. The reaction of the C horizon ranges from medium acid to neutral in areas adjacent to loess soils. The texture in the lower part of the profile ranges from fine sand to fine sandy loam.

Laboratory Data

Soil classification, to a great extent, is based on the relationship between the horizons and the specific soil characteristics that can be observed, inferred, or determined by close field examination. Physical, chemical, and mineralogical data resulting from laboratory analyses, however, can be useful to the soil scientist in classifying the soils. These data strengthen or support many field decisions that concern the placement of soils in the higher categories of classification.

Laboratory data are helpful in estimating moisture-supplying capacity, acidity, cation-exchange capacity, mineralogical composition, organic-matter content, and other soil characteristics that affect management needs. The data are also helpful in developing concepts of soil formation.

In Henderson County, soils of the Henshaw, McGary, Sequatchie, and Uniontown series were selected for analyses. Two samples of each soil type were selected in order to discover differences (not observable in field examination), if any, within similar soils. The two samples of each soil type were as nearly identical as possible.

Table 7 shows the results of the laboratory analyses of the soil samples, or profiles, that were collected. The analyses were made by the Soil Survey Laboratory, Soil Conservation Service, Beltsville, Md. Particle size distribution was determined by the pipette method (*6*, *7*). The pH values were determined by the glass electrode method, using a soil-water ratio of *1:1*, or *1:5* in an organic horizon. The macro method was used to determine the extractable cations (*8*). The procedure, however, deviated from the standard method in that a 25-gram soil sample and 250 milliliters of ammonium acetate were used to leach the soil material, a cerate titration was used to determine the extractable calcium, and a flame spectrophotometer was used to determine the extractable sodium and potassium. All data in table 7 are reported on an oven-dry basis.

All of the soils selected for analyses formed on terraces. The Sequatchie soils formed in general alluvium deposited by the Ohio River; and the Uniontown, Henshaw, and McGary soils formed in alluvial sediment along tributaries of the Ohio River. All of these soils have well-differentiated horizons. Organic matter has accumulated on the surface, carbonates have leached from the upper horizons, and silicate clays have been translocated from the A horizon to the B horizon. The Henshaw and McGary soils show evidence of gleying. Some characteristics, such as the dominance of sand, silt, or clay in the profile, are inherited from the parent materials. Some other characteristics are the result of soil-forming processes.

Both profiles of Sequatchie loam show evidence of stratified parent materials, as soils that occur along major streams commonly do. The large amount of sand indicates that the Sequatchie soils formed in sandy sediment. The C horizon formed in coarser textured material than the A and B horizons. A small accumulation of clay in the B horizon is normal for soils in which moderate illuviation has taken place. The profile near Geneva has lower values of cation-exchange capacity, pH, base saturation, and organic matter than the profile near Alzey. The acidity and base saturation can be corrected by lime. The relatively low cation-exchange capacity of both profiles reflects the low content of organic matter and the low content of clay; and it indicates a low ability to hold plant nutrients. Frequent small applications of fertilizer may be more beneficial than infrequent heavy applications.

The Uniontown and Henshaw soils likely formed in the same type of parent materials, medium textured to moderately fine textured sediments. The Uniontown profile taken near Canoe Creek and the Henshaw profile taken near Geneva are similar in many respects, as are the Uniontown profile taken near Bluff City and the Henshaw profile taken near Airline Road. The profiles of both soils contain insignificant amounts of sand. The B horizon contains a large amount of clay, as compared to the A horizon; and it contains more clay than the C horizon. The distribution of clay and the presence of thick clay films on the ped faces indicate that considerable clay has moved from the A horizon to the B horizon. The clay content of the C horizon in both Uniontown profiles and in the Henshaw profile taken near Geneva is lower than the combined clay content of the A and B horizons. Since these soils developed in alluvial sediment, stratification could be partly responsible for the textural differences between the horizons. These soils, however, show only weak evidence of stratification.

In all four profiles of the Uniontown and Henshaw soils, base saturation in the plow layer is satisfactory. In the Henshaw profile taken near Geneva, however, and in the Uniontown profile taken near Canoe Creek, base saturation decreases below the plow layer. The lower base saturation, the accompanying lower pH, and a rise in exchangeable hydrogen indicate more advanced leaching. Apparently, these profiles have been subjected to greater

weathering than the profile taken near Airline Road and the one taken near Bluff City. These latter profiles have a higher pH than is generally desired in soils used for general farming. Carbonates have been leached from the upper part of the Uniontown and Henshaw profiles and have been deposited in the calcareous lower horizons. The low cation-exchange capacity in both Henshaw profiles reflects the low content of organic matter and the low content of clay in the plow layer. Frequent small applications of lime and fertilizer can offset possible leaching losses. The rather high content of silt in the Uniontown and Henshaw soils indicates a potentially good moisture-supplying capacity.

McGary soils are of a finer texture than Henshaw soils, and this difference in texture is the basis for separation in the field. Moreover, laboratory data support this separation. The distribution of clay indicates that McGary soils formed in fine-textured sediment and that they are strongly illuviated. The cation-exchange capacity of the McGary soils is considerably higher than that of the coarser textured soils and reflects the influence of the clay content and the organic-matter content. These soils are low in productivity partly because of base saturation, pH, and type of exchangeable cations. The base saturation and pH generally is below desirable values. Hydrogen, sodium, and magnesium occur as exchangeable cations in more noticeable amounts in the McGary profiles than in the other profiles.

Soils, such as the McGary, that are dominated by clay-sized particles have many small pores and few large pores. Water moves slowly through these soils, and the upper horizons are saturated with water during a wet period. The fine texture of the B and C horizons somewhat retricts root development, and consequently most of the root development is in the upper horizons. The resulting poor aeration in the root zone likely contributes to the low productivity. Partly because water moves slowly through these soils, the C horizon is less leached and higher in base saturation than the A and B horizons. McGary soils are more leached than the Uniontown and Henshaw soils possibly because they have been weathering for a longer period of time.

McGary soils need improved drainage. The addition of crushed limestone can increase the productivity, for the limestone replaces the exchangeable hydrogen and sodium, raises the pH, and increases the base saturation. The low content of silt indicates a lower moisture-supplying capacity than that of the Uniontown and Henshaw soils.

Following are descriptions of the profiles that were analyzed.

Profile of Sequatchie loam, S54Ky–51–10(1–4) :

Ap—0 to 10 inches, brown to dark-brown (7.5YR 4/4), very friable loam; weak, fine and medium, subangular blocky structure breaking easily to weak, fine, granular structure; abrupt, smooth boundary; medium acid.

B1—10 to 15 inches, reddish-brown (5YR 4/4), friable loam; moderate, medium, angular blocky structure; vesicular; clear, smooth boundary; slightly acid.

B2—15 to 25 inches, reddish-brown (5YR 4/4), friable fine sandy loam; moderate, coarse, angular blocky structure; vesicular; clear, smooth boundary; slightly acid.

C—25 to 48 inches+, strong-brown (7.5YR 5/6), loose loamy fine sand; single grain; medium acid.

Profile of Sequatchie loam, S54Ky–51–11(1–5) :

Ap—0 to 7 inches, dark-brown (7.5YR 3/2), very friable loam; weak, fine and medium, subangular blocky structure breaking easily to weak, fine, granular structure; clear, smooth boundary; strongly acid.

A2—7 to 11 inches, dark-brown (7.5YR 3/2), friable loam; moderate, medium, angular blocky structure; abrupt, smooth boundary; slightly acid.

B1—11 to 16 inches, reddish-brown (5YR 4/3), firm loam; moderate, coarse, angular blocky structure; plastic, slightly sticky when wet; vesicular; gradual, smooth boundary; slightly acid.

B2—16 to 34 inches, dark reddish-brown (5YR 3/4), very firm sandy clay loam; moderate, coarse, angular blocky structure; plastic, slightly sticky when wet; vesicular; clear, smooth boundary; medium acid.

C—34 to 48 inches+, yellowish-red (5YR 4/6), loose loamy sand; single grain; slightly acid.

Profile of Uniontown silt loam, S54Ky–51–14–(1–5) :

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2), very friable silt loam; few, fine, faint grayish-brown (2.5Y 5/2) mottles; weak, medium, subangular blocky structure breaking easily to weak, fine, granular structure; abrupt, smooth boundary; slightly acid.

B1t—8 to 12 inches, yellowish-brown (10YR 5/6), firm silty clay loam; plastic and slightly sticky when wet; moderate, medium and coarse, angular blocky structure; gradual, smooth boundary; very strongly acid.

B2t—12 to 21 inches, yellowish-brown (10YR 5/6), firm silty clay loam; plastic and slightly sticky when wet; strong, medium and coarse, angular blocky structure; few, small, round, brown concretions; clear, smooth boundary; slightly acid.

B3t—21 to 25 inches, light olive-brown (2.5Y 5/6), friable silt loam; moderate, coarse, angular blocky structure; few, small, brown concretions; clear, smooth boundary; mildly alkaline.

C—25 to 48 inches+, light olive-brown (2.5Y 5/6), very friable, slightly calcareous silt loam; common, fine, distinct, light brownish-gray (2.5Y 6/2) mottles; weak, fine and medium, angular blocky structure; irregular-shaped lime nodules, ½ to 3 inches in diameter, numerous below a depth of 28 inches.

Profile of Uniontown silt loam, S54Ky–51–15–(1–6) :

Ap—0 to 9 inches, brown (10YR 5/3), very friable silt loam; weak, medium, angular blocky structure that breaks easily to weak, fine, granular structure; numerous roots and few dark organic-matter stains; abrupt, smooth boundary; mildly alkaline.

B1—9 to 14 inches, yellowish-brown (10YR 5/6), friable, slightly sticky heavy silt loam; few, fine, faint, brown (10YR 5/3) mottles; moderate, medium, angular blocky structure; clear, smooth boundary; mildly alkaline.

B21t—14 to 18 inches, yellowish-brown (10YR 5/6), friable, slightly plastic silty clay loam; few, fine, distinct mottles of light brownish gray (2.5Y 6/2); moderate, medium, angular blocky structure; few, small, round, brown concretions; clear, smooth boundary; mildly alkaline; clay-skin coatings of a lighter shade than matrix color on many of the ped surfaces.

B22t—18 to 25 inches, dark yellowish-brown (10YR 4/4) (on ped surfaces) and yellowish-brown (10YR 5/8) (when crushed), firm silty clay loam; strong, medium and coarse, angular blocky structure; prominent clay skins; few, small, round, brown concretions; gradual, smooth boundary; mildly alkaline.

B3t—25 to 35 inches, mottled yellowish-brown (10YR 5/6) and light olive-brown (2.5Y 5/6), friable silty clay loam; mottles are many, fine, and distinct; moderate, coarse, angular blocky structure; prominent brown (10YR 5/3) clay skins; few, small, round, brown concretions; gradual, smooth boundary; mildly alkaline; peds in this layer slightly vesicular.

TABLE 7.—*Chemical and physical characteristics*

[The analyses were made by the Soil Survey Laboratory,

Soil, survey number, and location of sample	Horizon	Depth	Particle size distribution, in millimeters			
			Very coarse sand (2–1)	Coarse sand (1–0.5)	Medium sand (0.5–0.25)	Fine sand (0.25–0.10)
		In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Sequatchie loam, S54Ky–51–10–(1–4): 4 miles N. of Geneva.	Ap	0–10	0. 1	1. 6	7. 0	26. 0
	B1	10–15	. 2	2. 5	10. 5	27. 1
	B2	15–25	. 5	3. 6	13. 8	30. 6
	C	25–48+	. 1	1. 6	11. 0	54. 4
Sequatchie loam, S54Ky–51–11–(1–5): 2 miles E. of Alzey.	Ap	0–7	0	4. 6	23. 6	11. 7
	A2	7–11	0	4. 9	23. 1	11. 5
	B1	11–16	0	5. 0	23. 8	14. 9
	B2	16–34	0	5. 0	23. 1	15. 3
	C	34–48+	0	9. 3	56. 4	22. 2
Uniontown silt loam, S54Ky–51–14–(1–5): ½ mile W. of Canoe Creek near Ky. Highway No. 136.	Ap	0–8	. 1	. 2	. 2	. 3
	B1	8–12	0	. 1	. 1	. 1
	B2t	12–21	0	0	. 1	. 2
	B3t	21–25	0	0	. 1	. 2
	C	25–48+	. 8	. 4	. 1	. 1
Uniontown silt loam, S54Ky–51–15–(1–6): ½ mile S. of Bluff City.	Ap	0–9	. 4	. 6	. 4	. 3
	B1	9–14	. 1	. 4	. 3	. 2
	B21t	14–18	. 1	. 2	. 2	. 2
	B22t	18–25	0	. 1	. 1	. 3
	B3t	25–35	. 1	. 2	. 3	. 6
	C	35–74+	. 6	. 5	. 2	. 3
Henshaw silt loam, S54Ky–51–12–(1–6): ½ mile W. of Geneva.	Ap	0–9	1. 2	1. 3	. 5	. 3
	A2	9–13	. 6	1. 0	. 4	. 3
	B1t	13–21	. 2	. 6	. 3	. 4
	B2t	21–34	. 2	. 5	. 2	. 3
	C1	34–38	. 1	. 1	. 1	. 2
	C2	38–48+	. 1	. 2	. 1	. 2
Henshaw silt loam, S54Ky–51–13–(1–6): 3 miles E. of Henderson near Airline Road.	Ap	0–10	. 3	. 5	. 2	. 2
	A2	10–18	1. 4	1. 2	. 4	. 3
	B1t	18–22	. 2	. 7	. 4	. 4
	B2t	22–34	. 2	. 6	. 4	. 7
	B3t	34–40	. 2	. 3	. 2	. 3
	C	40–48+	. 4	. 7	. 3	. 3
McGary silt loam, S54Ky–51–16–(1–4): ½ mile N. of Rangers Landing on the Green River.	Ap	0–8	1. 4	1. 7	. 8	1. 0
	B21t	8–13	. 6	. 8	. 4	. 6
	B22t	13–26	. 3	. 4	. 2	. 4
	C	26–61	. 2	. 6	. 4	. 8
McGary silt loam, S54Ky–51–17–(1–4): ½ mile N. of Webster County near U.S. Highway No. 41.	Ap	0–7	4. 0	2. 7	1. 0	1. 1
	B21t	7–14	1. 5	1. 3	. 6	. 8
	B22t	14–26	. 2	. 3	. 3	. 5
	C	26–60	. 5	. 5	. 3	. 4

[1] Organic matter was determined from organic carbon by the 1.724 factor.
[2] Calcareous.

of some representative soils

Soil Conservation Service, Beltsville, Md.]

Particle size distribution, in millimeters—Continued			Reaction	Organic [1] matter	Exchangeable cations (Milliequivalents per 100 grams of soil)					Cation exchange capacity (sum)	Base saturation
Very fine sand (0.10–0.05)	Silt (0.05–0.002)	Clay (<0.002)			Calcium	Magnesium	Hydrogen	Sodium	Potassium		
Pct.	*Pct.*	*Pct.*	*pH*	*Pct.*						*Meq./100 gm.*	*Pct.*
10. 9	43. 2	11. 2	5. 6	1. 10	2. 6	0. 4	4. 2	0. 1	0. 2	7. 4	43
9. 3	36. 6	13. 8	5. 5	. 31	2. 3	. 5	1. 5	. 2	. 1	4. 6	67
8. 8	27. 2	15. 5	5. 7	. 07	2. 7	. 5	1. 0	. 2	. 1	4. 5	78
13. 0	13. 1	6. 8	5. 4	. 14	1. 4	. 4	1. 3	. 2	. 1	3. 4	62
5. 4	39. 6	15. 1	6. 4	1. 28	5. 3	1. 4	1. 1	. 1	. 2	8. 1	86
5. 5	39. 4	15. 6	6. 6	1. 28	5. 5	1. 5	1. 1	. 1	. 2	8. 4	87
6. 3	32. 3	17. 7	6. 2	. 53	3. 9	1. 0	3. 4	. 2	. 1	8. 6	60
6. 4	27. 7	22. 5	5. 8	. 45	4. 5	. 8	4. 0	. 2	. 2	9. 7	59
1. 2	3. 7	7. 2	5. 9	. 14	2. 0	. 3	1. 5	. 1	. 1	3. 9	62
1. 4	83. 9	13. 9	6. 2	1. 31	7. 4	1. 6	3. 4	. 1	. 1	12. 4	73
. 7	68. 1	30. 9	4. 8	. 48	8. 1	3. 5	9. 7	. 3	. 3	21. 9	56
1. 0	65. 6	33. 1	5. 1	. 52	9. 9	5. 6	8. 4	. 3	. 3	24. 5	66
1. 2	72. 5	26. 0	7. 0	. 48	10. 6	5. 8	1. 3	. 4	. 2	18. 3	93
. 8	79. 8	18. 0	8. 0	. 41	[2]	[2]	[2]	[2]	[2]	[2]	[2]
[3] . 9	85. 2	12. 2	7. 6	1. 40	7. 7	3. 3	1. 3	. 1	. 1	12. 4	90
. 5	79. 2	19. 3	7. 3	. 45	7. 7	3. 7	1. 9	. 1	. 1	13. 0	85
. 5	67. 6	31. 2	7. 1	. 45	11. 8	6. 8	3. 3	. 1	. 2	22. 2	85
. 6	64. 1	34. 8	7. 4	. 59	15. 1	8. 5	3. 5	. 1	. 3	27. 5	87
1. 1	70. 6	27. 1	7. 6	. 43	12. 8	7. 2	1. 5	. 1	. 2	21. 8	93
1. 0	86. 5	10. 9	8. 1	. 14	[2]	[2]	[2]	[2]	[2]	[2]	[2]
[3] 1. 0	86. 8	8. 9	5. 8	. 84	4. 5	. 6	2. 5	. 1	. 1	7. 8	68
1. 2	78. 7	17. 8	4. 6	. 22	3. 3	. 9	9. 8	. 1	. 1	14. 2	31
. 9	68. 0	29. 6	4. 6	. 26	4. 5	3. 0	15. 8	. 1	. 3	23. 7	33
. 9	64. 7	33. 2	4. 8	. 19	6. 2	6. 6	14. 6	. 1	. 3	27. 8	47
1. 6	82. 3	15. 6	7. 8	. 19	[2]	[2]	[2]	[2]	[2]	[2]	[2]
1. 3	83. 7	14. 4	8. 0	. 17	[2]	[2]	[2]	[2]	[2]	[2]	[2]
1. 3	89. 6	7. 9	7. 1	1. 19	6. 1	. 8	1. 0	. 1	. 1	8. 0	88
1. 2	84. 4	11. 1	6. 9	. 60	5. 6	1. 7	. 8	. 1	. 1	8. 3	90
1. 3	71. 7	25. 3	7. 1	. 45	8. 6	6. 6	2. 4	. 6	. 2	18. 4	87
1. 7	65. 3	31. 1	7. 4	. 47	[2]	[2]	[2]	[2]	[2]	[2]	[2]
1. 1	70. 0	27. 9	7. 7	. 34	[2]	[2]	[2]	[2]	[2]	[2]	[2]
1. 1	77. 4	19. 8	8. 1	. 26	[2]	[2]	[2]	[2]	[2]	[2]	[2]
[3] 1. 2	67. 0	26. 9	5. 0	1. 48	3. 9	2. 3	10. 4	. 4	. 2	17. 2	40
1. 0	60. 4	36. 2	4. 8	. 41	2. 5	2. 8	13. 1	. 3	. 2	18. 9	31
. 5	44. 7	53. 5	4. 8	. 45	3. 4	7. 9	18. 6	. 6	. 5	31. 0	40
1. 0	52. 9	44. 1	5. 1	. 62	2. 8	10. 6	9. 8	. 8	. 4	24. 4	60
. 8	73. 7	16. 7	4. 8	2. 31	4. 6	1. 5	9. 4	. 4	. 1	16. 0	41
. 7	62. 8	32. 3	5. 0	. 93	3. 1	5. 5	12. 8	1. 2	. 2	22. 8	44
. 7	51. 5	46. 5	4. 9	1. 09	4. 3	7. 2	9. 2	2. 2	. 4	23. 3	61
. 5	53. 0	44. 8	6. 7	. 62	8. 2	18. 9	2. 6	5. 0	. 2	30. 4	91

[3] Undecomposed organic matter in sand fractions.

C—35 to 74 inches+, mottled yellowish-brown (10YR 5/8), light olive-brown (2.5Y 5/6), and light brownish-gray (2.5Y 6/2), very friable silt loam; calcareous; weak, fine and medium, angular blocky structure; few irregular-shaped lime nodules 1 to 2 inches in diameter at a depth of 43 inches.

Profile of Henshaw silt loam, S54Ky–51–12–(1–6) :

Ap—0 to 9 inches, brown to dark-brown (10YR 4/3), very friable silt loam; common, medium, distinct, grayish-brown (2.5Y 5/2) mottles; weak, medium, angular blocky structure breaking easily to weak, fine, granular structure; abrupt, smooth boundary; medium acid.

A2—9 to 13 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (2.5YR 6/2), friable silt loam; mottles are many, medium, and distinct; moderate, fine and medium, angular blocky structure; few, small, brown concretions; clear, smooth boundary; very strongly acid.

B1t—13 to 21 inches, yellowish-brown (10YR 5/4), friable to firm silty clay loam; few, fine, faint, light brownish-gray (2.5Y 6/2) mottles; strong, medium, angular blocky structure; plastic and slightly sticky when wet; clear, smooth boundary; very strongly acid.

B2t—21 to 34 inches, light olive-brown (2.5Y 5/6) firm silty clay loam; few, fine, faint, grayish-brown (2.5Y 5/6) mottles; moderate, coarse, angular blocky structure; plastic, slightly sticky when wet; few, small, brown concretions; gradual, smooth boundary; neutral; clay-skin coatings impart a brown to dark-brown cast to ped faces.

C1—34 to 38 inches, light olive-brown (2.5Y 5/6), friable silt loam; common, fine, distinct yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; moderate, medium, angular blocky structure; gradual, smooth boundary; mildly alkaline.

C2—38 to 48 inches+, light olive-brown (2.5Y 5/6), very friable silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) and light brownish-gray (10YR 6/2) mottles; weak, medium, angular blocky structure; slightly calcareous below a depth of 45 inches; few lime nodules ½ inch to 2 inches in diameter at a depth of 50 inches.

Profile of Henshaw silt loam, S54Ky–51–13–(1–6) :

Ap—0 to 10 inches, dark, grayish-brown (10YR 4/2), very friable silt loam; few, fine, faint, grayish-brown (2.5Y 5/2) mottles; weak, medium, angular and subangular blocky structure breaking easily to weak, fine, granular structure; clear, smooth boundary; mildly alkaline.

A2—10 to 18 inches, grayish-brown (2.5Y 5/2), very friable silt loam; many, fine, faint, dark grayish-brown (10YR 4/2) mottles; weak, coarse, platy structure; few, small, brown concretions; neutral; clear, smooth boundary.

B1t—18 to 22 inches, mottled yellowish-brown (10YR 5/8) and light brownish-gray (2.5Y 6/2), friable silt loam; mottles are many, medium, and distinct; moderate, coarse, angular blocky structure; slightly plastic and slightly sticky when wet; few, small, brown concretions; neutral; gradual, smooth boundary.

B2t—22 to 34 inches, light olive-brown (2.5Y 5/6), very firm silty clay loam; moderate, coarse, angular blocky structure; plastic and slightly sticky when wet; few, small, brown concretions; clear, smooth boundary; mildly alkaline; clay skins impart a darker color to ped faces.

B3t—34 to 40 inches, light olive-brown (2.5Y 5/6), firm silty clay loam; few, fine, distinct, grayish-brown (2.5Y 5/2) mottles; moderate, coarse, angular blocky structure; plastic and slightly sticky when wet; few, small, brown concretions; gradual, smooth boundary; mildly alkaline.

C—40 to 48 inches+, mottled light olive-brown (2.5Y 5/6), yellowish-brown (10YR 5/8), and light brownish-gray (10YR 6/2), very friable silt loam; mottles are many, fine, and distinct, weak, fine and medium, angular blocky structure; moderately alkaline; slightly calcareous at a depth of 46 inches.

Profile of McGary silt loam, S54Ky–51–16–(1–4) :

Ap—0 to 8 inches, mottled brown (10YR 5/3) and grayish-brown (10YR 5/2), friable heavy silt loam; mottles are many, fine, and faint; weak, medium, subangular blocky structure that breaks easily to moderate, fine, granular structure; few, small, round, black concretions; many fine roots; abrupt, smooth boundary; very strongly acid.

B21t—8 to 13 inches, mottled yellowish-brown (10YR 5/6) and light brownish-gray (2.5Y 6/2), firm silty clay loam; mottles are many, fine, and distinct; moderate, medium, angular blocky structure; clear, smooth boundary; few, small, round, brown concretions; fine roots; very strongly acid.

B22t—13 to 26 inches, mottled strong-brown (7.5Y 5/6), light olive-brown (2.5Y 5/4), and gray (5Y 6/1), firm silty clay; mottles are many, fine, and distinct; strong, coarse, blocky structure; sticky and plastic when wet; very pronounced clay skins; few, small, brown concretions; very strongly acid in upper part to medium acid in lower part

C—26 to 61 inches, mottled dark yellowish-brown (10YR 4/4) and grayish-brown (2.5Y 5/2), very firm silty clay; mottles are many, fine, and distinct; very sticky and plastic when wet; strong, medium and coarse, angular blocky structure; few, small, brown concretions; some dark-colored concretionary stains on some ped surfaces; neutral at depth of 30 inches and mildly alkaline at depth of 50 inches; slightly calcareous at depth of 60 inches; common lime nodules below a depth of 60 inches.

Profile of McGary silt loam, S54Ky–51–17–(1–4) :

Ap—0 to 7 inches, brown (10YR 5/3), friable silt loam; common, fine and distinct, grayish-brown (2.5Y 5/2) mottles; weak, medium, subangular blocky structure that breaks easily to weak, fine, granular structure; many small roots; few, small, round, brown concretions; abrupt, smooth boundary; strongly acid.

B21t—7 to 14 inches, mottled brown (10YR 5/3), light brownish-gray (2.5Y 6/2), and strong-brown (7.5Y 5/6), friable silty clay loam; mottles are many, fine and medium, and distinct; moderate, medium, angular blocky structure; plastic and slightly sticky when wet; clear, smooth boundary; strongly acid.

B22t—14 to 26 inches, olive-brown (2.5Y 4/4), very firm silty clay; common, fine, distinct, grayish-brown (2.5Y 5/2) and strong-brown (7.5YR 5/6) mottles; strong, medium, angular blocky structure; plastic and sticky when wet; few, small, soft, brown concretions; few small live roots and medium-sized decayed roots; clear, smooth boundary; medium acid.

C—26 to 60 inches, olive-brown (2.5Y 4/4), very firm silty clay; common, fine, distinct, olive-gray (5Y 4/2) and yellowish-brown (10YR 5/8) mottles; strong, coarse, angular blocky structure; plastic and sticky when wet; many, soft, brown concretions in uppermost 4 inches (their number decreases with depth); matrix is more yellowish brown with depth; neutral in upper part and mildly alkaline below depth of 50 inches; calcareous at depth of 55 inches; common lime nodules below depth of 55 inches.

General Nature of the County

This section tells some of the history of Henderson County and gives information about its population, relief, and climate. It discusses natural resources, agricultural trends, and industry.

History and Development

In prehistoric times, an ethnic group known as Mound Builders inhabited the area that is now Henderson

County. In later years, only small numbers of Indians inhabited the area, according to historians. The site of the present-day city of Henderson was called Red Banks by river pirates, because of the color of the soil.

In 1791, Pennsylvania Dutch people came to Red Banks and built cabins along the riverbank from the present Sixth Street to Powell Street. A 150-foot strip in that area, northwest of Water Street, has since eroded away. Other early settlers were English and Scotch-Irish frontiersmen from Virginia and the Carolinas.

Henderson County was established in 1798 out of a part of Christian County. At that time, in addition to its present acreage, Henderson County covered what is now Hopkins, Union, and Webster Counties. The boundary was changed last in 1860 when Webster County was established.

Henderson County was named for Col. Richard Henderson, who was president of the Transylvania Company. Colonel Henderson had been given a land grant of 200,000 acres, which took in most of the present acreage of Henderson County.

The early settlers were primarily farmers, and the early economy was based on agriculture and the processing and marketing of agricultural products, particularly tobacco. Other important crops were corn, hay, and wheat. Agricultural products were shipped by water to Great Britain and other parts of the world. The coming of the railroad opened up new markets, and the increased industrial activity following the Civil War further added to the economy.

The first industry in the county was a shallow-bored salt well started by Enas McCallister on Highland Creek in 1794. Operations were later moved to Knob Lick Creek. In 1827 the wells went dry.

In 1826 coal was being dug from the bluffs along the Ohio River near the mouth of Sugar Creek beyond the site of the present Henderson city waterworks. The coal was dumped into boats in the river below.

The first sawmill was built in 1817, the first distillery began operations in 1867, and the first cotton mill opened in 1883. As many as 36 tobacco stemmeries operated through the late 1800's.

Today, Henderson County is governed by a fiscal court consisting of a judge and eight magistrates. Each of the magistrates represents a district of the county. There are two incorporated cities in the county, Henderson and Corydon. Henderson is the county seat. It is governed by a mayor and two commissioners. Corydon is governed by a mayor and city council.

Population

The population of Henderson County increased rapidly in the 1800's as settlers came to cultivate the fertile soils. After 1900 the population began to decrease, and since 1900 the rural population has decreased and the urban population has steadily increased.

Table 8 shows the population of the county in given years, and that of Henderson, the largest city in the county.

TABLE 8.—*Population of Henderson County and of the city of Henderson in given years*

Year	Henderson County	Henderson (city)
1800	1,468	205
1850	12,171	1,775
1880	24,515	5,365
1900	32,907	10,272
1920	27,609	12,169
1940	27,020	13,160
1960	33,519	16,892

Relief and Drainage

Henderson County ranges from level to steep in relief but is about 80 percent level and gently sloping. The bottom lands, which make up about 36 percent of the county, are almost entirely level. Terraces make up about 26 percent of the county and are mostly level and gently sloping. Less than 6 percent of the county has a slope of more than a 12-foot fall in 100 feet.

The most rugged land surface is a band of steep hills, about 2 miles wide and 60 miles long, bordering the Ohio River. This area, which is known as the bluffs, has about 25 feet of fall per 100 feet and is completely dissected. The elevation from the valley floor to the hilltops is rarely more than 100 feet. The northern boundary of this area is well defined, but the southern boundary is gradational.

The southeastern part of the county, from south of Spottsville to the Webster County line, is moderately hilly; and the central and western parts are rolling. The boundaries between these areas are not distinct. In these areas, well-drained soils that developed in deep loess are on the narrow, gently sloping ridgetops; and mostly well-drained soils that developed in loess or in loess and residuum derived from sandstone and shale are on the sloping or strongly sloping side slopes. At the foot of the side slopes, in areas that are small and gently sloping, are somewhat poorly drained and moderately well drained soils; and below the foot slopes are the poorly drained to excessively drained soils of the bottom lands.

The highest point in the county, at a place about 4 miles northeast of the city of Henderson, is 588 feet above sea level. The lowest point, in the northwestern part of the county, is about 350 feet above sea level. Most bottoms and terraces are at an elevation ranging from 360 to 390 feet, and most uplands are at an elevation between 400 and 500 feet.

Drainage in Henderson County is mostly toward the north and west. The Green River, Canoe Creek, and Highland Creek, which are major tributaries of the Ohio River, carry runoff from about 80 percent of the county. The rest of the county drains directly into the Ohio River through small streams and ditches. The Green River flows along the eastern edge of the county and then cuts across the northeastern corner. Canoe Creek runs through the central part; its watershed is entirely within Henderson County. Highland Creek flows along the southwestern edge.

The large streams flow through wide, level valleys of alluvium. These streams have little gradient and in many places meander through the flood plain. They no longer cut deep channels; on the contrary, they tend to become clogged with silt. Periodic dredging and cleaning of the channel is needed.

Climate [6]

The climate is temperate in Henderson County. It is favorable for many kinds of plants and animals. Generally, summers are warm and winters are mild, but extremes in temperature occur.

Table 9 shows that a temperature of 100° F. or higher will occur on at least 4 days in July in 2 years out of 10. The days need not be consecutive. At the other extreme, table 9 shows that a temperature of 6° F. or lower will occur on at least 4 days in January in 2 years out of 10.

A temperature of 32° or lower occurs on about 90 nights in an average winter, but the temperature rises above freezing on all but about 12 days. Thus, a daily freeze-thaw cycle is normal in cold weather. The temperature drops below 0° on an average of once each winter.

The average length of the growing season in Henderson County, from the last freezing temperature in spring to the first in fall, is about 198 days. Probabilities of freezing temperatures occurring after specified dates in spring and before specified dates in fall are given in table 10. The probable risk of frost damage to crops can be determined with the help of this table. Critical temperatures of individual crops must, of course, be known.

Henderson County has an average annual rainfall of almost 46 inches, which is sufficient for agricultural production. Measurable rainfall occurs on about 115 days in an ordinary year. The county has no wet and dry seasons, for rainfall is fairly well distributed throughout the year. In some years, however, rainfall is either inadequate or excessive.

Table 9 shows that less than 0.79 inch of rain will fall in October in 1 year out of every 10 years. At the other extreme, this table shows that more than 8.96 inches of rain will fall in January in 1 year out of every 10 years.

During an ordinary year, the heaviest 1-hour rainfall amounts to about 1.2 inches. There is a 30-percent chance that such a 1-hour rain will occur in July of any year, and less than a 1-percent chance of its coming in December through February.

Once in 10 years, a total of 4.75 inches of rain in 24 hours can be expected. There is about a 2-percent chance that this much rain will fall in a 24-hour period in any July, and less than a 2-percent chance that this will happen in any other month.

Thunderstorms occur on an average of 50 days a year. They are most frequent from March through August but can occur in any month. Thunderstorms bring most of the short, intense rainfall during summer. Less intense rainfall that lasts for several days sometimes occurs late in spring and delays tillage. These long, slow rains are those most apt to cause local floods because they come when soils are frozen, snow covered, or saturated.

The average yearly snowfall is 11 inches and is distributed as follows: January, 3.4 inches; February, 2.5 inches; March, 2.1 inches; April, 0.1 inch; November, 0.9 inch; December, 2 inches.

In fall, when harvesting needs to be done, long periods of mild sunny weather are typical in the county.

Natural Resources

Henderson County can count among its natural resources oil, coal, timber, water, and sand and gravel.

[6] By A. B. Elam, Jr., State climatologist, U.S. Weather Bureau.

TABLE 9.—*Temperature and precipitation*

[Data from U.S. Weather Bureau station in Henderson, Ky.; period of record—1931 through 1960]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	2 years in 10 will have at least 4 days with—		Average total	1 year in 10 will have—		Days with snow cover [1]	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Number	Inches
January	44.9	27.1	64	6	5.01	0.97	8.96	6	1.6
February	48.1	28.9	66	12	3.51	.95	6.05	4	1.2
March	56.5	35.7	75	19	5.13	1.66	8.17	2	2.3
April	68.3	46.0	83	33	4.49	2.16	6.25	(2)	0
May	77.5	54.9	89	41	4.23	1.49	8.00	0	0
June	86.7	63.8	97	53	3.79	1.04	7.20	0	0
July	90.0	66.7	100	56	3.40	1.39	6.81	0	0
August	89.2	65.3	98	55	3.40	.94	6.19	0	0
September	83.6	57.7	96	43	2.98	.93	5.52	0	0
October	73.1	46.9	87	33	2.80	.79	4.63	0	0
November	54.2	36.0	74	21	3.49	1.18	6.06	1	1.1
December	46.6	28.8	64	10	3.59	1.22	5.25	4	1.1

[1] Trace or more at 6 p.m.
[2] Trace on only 1 day in 30-year period.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall in Henderson County, Ky.*

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 18.	March 24.	April 5.	April 16.	April 27.
2 years in 10 later than	March 10.	March 18.	March 29.	April 10.	April 22.
5 years in 10 later than	February 24.	March 6.	March 17.	March 30.	April 12.
Fall:					
1 year in 10 earlier than	November 26.	November 11.	November 3.	October 22.	October 13.
2 years in 10 earlier than	December 1.	November 17.	November 8.	October 27.	October 18.
5 years in 10 earlier than	December 11.	November 27.	November 19.	November 5.	October 28.

Oil, since its discovery near Hebbardsville in 1938, has become the most important revenue-producing natural resource in the county. Present annual production is more than 3 million barrels, which add about $9 million to the economy. In 1952, production was about two and a half million barrels, and the revenue derived therefrom was about $7 million. Producing oil wells are located in all parts of the county.

Some natural gas has been released as a result of drilling for oil. Many oil wells produce gas but not in sufficient quantity to be of commercial value. Some homes are heated with gas from nearby oil wells, but most of the gas is released into the atmosphere.

The mining of coal began soon after the settlement of the county. Production has been in fairly scattered areas, including those near Corydon, Smith Mills, Henderson, Spottsville, Zion, and Hebbardsville. Present-day production, however, is centered in the Hebbardsville area. Eighteen mines—all are shaft mines—are operating. Coal is taken from the No. 9 and No. 11 seams. In 1962, approximately 275,847 tons of coal was mined, according to the 1963 Yearbook of the Kentucky Department of Mines and Minerals.

The Ohio and Green Rivers provide an adequate supply of water for industrial, recreational, and transportational use. Locks and dams on both rivers keep them navigable at all times. Much of the coal and oil produced in the county is transported by river barge. The rivers are becoming increasingly popular for fishing, boating, swimming, and water skiing.

Underground water can be found in most parts of the county. In low areas, water-bearing sand and gravel generally are at a depth of about 30 feet. Wells of this depth can furnish an adequate supply of water for home, farm, or industry. In the uplands, underground water is less abundant, and in places the supply is not enough for farm or home. On most farms, wells furnish water for the household, and ponds furnish water for the livestock.

Mostly the wet bottom lands and the hills in the southeastern part of the county have been left wooded. One large sawmill and two or three small ones process the cypress, oak, gum, beech, walnut, cherry, and other native hardwoods from these areas.

Sand and gravel are dredged from the bed of the Ohio River and from sandbars. The material is suitable for road use, for construction purposes, or for other industrial use.

Agriculture

In spite of the trend toward industrialization, Henderson County is still one of the most important agricultural counties in Kentucky. It ranks high in overall agricultural production, and is one of the leading producers of soybeans, corn, and hogs.

Early in the history of the county, the settlers discovered that dark tobacco grew well on their well-drained silty soils. Before long, tobacco was the basis of their economy. It was used as a medium of exchange until 1815. This valuable crop created some tobacco barons in the county; some of the grand houses that these men built are still standing. The tobacco was stemmed, packed in hogsheads, and loaded for shipment on boats at Henderson, which was a State tobacco inspection point as early as 1801. Tobacco remained the most important cash crop until about 1900.

Corn also was an important crop to the early settlers. It grew well where tobacco did not. The wet bottom lands were good for corn, and the deep uplands produced yields that were considered good at that time. Erosion on the uplands was not a serious matter.

Most fields were cultivated in a rotation; the same rotation was used in all areas, regardless of the slope. Fields had straight sides, and rows were straight and in many places up and down the hill. Tobacco was grown in the best areas, the "new ground." After a field had been in tobacco for a few years, the supply of organic matter was depleted and the yield decreased. A new field was then cleared. No doubt this was why sloping to steep areas were cleared and cultivated.

Livestock consisted of hogs, beef cattle, dairy cows, horses, and mules. Hogs were kept to eat up some of the corn, and beef cattle to graze the land between crops of corn or tobacco. Dairy cows, of course, furnished milk for home consumption. The beef and dairy cows were not purebreds, and generally the distinction between them was vague and arbitrary. The horses and mules provided transportation and power for pulling farm machinery.

Table 11 gives the number of livestock in the county in 1959 and 1962. Horses and mules have gradually decreased in number because of the increasing use of tractors.

Since World War I the production of tobacco has decreased; today most of the tobacco is burley and a dark strain that is air cured. Soybeans have been increasing in importance since 1940. Peach and apple orchards are declining. Table 12 shows the acreage that was planted to the principal crops in 1949 and 1959.

TABLE 11.—*Livestock on farms in stated years*

Livestock	1959	1962
	Number	*Number*
Cattle and calves	28, 083	33, 100
Milk cows	848	900
Sheep and lambs	2, 703	1, 900
Hogs and pigs	48, 378	50, 800
Horses and mules	1, 225	(1)
Mules	1, 225	(1)

[1] Number not available.

TABLE 12.—*Acreage of principal crops in stated years*

Crop	1949	1959
	Acres	*Acres*
Corn harvested for grain	76, 641	64, 239
Wheat harvested	2, 973	3, 819
Soybeans harvested for beans	16, 732	21, 296
Tobacco	2, 558	1, 216
Alfalfa cut for hay	2, 045	2, 152
Lespedeza cut for hay	9, 619	6, 112

For many years, as the population was growing and estates were being divided, farms were increasing in number and decreasing in size. But with the introduction of tractors and other farm machines, the trend reversed itself. The number of farms decreased from 1,654 in 1949 to 1,271 in 1959, and the size increased from an average of 152.7 acres to 187.7 acres. Small farms are being combined into larger units that can be operated more economically.

Many small farms, particularly in the hilly sections of the county, have been abandoned. Broomsedge, blackberry briers, sumac, persimmon, and weeds soon start to grow in these areas and later hardwoods take over. In some areas, trees are large enough to be cut for sawlogs.

Part-time farming is on the increase, for many people that live in the country work in the city. In 1940, about 35 percent of the population worked in agriculture. By 1950, the percentage was down to about 21 percent. The average age of farmers in the county is 52.3 years. Generally, the young people go to work in the city. Most of the farms that are operated on a part-time basis are small.

Industry

Although Henderson County is chiefly an agricultural area, industry in recent years has been increasing in importance. At present a much larger number of people are employed in industry, either in or out of the county, than in agriculture. In 1960, according to the Federal census, 11,695 people in Henderson County were employed. Of these, 10,386 were engaged in an activity other than agriculture.

Manufacturing concerns are the biggest employers; they accounted for 3,203 employees in 1960. Wholesale and retail businesses are next; these employed 2,349 people in 1960.

In 1960, nearly 15 percent of the employed were working outside of the county, mostly in Evansville, Ind. Henderson County is part of the Evansville metropolitan area.

More than 50 manufacturers have located in the county, mainly in or near the city of Henderson, according to the Henderson Chamber of Commerce. Of these, the largest employs 550 people, and four employ more than 200 people each. The products include bakery goods, brushes, chemicals, dairy products, dresses, fertilizer, furniture, hosiery, lumber products, nylon, plastics, truck bodies, tacks, soybean oil, and toys. A die-casting plant also operates in the county.

An $18 million hydroelectric plant, along the Green River near the Webster County line, is aiding the industrial growth of the county. In the eastern part of the county near the Green River are coal reserves and a large tract of land that is a potential industrial site. These are owned by a metal company.

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Glossary

Acidity. See Reaction, soil.
Alkaline soil. See Reaction, soil.
Alluvium. Soil material, such as sand, silt, or clay, that has been deposited by streams.
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.
Bottom land. Lowland formed by alluvial deposit along a stream; a flood plain.
Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.
Catena, soil. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.
Cation-exchange capacity. A measure of the total amount of exchangeable cations that can be held by the soil. It is expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7) or at some other stated pH value.
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.
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; will not hold together in a mass.
Friable.—When moist, crushes easily under gentle to moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
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.
Contour. An imaginary line connecting points of equal elevation on the surface of the soil.
Depth, soil. As used in this report, very shallow is less than 10 inches, shallow is 10 to 20 inches, moderately deep is 20 to 36 inches, and deep is more than 36 inches.
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.
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, has a hard or very hard consistence, 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.
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.
Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.
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.
Leaching, soil. The removal of soluble materials from soils or other material by percolating water.
Loess. A fine-grained deposit consisting dominantly of silt-sized particles, presumably transported by wind.
Moisture-supplying capacity. The relative capacity of the soil to take in and supply moisture in amounts favorable for the growth of most plants. It is related to the amount of runoff, rate of infiltration, available water capacity, depth of root zone, and the moisture extraction pattern of plant roots. It is expressed as very high, high, moderately high, moderately low, low, and very low.
Natural drainage. The condition 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 drainage are recognized.
Excessively drained soils are commonly very porous and rapidly permeable and have a low moisture-supplying capacity.
Somewhat excessively drained soils are also very permeable and are free of mottling throughout their profile.
Well-drained soils are nearly free of 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 horizon and in the upper part of the B horizon and have mottling in the lower part of the B horizon and in the C horizon.
Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time; podzolic soils that are somewhat poorly drained commonly have mottlings in the lower part of the A horizon and in the B and C horizons at a depth below 6 to 16 inches.
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 absent 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.
Natural 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 factors, such as light, moisture, temperature, and the physical condition (or tilth) of the soil, are favorable.

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; the C horizon in the soil profile.

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:

	pH		*pH*
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

Residuum. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residuum is not soil but is frequently the material in which a soil has formed.

Root zone. The part of the soil that is penetrated, or can be penetrated, by plant roots.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but they may be any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slack water areas. Bottom lands where clay sediments have settled out of suspension.

Slope. The slope classes in Henderson County are as follows:

0 to 2 percent	level.
2 to 6 percent	gently sloping.
6 to 12 percent	sloping.
12 to 20 percent	strongly sloping.
20 to 30 percent	moderately steep.
30 to 50 percent	steep.

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.

Specialty crops. Strawberries, cucumbers, popcorn, nursery stock plantings of ornamental shrubs, and other such crops that bring a higher net return than most of the other locally grown crops. Specialty crops generally require more intensive management than general farm crops, and are grown on fewer acres.

Stratification. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to wind and water erosion.

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).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. 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.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

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