SOIL SURVEY OF

Oldham County, Kentucky

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

HOW TO USE

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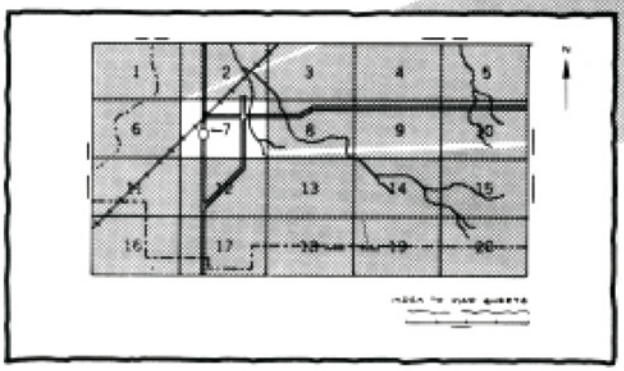

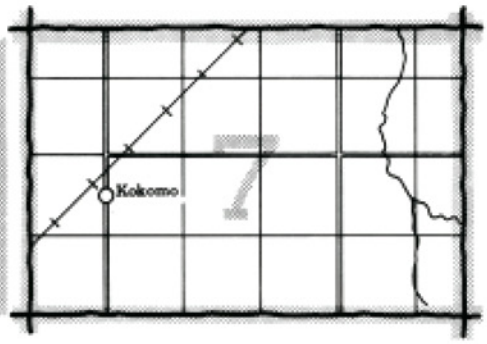

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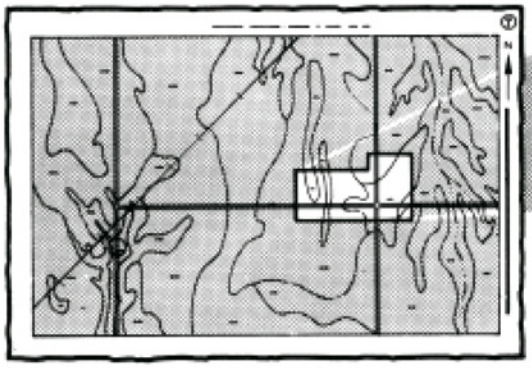

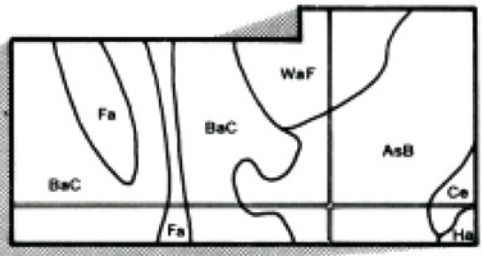

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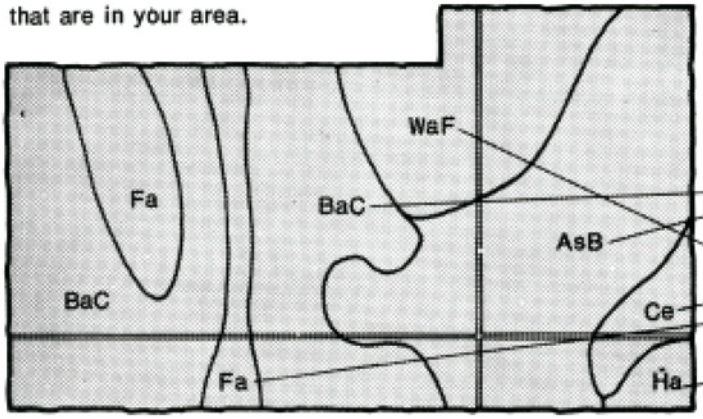
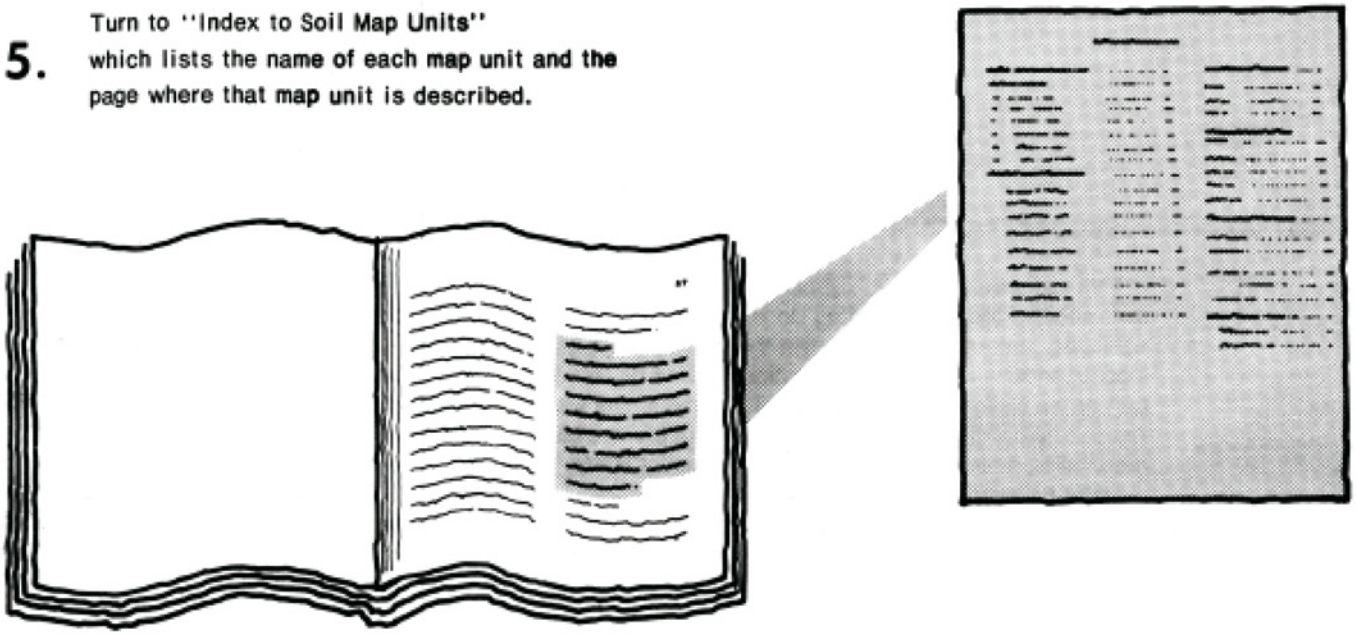


Symbols

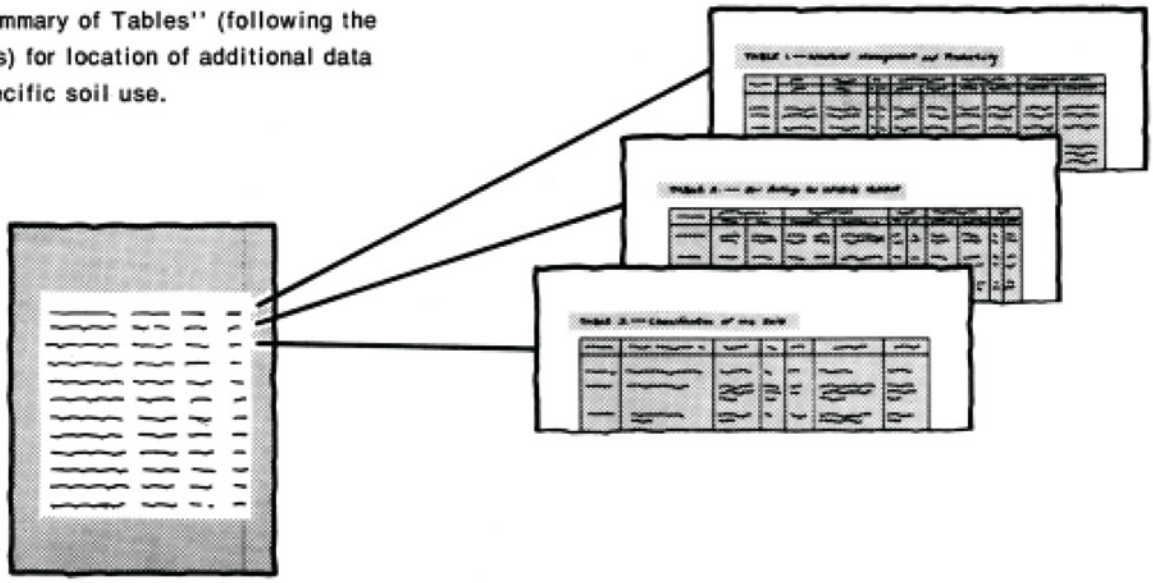
- AsB
- BaC
- Ce
- Fa
- Ha
- WaF

THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need information, regardless of race, color, national origin, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1969-74. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. 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 Oldham County Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: The productive farmland shown in this aerial view of an area of Crider silt loam, 0 to 2 percent slopes, is being invaded by a housing development (lower right).

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Foreword

I would like to introduce you to the soil survey of Oldham County. This publication can help you and your community plan and use wisely one of our most precious natural resources—the soil.

This soil survey was conducted for and is now available to many different users. It can help a homebuyer or developer determine soil-related hazards or limitations that affect homesites. It can help land use planners determine the suitability of areas for housing or onsite sewage disposal systems. In Kentucky, this survey can be very helpful in evaluating and maintaining our important agricultural base. It can assist farmers to estimate the potential crop or forage production of their land. It can be used to determine the suitability and limitations of soils for pipelines, buildings, landfills, recreation areas, and the many other uses where it is important to consider our land resources.

Many people are unaware that great differences in soil properties can occur within relatively small areas. They are also unaware of the significance these differences can make toward success or potential failure of any land related activity. Soils may be seasonally wet or subject to flooding, shallow to bedrock, too unstable to serve as a foundation for buildings or roads, or they may be unsuited to septic tank absorption fields. Also, a high water table may make them poorly suited to basements and other types of underground installations.

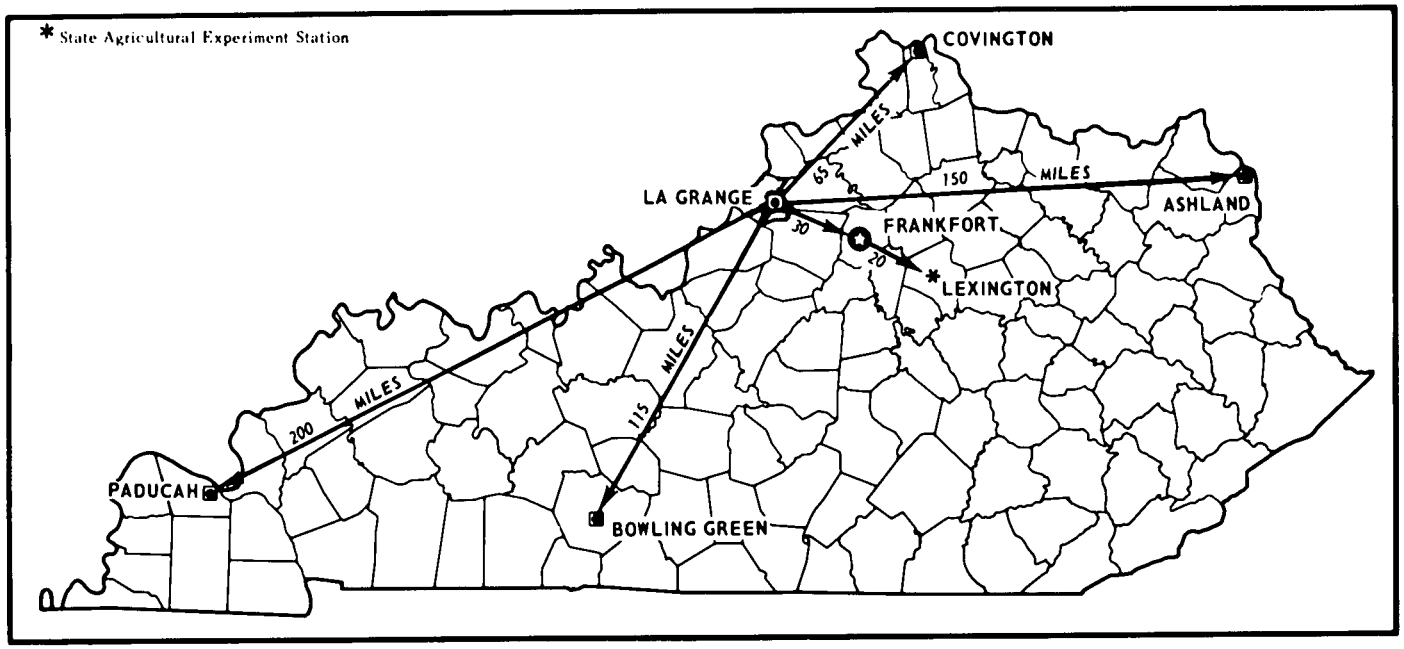
These and many other soil properties that affect land use are described in this soil survey. The location of broad areas of soils on the general soil map and the location of each kind of soil on the detailed maps are shown in the back of this publication. Descriptions of each kind of soil in the county are provided, and information about specific uses of each of the identified soils is given.

These are only a few of the ways this soil survey can help you. If you need additional information or assistance in using this survey, please call your local office of the Soil Conservation Service or the Cooperative Extension Service. The soil conservationist or soil scientist assigned to the Oldham County Conservation District or the county extension agents and directors can assist you.

I believe this soil survey, along with other natural resource information, will enable you to build a better environment for life and living. The effective use of this publication will assist all of us in the conservation, development, and productive use of our soil, water, and related resources.

Glen D. McCormacy

State Conservationist



Location of Oldham County in Kentucky.

SOIL SURVEY OF OLDHAM COUNTY, KENTUCKY

By Orville J. Whitaker, Soil Conservation Service

Soils surveyed by James F. Fehr, Herman P. McDonald, and Orville J. Whitaker, Soil Conservation Service

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

Oldham County is in the north-central part of Kentucky (See opposite page) and has a population of 16,200. LaGrange, the county seat, has a population of 2,200. The county has a total area of 117,500 acres, or approximately 183.6 square miles.

The county is in the Bluegrass Land Resource Area (*4*). The Ohio River has cut a deep gorge along the northwestern boundary and serves as a county line with Clark County, Indiana. The northeastern portion of the county is dissected by Eighteen Mile Creek and Pattons Creek and their tributaries. Floyds Fork and Harrods Creek and their tributaries dissect the central and southern portions of the county from east to west. Elevation of the land ranges from about 430 feet along the Ohio River to about 900 feet, north of U. S. Highway 42, about 3 miles west of the Trimble County line.

General Nature of the County

This section gives general information concerning the county. Climate, settlement, natural resources, geology, and farming are discussed in it.

Climate

In Oldham County, summers are hot in valleys and slightly cooler in the hills; winters are moderately cold. Rains are fairly heavy throughout the year, with a slight peak in spring. Snow falls nearly every winter, but the snow cover usually lasts only a few days.

Table 1 presents data on temperature and precipitation for the county recorded at Louisville for the period 1951 to 1974. In table 2 are probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 36 degrees F, and the average daily minimum is 27 degrees. The lowest temperature on record, -20 degrees, occurred at Louisville on January 24, 1963. In summer the average temperature is 76 degrees, and the average daily maximum is 86 degrees. The highest temperature, 105 degrees, was recorded on July 14, 1954.

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

Of the total annual precipitation, 22 inches, or 51 percent, usually falls during the period April through September, which includes the growing season for most crops. Two years in ten, the April-September rainfall is less than 18 inches. The heaviest 1-day rainfall during the period of record was 6.97 inches at Louisville on March 9, 1964. Thunderstorms number about 45 each year, 22 of which occur in summer.

Average seasonal snowfall is 18 inches. The greatest snow depth at any one time during the period of record was 11 inches. On the average, 7 days have at least 1 inch of snow on the ground, but the number of days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night in all seasons, and the average at dawn is about 80 percent. The percentage of possible sunshine is 65 percent in summer and 45 percent in winter. The prevailing direction of the wind is from the south. Average windspeed is highest in spring—10 miles per hour.

Settlement

Oldham County was formed in 1832 from territory taken from Jefferson, Shelby, and Henry Counties. It was named for Colonel William Oldham, a native Virginian who was an officer in the Revolutionary War.

LaGrange, the county seat, was named for the French estate of General Lafayette. It was formerly called Lick Branch, but was renamed LaGrange and incorporated in 1840.

The first county seat of Oldham County was at Westport, which is on the Ohio River. In the steamboat era, the town became a thriving Ohio River port for shipping farm produce and receiving merchandise from the West.

Ballardsville was at the center of north-south and east-west stagecoach lines.

Natural Resources

Soil is the most important natural resource in the county. Livestock that utilize pasture, hay, and row crops produced on farms are marketable products derived from the soil.

Water is adequate for domestic use throughout the county. Approximately 75 percent of the county is served by a community water system. Water for home use in the remainder of the county is furnished primarily by wells and cisterns.

The Ohio River supplies an adequate supply of water for recreation and water transportation. Locks and dams insure sufficient depth to make the river navigable at all times. The River is increasingly used for boating, swimming, fishing, and water skiing. Ponds are used as a source of water for livestock and for fishing and swimming.

Several limestone quarries in the county supply limestone for farming, industry, and road building.

Sand and gravel are mined from the stream terraces west of Rose Island Road along the Ohio River. These deposits are useful in the construction of roads. Sand and gravel are also dredged from the bed of the Ohio River.

Geology

Oldham County is in the Outer Bluegrass physiographic region. Most of the exposed rocks in the higher elevations are of Silurian age and are limestone or calcareous shale. A layer of loess or windblown silt, 20 to 40 inches thick, covers most of the ridgetops in the northern half of the county. Crider and Nicholson soils are common to this area and are underlain by the Louisville Limestone Formation. Beasley soils are generally at lower elevations, lack the loess mantle, and are commonly underlain with Silurian age Osgood and Brassfield Formations. These soft calcareous shales and siltstones weather rapidly when exposed. Common to the lower elevations in the northern half of the county are the Caneyville soils which are underlain by the Saluda Dolomite member of the Drakes Formation.

Most of the exposed rock in the southern half of the county is of Ordovician age. Beasley soils also occur in this area and are underlain in part by the Saluda Dolomite and the Bardstown members of the Drakes Formation. Some of the broader ridgetops in this area also have a 20 to 40 inch loess mantle over the residuum. Nicholson soils have formed in this material.

Along the Ohio River is a narrow band of deep mixed alluvium that washed from the upper drainage basin of the Ohio River. Also, small bands of alluvial soils are along Floyds Fork and Harrods Creek and their tributaries.

Farming

Much of the income in the county is derived from the sale of farm products. However, farming is less important to the economy than it formerly was. A large number of people live on small residential tracts in the county and work in the metropolitan Louisville area. According to the United States Census of Agriculture, of all farm products sold in 1969, 63 percent was from livestock and livestock products and the remaining 37 percent was from crops. Tobacco and corn are the most important cash crops, but soybeans are becoming increasingly important. About 90 percent of the corn crop is kept on the farm and fed to livestock. Alfalfa, red clover, orchard grass, timothy, and other grasses are harvested extensively for hay.

Orchard grass was first grown commercially for seed production in the United States in Oldham County by Lilburne Magruder in the 1890's. For many years approximately 80 percent of all orchard grass commercially grown in the United States was grown within 40 miles of Goshen in Oldham County. The highest production years were during and immediately after World War II. Production of the grass declined drastically in the mid 1960's.

In the early days, livestock farming was very diversified and included sheep, hogs, dairy cattle, and beef cattle.

A large number of residents of the county are part time farmers. These individuals work in the local industries, at the State reformatory, or commute daily to work in Louisville.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After a guide for classifying and naming the soils was worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The

soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called soil mapping units. Some mapping units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Mapping units are discussed in the section "Soil Maps for Detailed Planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and their interpretatons are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily useful to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

Soil Map for General Planning

The general soil map at the back of this publication shows, in color, the soil units for broad land use planning described in this survey. Each soil unit is a unique natural landscape that has a distinct pattern of soils and of relief and drainage features. A unit typically consists of one or more soils of major extent and some soils of minor extent. It is named for the major soils. The kinds of soil in one unit can occur in other soil units, but in a different pattern.

The map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are generally suitable for certain kinds of farming or other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure; the kinds of soils in any one soil unit ordinarily differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

Soil Association Descriptions and Potentials

The soil associations of the general soil map are described in the following paragraphs. Potential uses for soils in each association are presented in the descriptions.

1. Wheeling-Huntington Association

Deep, nearly level to strongly sloping, well drained soils that have a loamy subsoil; on stream terraces and flood plains

Areas of this association are in two discontinuous narrow bands along the Ohio River. One extends from about 1 1/2 miles southwest of the mouth of Pattons Creek to west of the mouth of Morris Branch. The community of Westport is near the center of this area. The other area extends from near the mouth of Bull Creek southwestward to the Jefferson County line opposite Twelve Mile Island. The landscape is made up mostly of moderately broad stream terraces and narrow flood plains.

This soil association (fig. 1) occupies about 3 percent of the county. About 48 percent of the association is Wheeling soils, 18 percent is Huntington soils, and the remaining 34 percent is minor soils.

Nearly level to strongly sloping Wheeling soils are on stream terraces above the Huntington soils, which are on flood plains. Wheeling soils are deep, well drained, and have a brown loamy subsoil. Huntington soils are deep, well drained, and have a dark colored surface layer and a brown loamy subsoil.

The minor soils on the stream terraces in this association are well drained Elk, moderately well drained Otwell, and the somewhat poorly drained Weinbach. The minor soils on flood plains are moderately well drained Lindside and somewhat poorly drained Newark.

This soil association is used mainly for growing row crops (fig. 2), pasture, and hay. A small percent is in subdivisions. Hazards of erosion and flooding are the main limitations for growing row crops.

This association has good potential for farming. Most of the lower lying areas flood in late winter and early spring. The higher stream terraces have high potential for urban development except for a few minor soils with a seasonal high water table. Most of this association has good potential for woodland, but economics generally precludes this use.

2. Beasley-Caneyville Association

Deep and moderately deep, strongly sloping to very steep, well drained, rocky soils that have a clayey subsoil; on hillsides

This association is in two discontinuous irregularly shaped areas in the western half of the county. The largest area extends from about 1/2 mile west of Kentucky Highway 53 along steep hillsides adjacent to Harrods Creek and its tributaries southwestward to the Jefferson County line. The smaller area extends from about 3/4

mile south of Westport along the Ohio River bluff to the Jefferson County line. These soils formed in clayey residuum from soft limestone and calcareous siltstone, sandstone, and shale and from hard limestone bedrock.

This soil association makes up about 12 percent of the county. About 45 percent of the association is Beasley soils, 30 percent is Caneyville soils, and the remaining 25 percent is minor soils.

Beasley soils are in two different landscape positions in this association. Strongly sloping Beasley soils are on the upper parts of hillsides. Steep to very steep Beasley soils are intermingled with Caneyville soils on lower side slopes and bluffs (fig. 3). In these places, Beasley soils are generally on the lower slopes, Caneyville soils are on the middle and upper slopes, and limestone outcrops cover 1 to 6 percent of the surface. Beasley soils are deep and well drained. They have a yellowish brown clayey subsoil. Caneyville soils are moderately deep to hard limestone bedrock. They are well drained and have a reddish brown and strong brown, dominantly clayey subsoil.

Minor soils in this association are well drained Brassfield, Crider, and Hagerstown upland soils, and well drained Nolin soils along narrow flood plains.

This soil association is used mainly for woodland, but some of the less steep slopes are used for pasture. A few small tracts above the Ohio River bluff are used for housing. Steep slopes and rock outcrops severely limit the use of this association for most farm uses.

This soil association has very low potential for farming and urban uses. It has medium potential for woodland but has severe equipment limitations. It has high potential for development of woodland wildlife habitat.

3. Crider-Nicholson Association

Deep, gently sloping and sloping, well drained and moderately well drained soils that have a loamy subsoil; some have a fragipan; on ridgetops and hillsides

This association is in the north-central and southwestern portions of the county. Scattered throughout this association are small areas having karst relief with sinkholes and underground drains (fig. 4). The major soils formed in a loess mantle and the underlying residuum from limestone, siltstone, and shale.

This soil association (fig. 5) occupies about 14 percent of the county. About 54 percent is Crider soils, 23 percent is Nicholson soils, and the remaining 23 percent is minor soils.

Crider soils are on moderately broad, relatively uniform ridgetops and narrow side slopes adjacent to areas of Nicholson soils on the wider ridgetops. Crider soils are deep, well drained, and have a brown loamy subsoil. Nicholson soils are moderately well drained and have a yellowish brown dominantly loamy subsoil. A slowly permeable fragipan is in the lower part of the subsoil.

Minor soils in this association are well drained Beasley, Caneyville, and Hagerstown soils and somewhat poorly drained Lawrence soils.

This soil association is used mainly for row crops, hay, and pasture. A significant acreage is in subdivision developments. Several horse farms are in the association. Erosion is the main limitation to the use of these soils for growing row crops.

This association has high potential for farming. It generally has high potential for urban development except for the soils that have a fragipan, which have limited use for septic tank absorption fields. Most of this association has high potential for woodland but economics generally precludes this use.

4. Crider-Beasley Association

Deep, gently sloping to strongly sloping, well drained soils that have a loamy or clayey subsoil; on ridgetops and hillsides

This association is in the west-central and southwestern portions of the county. Scattered throughout this association are small areas having karst relief with sinkholes and underground drains. The soils formed in a loess mantle and the underlying residuum from limestone and in residuum of interbedded soft limestone and calcareous siltstone, sandstone, and shale.

This association (fig. 6) occupies about 14 percent of the county. About 44 percent is Crider soils, 16 percent is Beasley soils, and the remaining 40 percent is minor soils.

Gently sloping and sloping Crider soils are on moderately broad, relatively uniform ridgetops and narrow side slopes adjacent to areas of Beasley soils. Beasley soils are on steeper parts of hillsides at lower elevations and are mainly sloping and strongly sloping. Crider soils are deep, well drained, and have a brown loamy subsoil. Beasley soils are deep, well drained, and have a yellowish brown clayey subsoil.

Minor soils in this association are well drained Cynthiana and Hagerstown and moderately well drained Nicholson soils.

This soil association is used mainly for row crops, hay, and pasture, although a significant acreage in the Peewee Valley and Crestwood areas is in subdivision and urban developments. Erosion is the main limitation to the use of the soils for growing row crops.

This soil association has high potential for farming. It generally has high potential for urban development except where soils that have a clayey subsoil limit use for septic tank absorption fields. Most of this association has high to medium potential for woodland, but economics generally precludes this use.

5. Beasley-Cynthiana-Faywood Association

Deep to shallow, gently sloping to very steep, well drained soils that have a clayey subsoil; on ridgetops and hillsides

This association is in the northern part of the county. Pattons Creek and Eighteen Mile Creek are the major streams in the area. Soils of this association formed in

clayey residuum from interbedded soft limestone and calcareous siltstone, sandstone, and shale and from hard limestone bedrock.

This soil association makes up about 10 percent of the county. About 30 percent is Beasley soils, 20 percent is Cynthiana soils, 15 percent is Faywood soils, and the remaining 35 percent is minor soils.

Gently sloping and sloping Beasley soils are on narrow ridgetops. On the hillsides below are intermingled steep and very steep Cynthiana, Faywood, and Beasley soils (fig. 7). Cynthiana soils are generally on the upper to middle slopes, Faywood soils are on the lower to middle slopes, and Beasley soils are interspersed throughout. In the areas of steep and very steep soils, thin flat stones, 4 to 12 inches in diameter, cover about 5 to 30 percent of the surface. Cynthiana soils are shallow to hard limestone bedrock, are well drained, and have a yellowish brown clayey subsoil. Faywood soils are moderately deep to hard limestone bedrock, are well drained and have a yellowish brown clayey subsoil. Beasley soils are deep and well drained and have a yellowish brown clayey subsoil.

Minor soils in this association are the well drained Brassfield and Crider soils and the moderately well drained Nicholson soils in the uplands and the well drained Boonesboro and Nolin soils on narrow flood plains.

This soil association is used mainly for woodland but a significant acreage is in pasture and hay. A few small tracts are used for housing and some small areas are in row crops. Steep slopes and depth to bedrock limit the use of this association for most farm uses.

This soil association has low potential for farming and most urban uses. It has medium potential for woodland with severe equipment limitations. It has high potential for development of woodland wildlife habitat.

6. Beasley-Nicholson Association

Deep, gently sloping to strongly sloping, well drained and moderately well drained soils that have a clayey or loamy subsoil; some have a fragipan; on ridgetops and hillsides

This association is in the eastern half of the county. Floyds Fork and Harrods Creek are the major streams in the area. These soils formed in clayey residuum from interbedded soft limestone, calcareous siltstone, sandstone, and shale and in a loess mantle and the underlying clayey residuum from limestone, siltstone, and shale.

This soil association occupies about 37 percent of the county. About 50 percent is Beasley soils, 20 percent is Nicholson soils, and the remaining 30 percent is minor soils.

Sloping to strongly sloping Beasley soils are mostly on hillsides below gently sloping Nicholson soils on moderately broad ridgetops (fig. 8). Beasley soils are deep, well drained, and have yellowish brown clayey subsoil. Nicholson soils are moderately well drained. They are brown and loamy in the upper part of the subsoil. The lower part of the subsoil is a yellowish brown, mottled, loamy, slowly permeable fragipan.

Minor soils in the uplands of this association are well drained Brassfield, Caneyville, Crider, and Hagerstown soils and well drained Nolin soils in the flood plains.

This soil association is used mainly for hay and pasture, but a considerable acreage is in row crops. A significant acreage is in subdivision and urban developments. Erosion is the main limitation to the use of the soils for growing row crops.

This soil association has medium potential for farming and urban developments. The fragipans and clayey subsoils limit use of the soils for septic tank absorption fields. This association has high to medium potential for woodland.

7. Lowell-Faywood-Beasley Association

Deep and moderately deep, gently sloping to moderately steep soils that have a clayey subsoil; on ridgetops and hillsides

Areas of these soils are mostly in the southeastern part of the county. Ballardsville is near the center of the association. The north and east forks of Floyds Fork and Gathright Creek are the major streams in the area. These soils formed in clayey residuum from hard limestone bedrock and interbedded soft limestone and calcareous siltstone, sandstone, and shale.

This association occupies about 10 percent of the county. About 50 percent is Lowell soils, 15 percent is Faywood soils, 10 percent is Beasley soils and the remaining 25 percent is minor soils.

Lowell soils are gently sloping. They are on moderately broad, relatively uniform ridgetops above sloping Beasley soils, which are on hillsides (fig. 9). Faywood soils are sloping to moderately steep. They are on hillsides below the Beasley soils. Lowell soils are deep to hard limestone bedrock, are well drained, and have a yellowish brown clayey subsoil. Faywood soils are moderately deep to hard limestone bedrock, are well drained, and have a yellowish brown clayey subsoil. Beasley soils are deep to moderately soft limestone and calcareous siltstone, sandstone, and shale. They are well drained and have a yellowish brown clayey subsoil.

Minor soils in this association are shallow, well drained Cynthiana soils and moderately well drained Nicholson soils in the uplands; moderately well drained Lindside and well drained Nolin soils on flood plains; and moderately well drained Otwell soils on stream terraces.

This soil association is used mainly for row crops, hay, and pasture. A considerable acreage is being developed for 5 to 10 acre homesites. Erosion is the main limitation to the use of these soils for growing row crops.

This soil association has high potential for farming. It has medium potential for urban development, but the soils with a clayey subsoil have limited use for septic tank absorption fields. This association has medium to high potential for woodland, but economics generally precludes this use.

Broad Land Use Considerations

Deciding what land to use for urban development is an important concern of the county. Since the mid 1960's, an increasing number of persons who work in Louisville have moved into the county. Many of them have purchased large lots or small tracts of land. These developments are occurring throughout the county, but the greatest concentration is in the Crestwood, Centerfield, Ballardsville, and Buckner areas. It is estimated that about 12,000 acres, or about 10 percent of the county, is in this type of development. This trend is expected to increase steadily in the immediate future.

The general soil map is most helpful for planning the general outline of urban areas; it cannot be used for the selection of sites for specific urban structures. In general, soils in the county that have high potential for cultivated crops also have high potential for urban development. Data about specific soils in this survey can be helpful in planning future land use patterns.

Few areas in the county are totally unsuited to urban development. However, large parts of the Beasley-Caneyville and the Beasley-Cynthiana-Faywood associations are so steep and shallow to bedrock that urban development is very costly. In the lower lying flood plain of the Wheeling-Huntington association, flooding is a limitation.

There are large areas of soils in the county that can be developed for urban uses at lower costs than those named above. These include parts of the Crider-Nicholson and Crider-Beasley associations and the well drained stream terrace part of the Wheeling-Huntington association. The aforementioned associations are also good to excellent farmland, and this use should not be overlooked when other broad land uses are considered. The Crider-Nicholson and the Crider-Beasley associations consist mainly of soils that are deep and well drained and are loamy in the upper part of the subsoil. A large part of these associations is favorable for residential development.

In the Lowell-Faywood-Beasley association, there are soils that have high potential for farming but medium to low potential for urban uses. A considerable acreage in the Ballardsville area is residential tracts of 5 acres or more. These soils generally have slowly permeable subsoils which limit their use for septic tank absorption fields.

In the Beasley-Nicholson association, there are soils with a medium potential for farming but medium to low potential for urban uses. A large acreage in the Centerfield and Buckner areas is in residential tracts of 5 acres or more. These soils generally have slowly permeable subsoils or fragipans which limit their use for septic tank absorption fields. Most of the industrial developments in the county are in this association.

Most of the soils of the county have high to medium potential for woodland. Generally, economics precludes the woodland use of the most productive agricultural soils in the county. The largest acreage of woodland is in the Beasley-Caneyville and the Beasley-Cynthiana-Faywood associations. Commercially valuable trees grow rather slowly on these two associations. Equipment limitations are severe on these soils due to the steep slopes.

Most of the soil associations in the county have sufficient trees, grasses, and grain crops to provide adequate food and cover for wildlife. The Beasley-Caneyville and the Beasley-Cynthiana-Faywood associations have high potential for development of woodland wildlife habitat.

The gently sloping and sloping Beasley soils on ridgetops in the Beasley-Cynthiana-Faywood association have medium to high potential for recreational developments. The hardwood forests enhance the natural beauty of this association. Nature study areas could be easily developed in this association. Generally, economics precludes the recreational use of the most productive farmland soils in the county.

Soil Maps for Detailed Planning

The kinds of soil (mapping units) shown on the detailed soil maps at the back of this publication are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each soil is given in the section "Use and Management of the Soils."

Preceding the name of each mapping unit is the symbol that identifies the unit on the detailed soil map. Each mapping unit description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated and the management concerns and practices needed are discussed.

A soil mapping unit represents an area on the landscape and consists mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map at the back of this publication are phases of soil series.

Soils that have profiles that are almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. All the soils in the United States having the same series name have essentially the same properties that affect their use and their response to management practices.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristic that affects the use of the soils. On the basis of such differences, a soil series is divided into phases. The name of

a *soil phase* commonly indicates a feature that affects use or management. For example, Beasely silt loam, 2 to 6 percent slopes, is one of several phases within the Beasley series.

Some mapping units are made up of two or more dominant kinds of soil. One such kind of mapping unit is shown on the soil map of this survey area, the soil complex.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Brassfield-Beasley silt loam, 20 to 30 percent slopes, is an example.

Most mapping units include small, scattered areas of soils other than those that appear in the name of the mapping unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the mapping unit. The soils that are included in mapping are recognized in the description of each mapping unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. "Pits" is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each mapping unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses are given for each kind of soil in other tables in this survey. (See "Summary of Tables.") Many of the terms used in describing soils are defined in the Glossary.

Soil Descriptions and Potentials

BeB—Beasley silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uniform, slightly convex ridgetops mostly in the eastern half of the county. Slopes are 75 to 200 feet in length. Individual areas are 3 to 20 acres.

Typically, the surface layer is brown, very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 34 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm, brown and gray, moderately alkaline silty clay with about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

Included with this soil in mapping are small areas of Hagerstown, Lowell, and Nicholson soils. Also included are small areas of an eroded Beasley soil with a yellowish brown silty clay loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. Except where it has been limed, it is very strongly to medium acid in the surface layer and upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow and available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions except in eroded spots where the surface layer is silty clay loam. The root zone is deep, but the clayey subsoil restricts root penetration for some plants.

Most of this soil is being used for pasture and hay crops, but some acreage is in row crops. Some small tracts are used for housing.

This soil has high potential for growing row crops and small grains, and good results can be expected if management is good. The soil has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion. Small seep spots are a problem in some areas but the problem can be corrected by improved surface or tile drainage where suitable outlets are available.

This soil has medium potential for woodland. It has moderate equipment limitations.

This soil has medium potential for most urban uses. Low strength, moderate shrink swell potential, and the clayey subsoil are limitations, but they can be overcome by good design and careful installation. The clayey subsoil percs slowly, and this limits the use of this soil for septic tank absorption fields. Capability subclass IIe; woodland ordination symbol 3c.

BeC—Beasley silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on convex ridgetops and complex side slopes mostly in the eastern half of the county. Slopes are 150 to 500 feet in length. Individual areas are 5 to 90 acres.

Typically, the surface layer is brown very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 34 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm brown and gray moderately alkaline silty clay with about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

Included with this soil in mapping are small areas of Brassfield, Faywood, Hagerstown, Lowell, and Nicholson

soils. Also included are small areas of an eroded Beasley soil with a yellowish brown silty clay loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. Except where it has been limed, it is very strongly to medium acid in the surface layer and upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow and available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions except in eroded spots where the surface layer is silty clay loam. The root zone is deep but the clayey subsoil may restrict root penetration for some plants.

Most of this soil is being used for pasture and hay crops, but some acreage is in row crops. Some small tracts are used for housing.

This soil has medium potential for growing row crops and small grains, and good results can be expected if management is good. The soil has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion. Small seep spots are a problem in some areas, but the problem may be corrected by improved surface or tile drainage where suitable outlets are available.

This soil has medium potential for woodland and has moderate equipment limitations.

This soil has medium potential for most urban uses. Slope, low strength, moderate shrink-swell potential, and the clayey subsoil are limitations, but they can be overcome by good design and careful installation procedures. The clayey subsoil percs slowly, and this limits the use of this soil for septic tank absorption fields. Capability subclass IIIe; woodland ordination symbol 3c.

BeD—Beasley silt loam, 12 to 20 percent slopes. This deep, well drained, moderately steep soil is on complex side slopes mostly in the eastern half of the county. Slopes are 100 to 300 feet in length and individual areas are 4 to 30 acres.

Typically, the surface layer is brown very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 34 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm brown and gray moderately alkaline silty clay with about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

Included with this soil in mapping are small areas of Brassfield, Caneyville, Cynthiana, Faywood, and Lowell soils. Also included are small areas of an eroded Beasley soil with a yellowish brown silty clay loam surface layer. Included soils make up 10 to 15 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. Except where it has been limed, it is very strongly to medium acid in the surface layer and upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow and available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions except in eroded spots where the surface layer is silty clay loam. The root zone is deep, but the clayey subsoil may restrict root penetration for some plants.

Most of this soil is being used for pasture and hay crops, but some acreage is in woodland. Some small tracts are used for housing.

This soil has medium potential for growing pasture and hay crops, and fairly good results can be expected if management is good. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a very severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion. Small seep spots are a problem in some areas, but the problem can be corrected by improved surface or tile drainage where suitable outlets are available.

This soil has medium potential for woodland and has severe equipment limitations.

This soil has low potential for most urban uses. Slope is the greatest limitation, but low strength, moderate shrink swell potential, and the clayey subsoil are other less significant limitations. The clayey subsoil percs slowly, and this limits the use of the soil for septic tank absorption fields. Capability subclass IVe; woodland ordination symbol 3c.

BfC3—Beasley silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained, severely eroded, sloping soil is on convex ridgetops and complex side slopes mostly in the eastern half of the county. Slopes are 150 to 500 feet in length. Individual areas are 4 to 35 acres. Some areas have rills and shallow gullies 4 to 12 inches deep and 50 to 150 feet apart.

Typically, the surface layer is yellowish brown friable silty clay loam about 5 inches thick. The upper part of the subsoil, to a depth of about 15 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part of the subsoil, to a depth of about 29 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm, brown and gray, moderately alkaline silty clay and about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

Included with this soil in mapping are small areas of Brassfield, Faywood, Hagerstown, Lowell, and Nicholson soils. Also included are small areas of a less eroded

Beasley soil that has a brown silt loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is low in natural fertility and organic matter content. Except where it has been limed, it is very strongly to medium acid in the surface layer and upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow and available water capacity is high. This soil has somewhat unfavorable tilth and can be worked only within a narrow range of moisture conditions. The root zone is deep, but the clayey subsoil restricts root penetration for some plants.

Most of this soil is being used for pasture and hay crops. Some small tracts are used for housing. A few areas are idle. Vegetation in the idle areas is being reestablished naturally.

This soil has low potential for growing row crops and small grains. It has medium potential for hay and pasture. Good tilth is difficult to maintain, but it can be improved by returning crop residue to the soil. Erosion is a very severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion. Small seep spots are a problem in some areas, but the problem can be corrected by improved surface or tile drainage where suitable outlets are available.

This soil has moderate potential for woodland. It has severe equipment limitations.

This soil has medium potential for most urban uses. Slope, low strength, moderate shrink swell potential, and the clayey subsoil are limitations, but they can be overcome by good design and careful installation. The clayey subsoil percs slowly, and this limits the use of this soil for septic tank absorption fields. Vegetation is difficult to establish due to the silty clay loam surface layer. Capability subclass IVe; woodland ordination symbol 4c.

BfD3—Beasley silty clay loam, 12 to 20 percent slopes, severely eroded. This deep, well drained, severely eroded, moderately steep soil is on complex side slopes mostly in the eastern half of the county. Slopes are 100 to 300 feet in length. Individual areas are 5 to 50 acres. Some areas have rills and shallow gullies 4 to 12 inches deep and 50 to 150 feet apart.

Typically, the surface layer is yellowish brown friable silty clay loam about 5 inches thick. The upper part of the subsoil, to a depth of about 15 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 29 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm brown and gray moderately alkaline silty clay with about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

Included with this soil in mapping are small areas of Brassfield, Caneyville, Cynthiana, Faywood, Hagerstown, and Lowell soils. Also included are narrow areas of Lindside, Newark, and Nolin soils along small drainageways. Small areas of less eroded Beasley soils with brown silt loam surface layers are included. Included soils make up 10 to 15 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is low in natural fertility and organic matter content. Except where it has been limed, it is very strongly to medium acid in the surface layer and upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow, and available water capacity is high. This soil has somewhat unfavorable tilth and can be worked only within a narrow range of moisture conditions. The root zone is deep, but the clayey subsoil may restrict root penetration for some plants.

Most of this soil is being used for pasture, but some acreage is low quality woodland. Some small tracts are used for housing. A few areas are idle, and vegetation in these areas is being reestablished naturally.

This soil has low potential for growing row crops and small grains. It has medium potential for pasture. Good tilth is difficult to maintain.

This soil has medium potential for woodland. It has severe equipment limitations.

This soil has low potential for most urban uses. Slope is the greatest limitation, but low strength, moderate shrink swell potential, and the clayey subsoil are other less significant limitations. The clayey subsoil percs slowly, and this limits the use of this soil for septic tank absorption fields. Vegetation is difficult to establish due to the silty clay loam surface layer. Capability subclass VIe; woodland ordination symbol 4c.

BnF—Beasley-Caneyville rocky silt loams, 30 to 60 percent slopes. This complex consists of areas of Beasley and Caneyville soils so intermingled that it was not feasible to separate them at the scale selected for mapping. These soils are on steep hillsides and very steep bluffs along the Ohio River and Harrods Creek and their tributaries. Generally, the Beasley soil is on the lower slopes and the Caneyville soil is on the middle and upper slopes. Slopes are 100 to 400 feet in length, and areas are 10 to 200 acres. Individual areas of each soil are 1 to 10 acres. Limestone outcrops cover about 1 to 6 percent of the surface.

Beasley soil makes up about 40 percent of each mapped area. Typically the surface layer is brown, very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is yellowish brown silty clay. It is firm when moist and sticky and plastic when wet. The lower part of the subsoil, to a depth of about 34 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm, brown and gray, moderately alkaline silty clay and about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

The Beasley soil is medium in natural fertility and moderate in organic matter content. It is very strongly to medium acid in the upper part of the subsoil and neutral

to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow, and available water capacity is high. The root zone is deep, but the clayey subsoil may restrict root penetration of some plants.

Caneyville soil makes up about 30 percent of each mapped area. Typically, the surface layer is brown, very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 12 inches, is reddish brown, slightly firm silty clay loam. The lower part, to a depth of about 31 inches, is reddish brown silty clay or clay with strong brown and grayish brown mottles. It is very firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 31 inches.

The Caneyville soil is medium in natural fertility and moderate in organic matter content. It is medium acid to neutral throughout the profile. Permeability is moderately slow, and the available water capacity is moderate. The root zone is moderately deep.

Included with this complex in mapping are small areas of Boonesboro, Brassfield, Cynthiana, Hagerstown, and Lowell soils. Some small areas where slopes are 15 to 30 percent are included, and a clayey soil that is less than 20 inches to limestone bedrock and has a reddish brown subsoil is included. Also included is a calcareous clayey soil that has a dark surface layer and is 12 to 30 inches to interbedded calcareous shale, siltstone, and limestone.

This complex is being used mostly for woodland. It has medium potential for woodland, but has severe equipment limitations.

This complex has very low potential for farming and urban uses. Steep and very steep slopes and rockiness are limitations that are very difficult to overcome. Capability subclass VIIs; woodland ordination symbol 3c.

Bo—Boonesboro silt loam. This moderately deep, well drained soil is on nearly level flood plains along the upper reaches of the smaller streams. It is usually flooded at least once each year. Slopes range from 0 to 2 percent. Individual areas are 5 to 50 acres.

Typically, the surface layer is dark brown very friable silt loam about 8 inches thick. The subsurface layer, to a depth of about 14 inches, is dark brown friable silt loam and about 10 percent limestone gravel 1/4 to 1 1/2 inches in diameter. The subsoil, which extends to a depth of about 28 inches, is dark yellowish brown friable gravelly silt loam. Limestone bedrock is at a depth of 28 inches.

Included with this soil in mapping are small areas of Elk, Huntington, Lindside, Nolin, and Woolper soils and a few areas where slopes are short and are 2 to 4 percent. Also included are areas where the soil has a loam surface layer. The included soils make up 5 to 10 percent of this mapping unit, but separate areas are generally less than 3 acres in size.

This soil is high in natural fertility and organic matter content. It is slightly acid to mildly alkaline. Permeability is rapid in the subsoil and available water capacity is moderate. Except in a few gravelly spots, this soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is moderately deep and is easily penetrated by plant roots.

This soil is used mostly for hay and pasture. A few areas are in row crops and woodland.

This soil has medium potential for growing row crops, and good results can be expected if management is good. It has high potential for hay and pasture. Flooding is a hazard in winter and spring. Good tilth is easily maintained by returning crop residue to the soil.

This soil has high potential for woodland and has only slight equipment limitations. It has low potential for most urban uses. Flooding is the greatest limitation and is very difficult to overcome. Capability subclass IIs; woodland ordination symbol 1o.

BsE—Brassfield-Beasley silt loams, 20 to 30 percent slopes. This complex consists of areas of the Brassfield and Beasley soils that are so intermingled it was not feasible to separate them at the scale selected for mapping. It occurs on moderately steep complex hillsides throughout the county. Generally the Brassfield soils are on the middle to upper slopes and the Beasley soils are on the uppermost and lower slopes. Slopes are 100 to 400 feet in length, and areas are 5 to 150 acres. Individual areas of each soil are 1 to 20 acres. Limestone outcrops cover less than one percent of the surface.

Brassfield soils make up about 48 percent of each mapped area. Typically, the surface layer is dark grayish brown, very friable, calcareous silt loam. The subsoil, to a depth of about 14 inches, is light olive brown, friable, calcareous silt loam with common yellowish brown mottles. The underlying material is mottled light olive brown, light brownish gray, and strong brown soft weathered calcareous siltstone and shale that break down to loam. Interbedded calcareous shale, siltstone, and limestone bedrock is at a depth of 24 inches.

The Brassfield soils are low in natural fertility and organic matter content. They are mildly to moderately alkaline and calcareous throughout. Permeability is moderate and available water capacity is moderate. The root zone is moderately deep.

Beasley soils make up about 30 percent of each mapped area. Typically, the surface layer is brown very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is yellowish brown silty clay and is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 34 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm, brown and gray, moderately alkaline silty clay. It is about 20 percent coarse fragments, 1/8 to 1/2 inch in diameter.

The Beasley soil is medium in natural fertility and moderate in organic matter content. It is very strongly to medium acid in the upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow, and available water capacity is high. The root zone is deep, but the clayey subsoil may restrict root penetration of some plants.

Included with this complex in mapping are small areas of Cynthiana and Faywood soils. Also included is a dark surfaced clayey soil that is calcareous throughout and is underlain by soft calcareous siltstone, shale, and limestone at depths of 12 to 30 inches. In spots, flagstones and channery fragments cover 3 to 15 percent of the surface. A few areas where slopes are 30 to 40 percent are also included.

This complex is being used mostly for woodland. Some areas are used for pasture, generally of low quality. A few areas are idle and are being revegetated naturally.

This complex has very low potential for farming and urban uses. Steepness is the greatest limitation and is very difficult to overcome. Plants adapted only to acid to neutral soil conditions do not grow well on the Brassfield component of this complex due to its alkaline properties.

This complex has low potential for woodland and has moderate equipment limitations. Capability subclass VIe; woodland ordination symbol 4d.

CaC—Caneyville silt loam, 6 to 12 percent slopes. This moderately deep, well drained soil is on sloping convex ridgetops and side slopes mostly in the western half of the county. Slopes are 75 to 300 feet in length. Individual areas are 5 to 35 acres.

Typically, the surface layer is brown very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 12 inches, is reddish brown firm silty clay loam. The lower part, to a depth of about 31 inches, is reddish brown silty clay or clay with strong brown and grayish brown mottles. It is very firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 31 inches.

Included with this soil in mapping are small areas of Beasley, Crider, and Hagerstown soils. A few short 2 to 6 percent slope ridgetops are included. Also included are small eroded spots with a reddish brown silty clay loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. It is medium acid to neutral throughout the profile. Permeability is moderately slow and the available water capacity is moderate. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions except in eroded spots where the silty clay loam subsoil is exposed. The root zone is moderately deep and the clayey subsoil may restrict root penetration for some plants.

Most of this soil is being used for pasture and hay, but a small acreage is in row crops and subdivisions.

This soil has medium potential for growing row crops and small grains, and moderately good results can be obtained under good management. It has medium potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has medium potential for woodland and has moderate equipment limitations.

This soil has medium potential for urban uses. Slope, depth to bedrock, low strength, moderate shrink swell potential, and clayey subsoils are limitations. Some of these can be overcome by good design and careful installation. The clayey subsoil percs slowly, and this limits use for septic tank absorption fields. Capability subclass IIIe; woodland ordination symbol 3c.

CbD—Caneyville-Beasley rocky silt loams, 12 to 30 percent slopes. This complex consists of areas of Caneyville and Beasley soils so intermingled that it was not feasible to separate them at the scale selected for mapping. It occurs on convex, moderately steep and steep hillsides mostly in the western half of the county. Generally, the Caneyville soil is on the upper and middle slopes and the Beasley soil is on the lower and middle slopes. Slopes are 100 to 400 feet in length and areas are 10 to 40 acres. Individual areas of each soil are 1 to 5 acres. Limestone outcrops cover about 1 to 4 percent of the surface.

Caneyville soil, and other closely related soils that are underlain by hard limestone bedrock, make up about 62 percent of each mapped area. Typically, the surface layer of the Caneyville soil is brown very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 12 inches, is reddish brown slightly firm silty clay loam. The lower part, to a depth of about 31 inches, is reddish brown silty clay or clay with strong brown and grayish brown mottles. It is very firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 31 inches.

The Caneyville soil is medium in natural fertility and moderate in organic matter content. It is medium acid to neutral throughout the profile. Permeability is moderately slow, and the available water capacity is moderate. The root zone is moderately deep, and the clayey subsoil may restrict root penetration for some plants.

Beasley soil and other closely related soils that are underlain by interbedded soft calcareous siltstone, sandstone, shale, and limestone make up about 33 percent of each mapped area. Typically, the surface layer of the Beasley soil is brown very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 34 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm, brown and gray, moderately alkaline silty clay. It is about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

The Beasley soil is medium in natural fertility and moderate in organic matter content. It is very strongly to medium acid in the upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow and available water capacity is high. The root zone is deep, but the clayey subsoil may restrict root penetration for some plants.

Included with this complex in mapping are small areas of Brassfield, Crider, Faywood, and Hagerstown soils. A clayey soil, with a reddish brown subsoil that is less than 20 inches to limestone bedrock, is included. Also included is a clayey soil that has a dark surface layer and is 12 to 30 inches to interbedded soft calcareous siltstone, shale, and limestone. A few small eroded spots with a silty clay loam surface layer are included.

This complex is used mostly for woodland, but a few areas are in low quality pasture or are idle. It has medium potential for woodland and has severe equipment limitations.

This complex has low potential for farming and urban uses. Moderately steep and steep slopes, depth to bedrock, and rockiness are limitations that are very difficult to overcome. Capability subclass VIs; woodland ordination symbol 3c.

CrA—Crider silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on ridgetops, mostly in the western half of the county. Slopes are 150 to 400 feet in length. Individual areas are 10 to 80 acres.

Typically, the surface layer is brown, very friable silt loam about 7 inches thick. The upper part of the subsoil, to a depth of about 40 inches, is brown, friable silty clay loam. The lower part, to a depth of 60 inches or more, is dark red, firm, silty clay loam or silty clay.

Included with this soil in mapping are small areas of Nicholson soils. Included soils make up 3 to 6 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where the surface layer has been limed, reaction is slightly to strongly acid in the upper 40 inches and medium to strongly acid below. Permeability is moderate and available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

Most of this soil is being used for row crops and hay. The soil has high potential for growing row crops and small grains. Very good results can be obtained under good management. This soil has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a slight hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and only slight equipment limitations. It has high potential for urban uses and has no significant limitations. Capability class I; woodland ordination symbol 1o.

CrB—Crider silt loam, 2 to 6 percent slopes. This deep, well drained soil is on gently sloping convex ridgetops, mostly in the western half of the county. Slopes are 75 to 300 feet in length. Individual areas are 5 to 500 acres. Some areas are karst.

Typically, the surface layer is brown very friable silt loam about 7 inches thick. The upper part of the subsoil, to a depth of about 40 inches, is brown friable silty clay loam. The lower part of the subsoil, to a depth of 60 inches or more, is dark red, firm, silty clay loam or silty clay.

Included with this soil in mapping are small areas of Beasley, Hagerstown, and Nicholson soils. Near slightly depressed areas, small areas of Lindside and Nolin soils are inclusions. Some areas northwest of U.S. Highway 42 have a loamy upper mantle deeper than 45 inches. An area approximately 1 to 4 miles wide that lies along U.S. Highway 42, roughly from Goshen to Covington Church, is underlain in places at depths of about 3 to 5 feet, by remnants considered to be glacial deposits. Also included are small eroded spots with a silty clay loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where the surface layer has been limed, reaction is slightly to strongly acid in the upper 40 inches and medium to strongly acid below. Permeability is moderate and available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

Most of this soil is being used for row crops or hay, but a significant acreage is in subdivisions and small tracts.

This soil has high potential for growing row crops and small grains, and very good results can be obtained under good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and only slight equipment limitations. It has high potential for urban uses and has no significant limitations. Capability subclass IIe; woodland ordination symbol 1o.

CrC—Crider silt loam, 6 to 12 percent slopes. This deep, well drained soil is on sloping ridgetops and side slopes, mostly in the western half of the county. Slopes are 75 to 400 feet in length. Individual areas are 5 to 200 acres.

Typically, the surface layer is brown very friable silt loam about 7 inches thick. The upper part of the subsoil, to a depth of about 40 inches, is brown friable silty clay loam. The lower part, to a depth of 60 inches or more, is dark red, firm silty clay loam or silty clay.

Included with this soil in mapping are small areas of Beasley, Caneyville, Hagerstown, and Nicholson soils. In some areas northwest of U.S. Highway 42 the loamy upper part of the mantle is thicker than 45 inches. An area approximately 1 to 4 miles wide along U.S. Highway 42, roughly from Goshen to Covington Church, is under-

lain in places (at depths of about 3 to 5 feet) by remnants considered to be glacial deposits. Also included are small eroded spots with a silty clay loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where the surface layer has been limed, reaction is slightly to strongly acid in the upper 40 inches and medium to strongly acid below. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

Most of this soil is being used for row crops, hay, and pasture. Some horse farms are on this soil.

This soil has high potential for growing row crops and small grains, and good results can be obtained under good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and has only slight equipment limitations. It has medium potential for most urban uses. Slope is a limitation, but it usually can be overcome by good design and careful installation procedures. Capability subclass IIIe; woodland ordination symbol 1o.

CyF—Cynthiana-Faywood-Beasley complex, 30 to 60 percent slopes. This complex consists of areas of Cynthiana, Faywood, and Beasley soils so intermingled that it was not feasible to separate them at the scale selected for mapping. It occurs on steep and very steep complex hillsides, mostly in the northeastern portion of the county. Generally, the Cynthiana soils are on the upper to middle slopes, the Faywood soils are on the lower to middle slopes, and the Beasley soils are interspersed throughout. Slopes are 150 to 500 feet in length. Areas are 5 to 70 acres. Individual areas of each soil are 2 to 20 acres. Flagstones, channery fragments, and thin flat stones cover about 5 to 30 percent of the surface. The highest percentage commonly is on the south facing slopes. Limestone outcrops cover none to less than 1 percent of the surface.

Cynthiana soil makes up about 35 percent of each mapped area. Typically, the surface layer is brown, firm silty clay loam about 5 inches thick. The subsoil, to a depth of about 17 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 17 inches.

The Cynthiana soil is medium in natural fertility and moderate in organic matter content. It is slightly acid to mildly alkaline throughout. Permeability is moderately slow, and available water capacity is low. The root zone is shallow, and the clayey subsoil may restrict root penetration of some plants.

Faywood soil makes up about 30 percent of each mapped area. Typically, the surface layer is brown, friable silt loam about 4 inches thick. The subsoil, to a depth of about 31 inches, is yellowish brown silty clay or clay that is firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 31 inches.

The Faywood soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to neutral throughout. Permeability is moderately slow or slow, and available water capacity is moderate. The root zone is moderately deep, and the clayey subsoil may restrict root penetration for some plants.

Beasley soil makes up about 25 percent of each mapped area. Typically, the surface layer is brown very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is yellowish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 34 inches, is yellowish brown clay with gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is firm, brown and gray, moderately alkaline silty clay with about 20 percent coarse fragments 1/8 to 1/2 inch in diameter.

The Beasley soil is medium in natural fertility and moderate in organic matter content. It is very strongly to medium acid in the upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the underlying material. Permeability is moderately slow, and available water capacity is high. The root zone is deep, but the clayey subsoil may restrict root penetration of some plants.

Included with this complex in mapping are small areas of Boonesboro, Brassfield, Lowell, and Woolper soils. Also included is a clayey soil that has a dark surface layer and is less than 20 inches to limestone; a clayey soil that has a dark surface layer and that is calcareous throughout and is underlain by soft calcareous siltstone, shale, and limestone at depths of 12 to 30 inches, and a few areas along the Ohio River where limestone bluffs are up to 12 feet thick. In a few areas slopes are 20 to 30 percent, and in places they are 60 to 70 percent. A few eroded spots of soil that has a more clayey surface layer are included.

These soils are used mostly for woodland. A few areas are being used to a limited degree for pasture. It has low potential for woodland and has severe equipment limitations.

This complex has low potential for farming and urban uses. Steep slopes and depth to bedrock are limitations that are very difficult to overcome. Capability subclass VIIe; woodland ordination symbol 4d.

ElB—Elk silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uniform convex stream terraces along the Ohio River, Harrods Creek, Floyds Fork, and their tributaries. Slopes are 75 to 200 feet in length. Individual areas are 3 to 20 acres.

Typically, the surface layer is brown, very friable silt loam about 7 inches thick. The subsoil, to a depth of about 50 inches, is brown or dark yellowish brown silt loam or silty clay loam. The underlying material is yellowish brown slightly firm silt loam with common pebbles 1/4 to 3/4 inch in diameter.

Included with this soil in mapping are small areas of Huntington, Newark, and Otwell soils. A few low terraces along the Ohio River have dark surface layers. In places slopes are 0 to 2 percent, and in other places they are short and 6 to 12 percent. Also included are a few areas where the surface layer is fine sandy loam. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where it has been limed, it is medium to very strongly acid in the surface layer and subsoil and slightly to strongly acid in the underlying material. Permeability is moderate and available water capacity is high. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used mostly for row crops, hay, and pasture. It has high potential for growing row crops and small grains, and very good results can be obtained under good managment. The soil has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and only slight equipment limitations. It has high potential for urban uses and has no significant limitations except where a few low areas flood occasionally. Capability subclass IIe; woodland ordination symbol 2o.

FaC—Faywood silt loam, 6 to 12 percent slopes. This moderately deep, well drained, sloping soil is on convex ridgetops and side slopes throughout the county. Slopes are 75 to 300 feet in length. Individual areas are 5 to 30 acres.

Typically, the surface layer is brown, friable silt loam about 4 inches thick. The subsoil, to a depth of about 31 inches, is yellowish brown silty clay or clay that is firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 31 inches.

Included with this soil in mapping are small areas of Beasley, Cynthiana, Lowell, and Nicholson soils. A few 2 to 6 percent slopes are included. Also included are small areas of eroded soil with a yellowish brown silty clay loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas are generally less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to neutral throughout. Permeability is moderately slow and available water capacity is moderate. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions except in eroded spots where the silty clay loam subsoil is exposed. The root zone is moderately deep, and the clayey subsoil may restrict root penetration for some plants.

Most of this soil is being used for pasture and hay crops, but a small acreage is in row crops.

This soil has medium potential for growing row crops and small grains. Moderately good results can be obtained under good management. The soil has medium potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has medium potential for woodland and severe equipment limitations. It has medium potential for urban uses. Slope, depth to bedrock, low strength, moderate shrink swell potential, and the clayey subsoil are limitations. Some of these can be overcome by good design and careful installation. The clayey subsoil percs slowly, and this limits its use for septic tank absorption fields. Capability subclass IIIe; woodland ordination symbol 3c.

FaD—Faywood silt loam, 12 to 30 percent slopes. This moderately deep, well drained, moderately steep to steep soil is on hillsides throughout the county. Slopes are 75 to 200 feet in length. Individual areas are 5 to 30 acres.

Typically, the surface layer is brown, friable silt loam about 4 inches thick. The subsoil, to a depth of about 31 inches, is yellowish brown silty clay or clay that is firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 31 inches.

Included with this soil in mapping are small areas of Beasley, Brassfield, Cynthiana, and Lowell soils. A few areas where slopes are 30 to 40 percent are included, and small eroded areas where there is a yellowish brown silty clay loam surface layer are also included. Included soils make up 5 to 10 percent of this mapping unit, but separate areas are generally less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. It is strongly acid to neutral throughout. Permeability is moderately slow and available water capacity is moderate. Tilth is good, and the soil can be worked throughout a wide range of moisture conditions except in eroded spots where the silty clay loam subsoil is exposed. The root zone is moderately deep, and the clayey subsoil may restrict root penetration for some plants.

Most of this soil is being used for pasture and hay crops, but a small acreage is in row crops. A few areas are woodland.

This soil has low potential for growing row crops and for urban uses, primarily because of the moderately steep and steep slopes and depth to bedrock. It has medium potential for pasture, but clipping is a problem on the steeper slopes.

This soil has medium potential for woodland and has severe equipment limitations. Capability subclass VIe; woodland ordination symbol 3c.

FsD3—Faywood silty clay, 12 to 30 percent slopes, severely eroded. This moderately deep, well drained, moderately steep to steep soil is on hillsides throughout the county. Slopes are 75 to 200 feet in length and individual areas are 5 to 60 acres.

Typically, the surface layer is yellowish brown, slightly firm silty clay about 4 inches thick. The subsoil, to a depth of about 27 inches, is yellowish brown silty clay or clay that is firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of about 27 inches.

Included with this soil in mapping are small areas of Beasley, Brassfield, Cynthiana, and Lowell soils. A few 30 to 40 percent slopes are present. Included soils make up 5 to 10 percent of this mapping unit, but separate areas are generally less than 3 acres in size.

This soil is low in natural fertility and organic matter content. It is strongly acid to neutral throughout. Permeability is moderately slow, and available water capacity is moderate. This soil has somewhat unfavorable tilth and can be worked only within a narrow range of moisture conditions. The root zone is moderately deep and the clayey subsoil may restrict root penetration for some plants.

Most of this soil is being used for pasture. A few areas are being revegetated naturally.

This soil has low potential for farming and urban uses, mainly because of the moderately steep slopes and depth to bedrock.

This soil has medium potential for woodland and has severe equipment limitations. Capability subclass VIe; woodland ordination symbol 4c.

HaB—Hagerstown silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uniform, convex ridgetops. It's mostly in the western half of the county. Slopes are 75 to 300 feet in length. Individual areas are 3 to 15 acres.

Typically, the surface layer is brown, very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 16 inches, is yellowish red friable silty clay loam. The lower part, to a depth of about 60 inches, is red or dark red silty clay that is firm when moist and sticky and plastic when wet. The underlying material is dark red silty clay that is firm when moist and sticky and plastic when wet.

Included with this soil in mapping are small areas of Beasley, Caneyville, and Crider soils. Also included are small eroded spots with a yellowish red silty clay loam surface layer. Included soils make up 4 to 8 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. It is slightly to strongly acid in the upper part of the subsoil and strongly acid to neutral below that. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions except where the silty clay loam subsoil is exposed in eroded spots. Root zone is deep and easily penetrated by plant roots.

Most of this soil is being used for row crops, hay, and pasture. Some small tracts are used for housing.

This soil has high potential for growing row crops and small grains and very high yields can be obtained under good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and only slight equipment limitations. It has high potential and no significant limitations for urban uses. Capability subclass IIe; woodland ordination symbol 1o.

HaC—Hagerstown silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on convex ridgetops and side slopes mostly in the western half of the county. Slopes are 75 to 300 feet in length. Individual areas are 4 to 60 acres.

Typically, the surface layer is brown, very friable silt loam about 5 inches thick. The upper part of the subsoil, to a depth of about 16 inches, is yellowish red friable silty clay loam. The lower part, to a depth of about 60 inches, is red or dark red silty clay that is firm when moist and sticky and plastic when wet. The underlying material is dark red silty clay that is firm when moist and sticky and plastic when wet.

Included with this soil in mapping are small areas of Beasley, Caneyville, and Crider soils. Also included are small eroded spots with a yellowish red silty clay loam surface layer. A few 12 to 18 percent slopes are included. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. It is medium to strongly acid in the upper part of the subsoil and strongly acid to neutral below that. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions except in eroded spots where the silty clay loam subsoil is exposed. The root zone is deep and easily penetrated by plant roots.

Most of this soil is being used for row crops, hay, and pasture. Some small tracts are used for housing.

This soil has high potential for growing row crops and small grains, and good results can be expected if management is good. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland but has slight equipment limitations. It has medium potential for urban uses. Slope is a limitation, but it usually can be overcome by good design and careful installation procedures. Capability subclass IIIe; woodland ordination symbol 1o.

HsC3—Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained, severely eroded, sloping soil is on convex ridgetops and side slopes.

It is mostly in the western half of the county. Slopes are 75 to 300 feet in length. Individual areas are 4 to 35 acres.

Typically, the surface layer is yellowish red friable silty clay loam about 5 inches thick. The upper part of the subsoil, to a depth of about 11 inches, is yellowish red friable silty clay loam. The lower part, to a depth of about 55 inches, is red or dark red silty clay that is firm when moist and sticky and plastic when wet. The underlying material is dark red silty clay that is firm when moist and sticky and plastic when wet.

Included with this soil in mapping are small areas of Beasley, Caneyville, and Crider soils. Also included are a few small areas where the soil is less eroded and has a brown silt loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is medium in natural fertility and low in organic matter content. It is medium to strongly acid in the upper part of the subsoil and strongly acid to neutral below that. Permeability is moderate, and available water capacity is high. This soil has somewhat unfavorable tilth and can be worked only within a narrow range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

Most of this soil is being used for pasture and hay. A few areas are in row crops.

This soil has low potential for growing row crops and small grains. It has medium potential for hay and pasture. Good tilth is difficult to maintain, but it is improved by returning crop residue to the soil. Erosion is a very severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and has slight equipment limitations. It has medium potential for most urban uses. Slope and the silty clay loam surface layer are limitations, but they can usually be overcome by good design and careful installation procedures. Capability subclass IVe; woodland ordination symbol 1o.

Hu—Huntington silt loam. This deep, well drained, level to nearly level soil is on flood plains along the Ohio River. It is usually flooded at least once each year. Slopes range from 0 to 2 percent. Individual areas are 5 to 95 acres.

Typically, the surface layer is dark brown, very friable silt loam about 10 inches thick. The subsoil, to a depth of about 72 inches, is brown or dark yellowish brown, friable to firm silt loam or silty clay loam.

Included with this soil in mapping are small areas of Elk, Lindside, Newark, Otwell, Weinbach, and Wheeling soils. A few areas where the surface layer is fine sandy loam are included. Also included are narrow, steep, sandy areas along the bank of the Ohio River. The included soils make up 4 to 8 percent of this mapping unit, but separate areas are generally less than 3 acres in size.

This soil is high in natural fertility and organic matter content. It is medium acid to mildly alkaline. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used for row crops, hay, and pasture. It has high potential for growing row crops, and very good results can be expected under good management. It has high potential for hay and pasture except for the hazard of flooding in late winter and early spring. Good tilth is easily maintained by returning crop residue to the soil.

This soil has high potential for woodland and has only slight equipment limitations. It has low potential for most urban uses. Flooding is the greatest limitation and is very difficult to overcome. Capability class I; woodland ordination symbol 1o.

La—Lawrence silt loam. This deep, somewhat poorly drained, nearly level soil is on broad upland flats throughout the county. Individual areas are 4 to 70 acres. Slopes range from 0 to 4 percent.

Typically, the surface layer is grayish brown very friable silt loam about 8 inches thick. The upper part of the subsoil, to a depth of about 22 inches, is yellowish brown friable silty clay loam with brownish gray mottles. The very firm, brittle and compact silty clay loam fragipan, between depths of about 22 and 38 inches, is mottled light brownish gray and yellowish brown. The lower part of the subsoil and underlying material are yellowish brown, firm silty clay loam or silty clay with common gray mottles.

Included with this soil in mapping are small areas of Newark and Nicholson soils. A poorly drained soil that is clayey in the subsoil and lacks a fragipan is also included. In places this soil is underlain, at a depth of 3 to 5 feet, by remnants considered to be glacial deposits. Included soils make up 10 to 15 percent of this mapping unit, but separate areas generally are less than 5 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. Except where it has been limed, reaction is strongly or very strongly acid from the surface layer through the fragipan. The underlying material is very strongly acid to neutral. Permeability is slow in the fragipan, and available water capacity is moderate. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is moderately deep, and the compact and brittle fragipan restricts root penetration for most plants.

Most of this soil is being used for hay and pasture, but a small acreage is in woodland.

This soil has medium potential for growing row crops and small grain, and moderately good results can be expected under good management. It has medium potential for hay and pasture, but selection of water tolerant plants is essential. Good tilth is easily maintained by returning crop residue to the soil.

This soil has high potential for woodland and moderate equipment limitations. It has low potential for most urban uses. Seasonal wetness, slow permeability, and low

strength are limitations which are difficult to overcome. The compact and brittle fragipan percs slowly, and this limits use for septic tank absorption fields. Capability subclass IIIw; woodland ordination symbol 2w.

Ln—Lindside silt loam. This deep, moderately well drained, nearly level soil is on flood plains along major streams and their tributaries. A few areas are around small depressions in the uplands. It usually floods at least once each year. Slopes range from 0 to 2 percent and individual areas are 5 to 40 acres.

Typically, the surface layer is brown, very friable silt loam about 8 inches thick. The upper part of the subsoil, to a depth of about 21 inches, is brown, friable silt loam. The lower part, to a depth of about 48 inches, is brown friable silt loam with few grayish brown mottles. The underlying material is brown, slightly firm, stratified silt loam, loam, and fine sandy loam with common grayish brown mottles.

Included with this soil in mapping are small areas of Elk, Huntington, Newark, Nolin, Wheeling, and Woolper soils. A few 2 to 4 percent slopes are also included. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. It is medium acid to neutral throughout except for the underlying material which is mildly alkaline in places. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used mostly for row crops, hay, and pasture. A few areas are in woodland.

This soil has high potential for growing row crops, and very good results can be expected under good management. It also has high potential for pasture (fig. 10) and hay except for the hazard of flooding during late winter and early spring. Good tilth is easily maintained by returning crop residue to the soil.

This soil has high potential for woodland and has slight equipment limitations. It has low potential for most urban uses except for a few small areas which do not flood. Flooding is the greatest limitation and is very difficult to overcome. Seasonal wetness is a less significant problem. Capability class I; woodland ordination symbol 1o.

LoB—Lowell silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uniform convex ridgetops, mostly in the southeastern portion of the county. Slopes are 75 to 200 feet in length. Individual areas are 5 to 25 acres.

Typically, the surface layer is brown, very friable silt loam about 6 inches thick. The upper part of the subsoil, to a depth of about 14 inches, is dark yellowish brown friable silty clay loam. The lower part, to a depth of about 36 inches, is strong brown or yellowish brown silty clay or clay that is firm when moist and sticky and plastic when wet. The underlying material is mottled yellowish brown and strong brown clay that is very firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of 59 inches.

Included with this soil in mapping are small areas of Beasley, Faywood, and Nicholson soils. Also included are small areas where the soil is eroded and has a dark yellowish brown silty clay loam surface layer. Included soils make up 4 to 8 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where it has been limed, it is slightly to very strongly acid in the surface layer and upper part of the subsoil and strongly acid to mildly alkaline in the lower part of the subsoil. Permeability is moderately slow, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions except in eroded spots where the silty clay loam subsoil is exposed. The root zone is deep, but the clayey subsoil restricts root penetration for some plants.

This soil is being used mostly for row crops, hay, and pasture (fig. 11). It has high potential for growing row crops and small grains, and good results can be expected under good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and has moderate equipment limitations. It has medium potential for most urban uses. Low strength, moderate shrink-swell potential, and the clayey subsoil are limitations, but they can usually be overcome by good design and careful installation procedures. The clayey subsoil percs slowly, and this limits its use for septic tank absorption fields. Capability subclass IIe; woodland ordination symbol 2c.

LoC—Lowell silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on uniform convex ridgetops and side slopes, mostly in the southeastern portion of the county. Slopes are 75 to 300 feet in length. Individual areas are 4 to 75 acres.

Typically, the surface layer is brown very friable silt loam about 6 inches thick. The upper part of the subsoil, to a depth of about 14 inches, is dark yellowish brown friable silty clay loam. The lower part, to a depth of about 36 inches, is strong brown or yellowish brown silty clay or clay that is firm when moist and sticky and plastic when wet. The underlying material is mottled yellowish brown and strong brown clay that is very firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of 59 inches.

Included with this soil in mapping are small areas of Beasley, Cynthiana, Faywood, and Nicholson soils. Also included are small areas where the soil is eroded and has a dark yellowish brown silty clay loam surface layer. Included soils make up 4 to 8 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where it has been limed, it is slightly to very strongly acid in the surface layer and upper part of the subsoil and strongly acid to mildly alkaline in the lower part of the subsoil. Permeability is moderately slow, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions except in eroded spots where the silty clay loam subsoil is exposed. The root zone is deep, but the clayey subsoil restricts root penetration for some plants.

This soil is being used mostly for row crops, hay, and pasture. It has medium potential for growing row crops and small grains, and good results can be expected under good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and has moderate equipment limitations.

This soil has medium potential for most urban uses. Slope, low strength, moderate shrink-swell potential, and the clayey subsoil are limitations, but they can usually be overcome by good design and careful installation procedures. The clayey subsoil percs slowly, and this limits its use for septic tank absorption fields. Capability subclass IIIe; woodland ordination symbol 2c.

LsC3—Lowell silty clay loam, 6 to 12 percent slopes, severely eroded. This deep, well drained, severely eroded, sloping soil is on convex ridgetops and side slopes, mostly in the southeastern portion of the county. Slopes are 75 to 300 feet in length. Individual areas are 3 to 40 acres. Some areas have rills and shallow gullies 4 to 12 inches deep and 50 to 150 feet apart.

Typically, the surface layer is dark yellowish brown friable silty clay loam about 6 inches thick. The subsoil, to a depth of about 30 inches, is strong brown or yellowish brown silty clay or clay that is firm when moist and sticky and plastic when wet. The underlying material is mottled yellowish brown and strong brown clay that is very firm when moist and sticky and plastic when wet. Limestone bedrock is at a depth of 53 inches.

Included with this soil in mapping are small areas of Beasley, Cynthiana, Faywood, and Nicholson soils. A few short 12 to 20 percent slopes are included. Also included are small areas where the soil is less eroded and has a brown silt loam surface layer. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is low in natural fertility and organic matter content. Except where it has been limed, it is slighty to very strongly acid in the surface layer and upper part of the subsoil and strongly acid to mildly alkaline in the lower part of the subsoil. Permeability is moderately slow, and available water capacity is high. This soil has somewhat unfavorable tilth and can be worked only within a narrow range of moisture conditions. The root zone is deep, but the clayey subsoil restricts root penetration for some plants.

This soil is being used mostly for hay and pasture. It has low potential for growing row crops and small grains. It has medium potential for hay and pasture. Good tilth is difficult to maintain, but it is improved by returning crop residue to the soil. Erosion is a very severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland, but it has moderate equipment limitations. It has low potential for most urban uses. Slope, low strength, moderate shrink-swell potential, and the clayey subsoil are limitations, but they can usually be overcome by good design and careful installation procedures. The clayey subsoil percs slowly, and this limits use for septic tank absorption fields. Vegetation is difficult to establish because of the clayey surface layer. Capability subclass IVe; woodland ordination symbol 2c.

Ne—Newark silt loam. This deep, somewhat poorly drained, nearly level soil is on flood plains along major streams and their tributaries. It usually floods at least once each year. Slopes range from 0 to 2 percent. Individual areas are 4 to 25 acres.

Typically, the surface layer is brown, very friable silt loam. The upper part of the subsoil, to a depth of about 15 inches, is brown, very friable silt loam with many light brownish gray mottles. The lower part, to a depth of about 38 inches, is grayish brown and light brownish gray friable silt loam with common to many brown and yellowish brown mottles. The underlying material is mottled, light brownish gray and yellowish brown, friable silt loam.

Included with this soil in mapping are small areas of Huntington, Lindside, Nolin, and Weinbach soils. Also included are a few areas of poorly and very poorly drained soils. The included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Reaction is medium acid to mildly alkaline. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used mostly for row crops, hay, and pasture. A few small tracts are in woodland.

This soil has high potential for growing row crops, when drained, and good results can be expected under good management. It also has high potential for pasture and hay. The hazard of flooding during late winter and early spring and the seasonal water table may affect pasture and hay yields during some seasons. Good tilth is easily maintained by returning crop residue to the soil.

This soil has high potential for woodland and has moderate equipment limitations. It has low potential for most urban uses. Flooding is the greatest limitation and is very difficult to overcome. The seasonal high water table can be corrected if suitable outlets are available. Capability subclass IIw; woodland ordination symbol 1w.

NhB—Nicholson silt loam, 2 to 6 percent slopes. This deep, moderately well drained, gently sloping soil is on uniform convex ridgetops throughout the county. Slopes are 75 to 200 feet in length and individual areas are 3 to 45 acres.

Typically, the surface layer is brown friable silt loam about 7 inches thick. The upper part of the subsoil, to a depth of about 27 inches, is brown or strong brown friable silt loam or silty clay loam. Between depths of about 27 and 36 inches is a yellowish brown, firm, brittle, compact silty clay loam fragipan with common gray mottles. The lower part of the subsoil and underlying material is yellowish brown silty clay or clay that has common gray mottles and is very firm when moist and sticky and plastic when wet.

Included with this soil in mapping are small areas of Beasley, Lawrence, and Lowell soils. A few 0 to 2 percent slopes are included. In places this soil is underlain, at a depth of 3 to 5 feet, by remnants considered to be glacial deposits. A few areas have bedrock at depths of less than 60 inches. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. Except where it has been limed, reaction is very strongly to medium acid in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and underlying material. Permeability is slow in the fragipan, and available water capacity is moderate. The root zone is moderately deep, and the compact and brittle fragipan restricts root penetration for most plants.

Most of this soil is being used for row crops, hay, and pasture. Some small tracts are used for housing.

This soil has high potential for growing row crops and small grains, and good results can be expected under good management. It has high potential for pasture and hay, but the seasonal high water table is a problem when alfalfa is grown. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and only slight equipment limitations. It has medium potential for most urban uses. Seasonal wetness and low strength are limitations, but they can usually be overcome by good design and careful installation procedures. The compact and brittle fragipan percs slowly and limits its use for septic tank absorption fields. Capability subclass IIe; woodland ordination symbol 2o.

NhC—Nicholson silt loam, 6 to 12 percent slopes. This deep, moderately well drained, sloping soil is on uniform convex ridgetops and side slopes throughout the county. Slopes are 75 to 300 feet in length and individual areas are 4 to 75 acres.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The upper part of the subsoil, to a depth of about 27 inches, is brown or strong brown, friable silt loam or silty clay loam. Between depths of about 27 and 36 inches is a yellowish brown, firm, brittle, compact silty clay loam fragipan with common gray mottles. The lower part of the subsoil and underlying material are yellowish brown silty clay or clay that has common gray mottles and is very firm when moist and sticky and plastic when wet.

Included with this soil in mapping are small areas of Beasley, Faywood, and Lowell soils. A few 12 to 18 percent slopes are included. In places this soil is underlain, at depths of 3 to 5 feet, by remnants considered to be glacial deposits. Also included are small areas where the soil is eroded and has a brown or strong brown silty clay loam surface layer. A few small areas have bedrock at depths of less than 60 inches. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. Except where it has been limed, reaction is very strongly to medium acid in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the underlying material. Permeability is slow in the fragipan and available water capacity is moderate. The root zone is moderately deep and the compact and brittle fragipan restricts root penetration for most plants.

Most of this soil is being used for hay and pasture, but a few areas are in row crops. Some small tracts are used for housing.

This soil has high potential for growing row crops and small grains, and good results can be expected under good management. It has high potential for pasture and hay, but the seasonal high water table is a problem when alfalfa is grown. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and has slight equipment limitations. It has medium potential for most urban uses. Slope, seasonal wetness, and low strength are limitations, but they can usually be overcome by good design and careful installation procedures. The compact and brittle fragipan percs slowly and limits the use of this soil for septic tank absorption fields. Capability subclass IIIe; woodland ordination symbol 2o.

No—Nolin silt loam. This deep, well drained, nearly level soil is on flood plains along major streams and their tributaries. It usually floods at least once each year.

Slopes range from 0 to 2 percent. Individual areas are 5 to 150 acres.

Typically, the surface layer is brown, very friable silt loam about 8 inches thick. The upper part of the subsoil, to a depth of about 61 inches, is brown friable silt loam. The lower part of the subsoil and the underlying material are brown, friable silt loam with common grayish brown mottles and a few small pebbles.

Included with this soil in mapping are small areas of Boonesboro, Elk, Lindside, and Woolper soils. In places small areas of Huntington soils are also included. The included soils make up 5 to 15 percent of this mapping unit, but separate areas are generally less than 3 acres in size.

This soil is high in natural fertility and moderate in organic matter content. It is medium acid to neutral throughout except for the underlying material, which ranges to mildly alkaline in places. Permeability is moderate and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used mostly for row crops, hay, and pasture. It has high potential for growing row crops, and very good results can be expected under good management. It has high potential for hay and pasture except for the hazard of flooding in late winter and early spring. Good tilth is easily maintained by returning crop residue to the soil.

This soil has high potential for woodland and only slight equipment limitations. It has low potential for most urban uses except for a few small areas which do not become flooded. Flooding is the greatest limitation and is very difficult to overcome. Capability class I; woodland ordination symbol 1o.

OtB—Otwell silt loam, 2 to 6 percent slopes. This deep, moderately well drained, gently sloping soil is on convex stream terraces along the Ohio River, Harrods Creek, Floyds Fork, and their tributaries. Slopes are 75 to 200 feet in length and individual areas are 3 to 20 acres.

Typically, the surface layer is brown, very friable silt loam about 7 inches thick. The upper part of the subsoil, to a depth of about 24 inches, is dark yellowish brown or yellowish brown, friable silt loam or silty clay loam. Between depths of about 24 and 33 inches is a mottled, yellowish brown, brown, and light brownish gray silty clay loam fragipan that is very firm, brittle, and compact. The lower part of the subsoil and underlying material are yellowish brown and grayish brown, firm silty clay loam or silty clay.

Included with this soil in mapping are small areas of Elk, Newark, Weinbach, and Wheeling soils. A few 0 to 2 percent slopes and short 6 to 12 percent slopes are included. Also included are small areas of a similar soil that is more sandy throughout. Included soils make up 5 to 10 percent of this mapping unit, but separate areas are generally less than 2 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. It is neutral to very strongly acid in the upper part of the subsoil, very strongly to strongly acid in the fragipan, medium to very strongly acid in the lower part of the subsoil, and neutral to very strongly acid in the underlying material. Permeability is slow in the fragipan, and available water capacity is moderate. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is moderately deep, but the compact and brittle fragipan restricts root penetration for some plants.

Most of this soil is being used for row crops, hay, and pasture. This soil has high potential for growing row crops and small grains, and good results can be expected under good management. It has high potential for pasture and hay, but the seasonal high water table is a problem when alfalfa is grown. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has medium potential for woodland and only slight equipment limitations. It has medium potential for most urban uses. Seasonal wetness and low strength are limitations, but they can usually be overcome by good design and careful installation procedures. A few low areas become flooded occasionally. The compact and brittle fragipan percs slowly and limits the use of this soil for septic tank absorption fields. Capability subclass IIe; woodland ordination symbol 3o.

Pt—Pits. Pits are open excavations from which soil and underlying material have been removed. Most are limestone quarries. Two of the pits are along the Ohio River and have had sand and gravel removed. Included in mapping is a landfill 2 miles south of Floydsburg and 150 yards west of Floyds Fork.

We—Weinbach silt loam. This deep, somewhat poorly drained, nearly level soil is on slightly concave stream terraces along the Ohio River, Harrods Creek, Floyds Fork, and their tributaries. Individual areas are 3 to 25 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is dark grayish brown very friable silt loam about 8 inches thick. The upper part of the subsoil, to a depth of about 23 inches, is yellowish brown and light brownish gray, friable silty clay loam. The very firm, brittle, and compact silty clay loam fragipan, between depths of about 23 and 39 inches, is light brownish gray with many yellowish brown mottles. The lower part of the subsoil and the underlying material are brown and dark yellowish brown silty clay loam.

Included with this soil in mapping are small areas of Elk, Lindside, Newark, and Otwell soils. A few areas of a poorly drained stream terrace soil are also included. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 3 acres in size.

This soil is medium in natural fertility and moderate in organic matter content. Except where it has been limed,

the surface layer and subsoil are medium to very strongly acid, and the underlying material is strongly or very strongly acid. Permeability is slow in the fragipan, and available water capacity is moderate. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is moderately deep, and the compact and brittle fragipan restricts root penetration for most plants.

Most of this soil is being used for row crops, hay, and pasture. A small acreage is in woodland.

This soil has medium potential for growing row crops, and moderately good results can be expected under good management. It has medium potential for hay and pasture, but selection of water tolerant plants is essential. Good tilth is easily maintained by returning crop residue to the soil.

This soil has high potential for woodland and moderate equipment limitations. It has low potential for most urban uses. Seasonal wetness, slow permeability, and low strength are limitations difficult to overcome. A few low areas become flooded occasionally. The compact and brittle fragipan percs slowly and limits the use of this soil for septic tank absorption fields. Capability subclass IIIw; woodland ordination symbol 2w.

WhA—Wheeling silt loam, 0 to 2 percent slopes. This deep, well drained, nearly level soil is on stream terraces along the Ohio River. Individual areas are 5 to 35 acres.

Typically, the surface layer is brown very friable silt loam about 10 inches thick. The upper part of the subsoil, to a depth of about 28 inches, is dark yellowish brown and brown, friable silty clay loam. The lower part, to a depth of about 46 inches, is brown, friable loam with gravel in the lower part. The underlying material is dark yellowish brown, friable gravelly sandy loam.

Included with this soil in mapping are small areas of Elk, Huntington, Otwell, and Weinbach soils. Also included are small areas of a soil that is more sandy throughout. Included soils make up 5 to 10 percent of this mapping unit, but separate areas generally are less than 2 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where it has been limed, it is medium to strongly acid in the surface layer and subsoil and neutral to strongly acid in the underlying material. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used mostly for row crops, hay, and pasture. A small acreage is residential.

This soil has high potential for growing row crops and small grains and very high yields can be obtained using good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a slight hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and erosion.

This soil has high potential for woodland and only slight equipment limitations. It has high potential for urban uses and has no significant limitations except for a few low areas that become flooded occasionally. Capability class I; woodland ordination symbol 2o.

WhB—Wheeling silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uniform stream terraces along the Ohio River. Slopes are 75 to 200 feet in length. Individual areas are 3 to 45 acres.

Typically, the surface layer is brown, very friable silt loam about 10 inches thick. The upper part of the subsoil, to a depth of about 28 inches, is dark yellowish brown and brown, friable silty clay loam. The lower part, to a depth of about 46 inches, is brown, friable loam with gravel in the lower part. The underlying material is dark yellowish brown, friable gravelly sandy loam.

Included with this soil in mapping are small areas of Elk, Newark, Otwell, and Weinbach soils. Also included are small areas of a soil that is more sandy throughout. Included soils make up 10 to 15 percent of this mapping unit, but separate areas generally are less than 5 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where it has been limed, it is medium to strongly acid in the surface layer and subsoil and neutral to strongly acid in the underlying material. Permeability is moderate and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used mostly for row crops, hay, and pasture. A small acreage is in subdivisions. It has high potential for growing row crops and small grains and very good results can be expected under good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and only slight equipment limitations. It has high potential for urban uses and has no significant limitations except for a few low areas that become flooded occasionally. Capability subclass IIe; woodland ordination symbol 2o.

WhC—Wheeling silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on uniform stream terraces along the Ohio River. Slopes are 75 to 200 feet in length. Individual areas are 4 to 30 acres.

Typically, the surface layer is brown very friable silt loam about 10 inches thick. The upper part of the subsoil, to a depth of about 28 inches, is dark yellowish brown and brown, friable silty clay loam. The lower part, to a depth of about 46 inches, is brown, friable loam with gravel in the lower part. The underlying material is dark yellowish brown, friable gravelly sandy loam.

Included with this soil in mapping are small areas of Elk and Newark soils. Also included are small areas of a

soil that is more sandy throughout. Included soils make up 10 to 15 percent of this mapping unit, but separate areas generally are less than 5 acres in size.

This soil is high in natural fertility and moderate in organic matter content. Except where it has been limed, it is medium to strongly acid in the surface layer and subsoil and neutral to strongly acid in the underlying material. Permeability is moderate, and available water capacity is high. This soil has good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

This soil is being used mostly for row crops, hay, and pasture. A small acreage is residential.

This soil has high potential for growing row crops and small grains and high yields can be obtained using good management. It has high potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland but has slight equipment limitations.

This soil has medium potential for urban uses. Slope is a limitation, but this can be overcome by good design and careful installation procedures. A few low areas become flooded occasionally. Capability subclass IIIe; woodland ordination group 2o.

WlD—Wheeling soils, 12 to 30 percent slopes. This mapping unit consists of deep, well drained, strongly sloping to moderately steep, stream terrace soils along the Ohio River. It consists of areas of Wheeling soils with variable surface textures and other closely related soils containing more sand or gravel throughout. Soils in this unit are in complex patterns, but composition is not uniform in each area. Slopes are 100 to 500 feet in length. Individual areas are 4 to 65 acres.

Surface layers are silt loam, loam, fine sandy loam, or loamy fine sand. Typically, the surface layer is brown very friable silt loam about 10 inches thick. The upper part of the subsoil, to a depth of about 28 inches, is dark yellowish brown and brown friable silty clay loam. The lower part, to a depth of about 46 inches, is brown, friable loam with gravel in the lower part. The underlying material is dark yellowish brown, friable gravelly sandy loam.

Included with this complex in mapping are small areas of Elk and Otwell soils. Also included are a few areas where the soil is severely eroded. Included soils make up 5 to 10 percent of this complex, but separate areas generally are less than 5 acres in size.

This complex is high in natural fertility and moderate in organic matter content. Except where it has been limed, it is medium to strongly acid in the surface layer and subsoil and neutral to strongly acid in the underlying material. Permeability is moderate and available water capacity is high. The soils have good tilth and can be worked throughout a wide range of moisture conditions. The root zone is deep and easily penetrated by plant roots.

These soils are being used mostly for pasture and hay. A few areas are in row crops and woodland. Others are idle and are being revegetated naturally.

This soil has low potential for growing row crops. It has medium potential for hay and pasture. Good tilth is easily maintained by returning crop residue to the soil. Erosion is a very severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion.

This soil has high potential for woodland and moderate equipment limitations. It has low potential for urban uses. Moderately steep slopes are limitations that are very difficult to overcome. A few low areas become flooded occasionally. Capability subclass IVe; woodland ordination symbol 2r.

WoB—Woolper silty clay loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on concave toe slopes throughout the county. Slopes are 75 to 200 feet in length, and individual areas are 3 to 15 acres.

Typically, the surface layer is very dark grayish brown slightly firm silty clay loam about 7 inches thick. The upper part of the subsoil, to a depth of about 18 inches, is very dark grayish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 43 inches, is yellowish brown silty clay with common gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is mottled, yellowish brown and light brownish gray, very firm clay with a few limestone fragments 1/8 to 1/2 inch in diameter.

Included with this soil in mapping are small areas of Boonesboro, Elk, Faywood, and Nolin soils. A wetter soil with similar characteristics is also included and a similar soil with a lighter colored surface layer. Included soils make up 10 to 20 percent of this mapping unit, but separate areas are generally less than 4 acres in size.

This soil is high in natural fertility and high in organic matter content. It is mildly alkaline to slightly acid throughout. Permeability is moderately slow, and available water capacity is high. This soil has somewhat unfavorable tilth and can be worked only within a narrow range of moisture conditions. The root zone is deep, but the clayey subsoil restricts root penetration for some plants.

Most of this soil is being used for hay and pasture. A few areas are used for row crops, and others are idle and are being revegetated naturally.

This soil has high potential for growing row crops, and good results can be expected under good management. It has high potential for hay and pasture. Tilth is improved by returning crop residue to the soil. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion. Generally, diversion

channels constructed around the base of the footslopes to divert runoff from the adjacent steep hillsides are necessary when row crops are grown. Small seep spots are a problem in some areas but this usually can be corrected by installing intercept drain tile where suitable outlets are available.

This soil has high potential for woodland but has moderate equipment limitations. It has medium potential for most urban uses. Low strength, moderate shrink-swell potential, and the clayey subsoil are limitations, but they can usually be overcome by good design and careful installation procedures. The clayey subsoil percs slowly and this limits the use of this soil for septic tank absorption fields. Capability subclass IIe; woodland ordination symbol 2c.

WoC—Woolper silty clay loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on concave toe slopes throughout the county. Slopes are 75 to 300 feet in length, and individual areas are 3 to 20 acres.

Typically, the surface layer is very dark grayish brown slightly firm silty clay loam, about 7 inches thick. The upper part of the subsoil, to a depth of about 18 inches, is very dark grayish brown silty clay that is firm when moist and sticky and plastic when wet. The lower part, to a depth of about 43 inches, is yellowish brown silty clay with common gray mottles. It is very firm when moist and sticky and plastic when wet. The underlying material is mottled, yellowish brown and light brownish gray, very firm clay with a few limestone fragments 1/8 to 1/2 inch in diameter.

Included with this soil in mapping are small areas of Boonesboro, Elk, Faywood, and Nolin soils. A wetter soil with similar characteristics is included. Also included is a similar soil with a lighter colored surface layer. Included soils make up 10 to 20 percent of this mapping unit, but separate areas are generally less than 4 acres in size.

This soil is high in natural fertility and high in organic matter content. It is mildly alkaline to slightly acid throughout. Permeability is moderately slow, and available water capacity is high. It has somewhat unfavorable tilth and can be worked only within a narrow range of moisture conditions. The root zone is deep, but the clayey subsoil restricts root penetration for some plants.

Most of this soil is being used for hay and pasture. A few areas are used for row crops, and others are idle and are being revegetated naturally.

This soil has medium potential for growing row crops, and good results can be expected under good management. It has high potential for hay and pasture. Tilth is improved by returning crop residue to the soil. Erosion is a severe hazard if cultivated crops are grown. Minimum tillage and the use of cover crops, including grasses and legumes in the cropping system, are practices that help reduce runoff and control erosion. Generally, diversion channels constructed around the base of the foot slopes to divert runoff from the adjacent steep hillsides are necessary when row crops are grown. Small seep spots are a problem in some areas, but this usually can be corrected by installing intercept drain tile where suitable outlets are available.

This soil has high potential for woodland and moderate equipment limitations.

This soil has medium potential for most urban uses. Slope, low strength, moderate shrink-swell potential, and the clayey subsoil are limitations, but they can usually be overcome by good design and careful installation procedures. The clayey subsoil percs slowly, and this limits the use of this soil for septic tank absorption fields. Capability subclass IIIe; woodland ordination symbol 2c.

Use and Management of the Soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, and as sites for buildings, highways and other transportation systems, sanitary facilities, parks and other recreation facilities, and wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil (*13*).

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is

closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and Pasture

ROSCOE ISAACS, assistant State resource conservationist, Soil Conservation Service, assisted in preparing this section.

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil (*17*).

This section provides information about the overall agricultural potential of the survey area and about the needed management practices. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil Maps for Detailed Planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

Approximately 83,000 acres in the county were used for crops and pasture in 1967, according to the Kentucky Soil and Water Conservation Needs Inventory (*19*). Of this total, 53,000 acres were used for permanent pasture; 9,000 acres for row crops, mostly corn and burley tobacco; 2,100 acres for close-grown crops, mainly wheat and barley; 15,000 acres for hayland and rotation hay and pasture; and approximately 3,900 acres of open land, formerly cropped, were used for rotation hay.

The potential of the soils in Oldham County for increased production of food is high. About 2,600 acres of high potential cropland is currently used as woodland and about 17,000 acres as pasture. This represents an acreage reserve that could be used for growing additional food crops. Food production could also be further increased by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

Acreage in crops and pasture has gradually been decreasing as more land is used for urban development (fig. 12). According to the Kentucky Soil and Water Conservation Needs Inventory (*19*), in 1967, there were about 5,600 acres of urban and built up land in the county; this figure has been growing at the rate of about 1,000 acres per year. The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section "Soil Map for General Planning."

Soil erosion is the major problem on about 85 percent of the cropland and pasture in Oldham County. If the slope is more than 2 percent, erosion is a hazard. Crider, Hagerstown, Lowell, and Woolper, for example, have slopes of 2 to 12 percent. The Nicholson and Otwell soils have dominant slopes of 2 to 6 percent and an additional problem of wetness.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils with a clayey subsoil, such as the Beasley and Lowell soils, and on soils with a layer in or below the subsoil that limits the depth of the root zone. Such layers include fragipans as in Nicholson and Otwell soils, or bedrock as in Caneyville, Cynthiana, and Faywood soils. Soil erosion on farmland results in sediment entering streams. Control of erosion minimizes the pollution of streams by sediment and improves quality of water for municipal use, for recreation, and for fish and wildlife.

In many sloping fields, preparing a good seedbed and tilling are difficult on clayey soils because the original friable surface soil has been eroded away. Such areas are common in Beasley and Lowell soils that have 6 to 12 percent slopes.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration on the sloping cropland and pasture in Oldham County. A cropping system that keeps vegetative cover on the soil for extended periods generally holds soil erosion losses to amounts that will not reduce the productive capacity of the soils. On livestock farms that require pasture and hay, grasses and legumes in the cropping system reduce erosion on sloping soils and provide nitrogen and improve tilth for the following crop.

On sloping soils, cropping systems that provide substantial vegetative cover are required to control erosion unless minimum tillage is practiced. Minimizing tillage and leaving crop residues on the surface help to increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most soils in the county. No tillage for corn is a common management practice on an increasing acreage in the county. It is effective in reducing erosion on sloping land and can be adapted to most soils in the county. "No tillage" is more difficult to practice successfully on the soils with a clayey surface layer, such as the severely eroded Beasley and Lowell soils, than on soils with a loamy surface layer.

Information on the design of erosion control practices for each mapping unit is contained in the Technical Guide, available in local offices of the Soil Conservation Service.

Soil drainage is the major management need on about 5 percent of the acreage used for crops and pasture in the county. Some soils are naturally so wet that the production of crops common to the area is generally not possible. Unless artificially drained, crop yields are reduced during most years on the somewhat poorly drained soils. In this category are the Lawrence, Newark, and Weinbach soils.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage is needed for most

areas of the somewhat poorly drained Newark soils used for intensive row cropping. Drains have to be more closely spaced in soils with slow permeability than in soils with moderate permeability. Open ditch drainage is commonly more effective on the Lawrence and Weinbach soils, which have fragipans.

Soil fertility is naturally medium in most soils of the uplands in the county. The soils on flood plains, such as Huntington, Lindside, Newark, and Nolin soils, range from medium acid to mildly alkaline and are naturally higher in plant nutrients than most upland soils.

Many upland soils are naturally strongly to medium acid and require applications of ground limestone to raise the pH level sufficiently to obtain high yields of most of the commonly grown hay and pasture crops. Available phosphorous and potash levels are naturally low in most of these soils. On all soils, amounts of lime and fertilizer to be applied should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. The Kentucky Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Most of the soils used for crops in the county have a silt loam surface layer that is light in color and moderate in organic matter content.

Field crops most commonly grown in the county include corn, burley tobacco, and soybeans. Numerous other crops are adapted to the soil and climate of the county but are not commonly grown.

Wheat and barley are the common close-growing crops. Rye and oats could be grown, and grass seed could be produced from orchardgrass, fescue, and bluegrass.

Special crops grown for commercial use are of limited extent in the county. Deep soils, such as Crider and Wheeling that have good natural drainage are especially well suited to vegetables. Many deep, well drained soils have properties that make them suitable for orchards and nursery plants.

Latest information and suggestions for growing special crops can be obtained from local offices of the Kentucky Cooperative Extension Service and the Soil Conservation Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes climatically suited to the area and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

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

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

Capability Classes and Subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil can be grouped at three levels: capability class, subclass, and unit. Capability class and subclass are defined in the following paragraphs. A survey area may not have soils of all classes.

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

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

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

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

Class VIII soils and landforms have limitations that nearly preclude their use for commercial crop production.

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

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

The acreage of soils in each capability class and subclass is indicated in table 6. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture, for example, soils in capability classes I and II, may be in low-intensity use. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil mapping unit in the section "Soil Maps for Detailed Planning."

Woodland Management and Productivity

CHARLES A. FOSTER, staff forester, Soil Conservation Service, assisted in preparing this section.

Kentucky is in the Deciduous Forest Formation of eastern North America and contains parts of two forest regions, the Mixed Mesophytic in eastern Kentucky and the Western Mesophytic over the rest of the State.

Oldham County is a part of the Western Mesophytic forest region and can be divided into several forest types. Approximately 95 percent of the forest acreage in the county is classified as redcedar-hardwoods, oak-hickory, central mixed hardwoods, or elm-ash-cottonwood. These types differ from one another in slope, exposure, and such soil characteristics as fertility, depth, texture, drainage, and available moisture.

Oldham County has 22,000 acres of commercial forest covering 18.7 percent of the land area. Nearly half of this acreage is in the seedling-sapling size class. Volume growth is 22 cubic feet of growing stock and 84 board feet of sawtimber per year. Most wooded areas have the potential to produce 50 cubic feet (*6, 7, 10, 11*) of growing stock per acre per year. However, less than one-fourth of the forest area is well stocked with merchantable or potentially merchantable trees, and significant increases in productivity cannot be expected until tree stocking improves. Generally, tree growth exceeds harvesting for most of the important timber species.

There are no commercial sawmills in Oldham County. One mill, however, does custom work. The adjacent counties of Henry and Jefferson have commercial mills that purchase timber from Oldham County. These mills produce such products as lumber, posts, fuelwood, railroad crossties, veneer cants, and farm materials.

Table 7 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Mapping unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

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

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well-managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road con-

struction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

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

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings when plant competition is not a limiting factor. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

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

The *potential productivity* of merchantable or *important trees* on a soil is expressed as a *site index* (*5*, *9*). This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Important trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

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

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this section are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil Properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to: (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary

facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

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

Building Site Development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible. In some low areas, the Elk, Otwell, Weinbach, and Wheeling soils are subject to occasional flooding. In these areas these soils have severe limitations for all building site development.

Shallow excavations are used for pipelines, sewerlines, telephone and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by the soil wetness of a high seasonal water table, the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is defined, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious limitation.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary Facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. In some low areas, the Elk, Otwell, Weinbach, and Wheeling soils are subject to occasional flooding. In these low spots these soils have severe limitations for all sanitary facilities except daily cover for landfill.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are

those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope may cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table could be installed or the size of the absorption field could be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soils affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with thin layers of soil. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness may be a limitation because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

In the trench type of landfill, ease of excavation also affects the suitability of a soil for this purpose, so the soil must be deep to bedrock and free of large stones and boulders. Where the seasonal water table is high, water seeps into trenches and causes problems in filling.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry weather. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction Materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few

cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slopes, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water Management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 the degree of soil limitation and soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability, texture, depth to bedrock, hardpan, or other layers that affect the rate of water movement, depth to the water table, slope, stability of ditchbanks, susceptibility to flooding, salinity and alkalinity, and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

Because of the trend by many families to live in an urban area, the need for more recreational facilities has increased. As a result, productive farmland is being used for this purpose. Most areas of the county have medium to high potential for recreational uses.

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use

by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

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

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

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

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

In some low areas the Elk, Otwell, Weinbach, and Wheeling soils are subject to occasional flooding. Because of this, the low spots have severe limitations for camp areas and moderate limitations for picnic areas and playgrounds.

Wildlife Habitat

WILLIAM H. CASEY, biologist, Soil Conservation Service, assisted in preparing this section.

The wildlife population of Oldham County is composed of an estimated 37 species of mammals, 43 species of reptiles and amphibians, and 107 kinds of breeding birds. It is probable that many of the more than 200 other birds that visit Kentucky each year can be found in Oldham County during certain seasons.

The kinds of wildlife most important to man are those that furnish recreation in the form of sport hunting or economic gain in the form of commercial trapping. In Oldham County, these are the cottontail rabbit, grey squirrel, fox squirrel, white-tailed deer, raccoon, red fox, mink, muskrat, bobwhite quail, mourning dove, woodcock, and various kinds of waterfowl. Although there is much overlap in the types of habitat required by these animals, the white-tailed deer, grey squirrel, and fox squirrel are usually classified as woodland wildlife. The rabbit, quail, and dove are generally considered open-land species; and the several kinds of ducks, plus those mammals such as mink and muskrat that spend much of their time in or about water, are thought of as wetland wildlife.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, inadequate, or inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants (*3*).

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult

and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. Examples are corn, wheat, oats, and barley. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Examples are fescue, lovegrass, bromegrass, clover, and alfalfa. Major soil properties that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestem, goldenrod, beggarweed, wheatgrass, and grama. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Examples of native plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated good are Russian-olive, autumn-olive, and crabapple. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Examples are pine, spruce, fir, cedar, and juniper. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, and cordgrass and rushes, sedges, and reeds. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control devices in marshes or streams. Examples are marshes, waterfowl feeding areas, and ponds. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed.

The kinds of wildlife habitat are briefly described in the following paragraphs.

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

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Wetland habitat consists of open, marshy or swampy, shallow-water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Soil Properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for

many soil series not tested are available from nearby survey areas (*18*).

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classification, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering Properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil Series and Morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

The estimated classification (Unified and AASHTO), without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified (*2*) and AASHTO (*1*) soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted in table 14.

Physical and Chemical Properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil (*14*) is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Availa-

ble water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Soil and Water Features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding; and information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

In some low areas the Elk, Otwell, Weinbach and Wheeling soils are subject to occasional flooding.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a

seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the soil mapping. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Classification of the Soils

In this section, the soil series recognized in the survey area are described, the current system of classifying soils is defined, and the soils in the area are classified according to the current system.

Soil Series and Morphology

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

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*15*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or mapping units, of each soil series are described in the section "Soil Maps for Detailed Planning."

Beasley Series

The Beasley series consists of deep, well drained soils that have moderately slow permeability. They formed in residuum from interbedded soft limestone and calcareous siltstone, sandstone, and shale. Beasley soils are mostly in the eastern half of the county on ridgetops and concave and convex side slopes. Slope ranges from about 2 to 60 percent, but is dominantly 6 to 12 percent.

Beasley soils are associated with the Brassfield, Caneyville, Faywood, Hagerstown, Lowell, and Nicholson soils. Brassfield, Caneyville, and Faywood soils are moderately deep to bedrock. Brassfield soils are less acid and contain less clay than Beasley soils. Caneyville soils are redder and, along with Faywood soils, are underlain by hard limestone. The Hagerstown and Lowell soils have a thicker solum and are also underlain by hard bedrock. Nicholson soils have coarser textures in the upper part of the solum and have a fragipan.

Typical pedon of Beasley silt loam in an area of Beasley silt loam, 6 to 12 percent slopes; 0.5 mile southeast of the junction of Kentucky Highways 22 and 393 at Centerfield, 550 yards south of Kentucky Highway 22, and 100 feet south of access road into Croftboro Farms Development:

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

B2t—5 to 20 inches; yellowish brown (10YR 5/6) silty clay; moderate medium angular blocky structure; firm; sticky and plastic; common fine roots; nearly continuous clay films; few black concretions; very strongly acid; clear wavy boundary.

B3—20 to 34 inches; yellowish brown (10YR 5/4) clay; common medium distinct mottles of light brownish gray (10YR 6/2) and light olive brown (2.5Y 5/4); weak coarse subangular blocky structure; very firm, sticky and plastic; few fine roots; nearly continuous clay films; common black concretions; neutral; clear smooth boundary.

C—34 to 50 inches; mottled light olive brown (2.5Y 5/4), light gray (2.5Y 7/2), and brown (7.5YR 5/4) silty clay; massive; firm, sticky and plastic; common black stains; 20 percent soft limestone fragments 1/8 to 3/4 inch in diameter; moderately alkaline; calcareous.

Solum thickness ranges from 20 to 40 inches, and depth to hard bedrock is more than 5 feet. Coarse fragments of limestone, shale, or siltstone range from 0 to 10 percent in the solum and from 0 to 35 percent in the upper part of the C horizon. Reaction ranges from very strongly to medium acid in the B2t horizon and from neutral to moderately alkaline in the B3 and C horizons.

The Ap horizon has hues of 10YR or 2.5Y, values of 4 or 5, and chromas of 2 through 4. Texture is silt loam or silty clay loam. Some pedons have A1 horizons less than 6 inches thick with value of 3 and chroma of 2.

The B horizon has hues of 10YR or 7.5YR, except the B3 horizon ranges to 2.5Y in some pedons. It has values of 4 or 5 and chromas of 3 through 8. Some pedons have few to many mottles in shades of red, brown, or yellow. Below the upper 10 inches of the argillic horizon some pedons have few to many mottles in shades of gray. Texture of the B horizon is silty clay or clay. Some pedons have a 3 to 8 inch thick silty clay loam B1 horizon.

The C horizon has matrix and mottled colors in shades of gray, olive, and brown. It is silty clay, clay loam, or loam. Some pedons have a Cr horizon that has beds of calcareous clay shales ranging from 1 inch to more than 12 inches in thickness.

Boonesboro Series

The Boonesboro series consists of moderately deep, well drained soils that have rapid permeability in the subsoil. They formed in mixed alluvium and are subject to brief flooding in winter and spring. Boonesboro soils are

on flood plains along the upper reaches of the smaller streams. Slope ranges from 0 to 2 percent.

Boonesboro soils are associated with the Huntington, Lindside, Newark, Nolin, and Woolper soils. All of the associated soils are deep to bedrock. Huntington soils contain less coarse fragments in the solum than these soils. Lindside and Newark soils are wetter and lack a mollic epipedon. Nolin soils also lack a mollic epipedon and contain less coarse fragments. Woolper soils are finer textured and are on toe slopes.

Typical pedon of Boonesboro silt loam in an area of Boonesboro silt loam, 1.25 miles northwest of the junction of U. S. Highway 42 and Kentucky Highway 524, 1.1 miles southeast of Covington Church, 100 yards east of Kentucky Highway 524:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam; weak fine granular structure; very friable; many fine roots; approximately 2 percent limestone gravel 1/4 to 3/4 inch in diameter; neutral; clear smooth boundary.

A1—8 to 14 inches; dark brown (10YR 3/3) silt loam; moderate medium granular structure; friable; many fine roots; approximately 10 percent limestone gravel 1/4 to 1 1/2 inches in diameter; neutral; clear wavy boundary.

B—14 to 28 inches; dark yellowish brown (10YR 4/4) gravelly silt loam; moderate medium granular structure; friable; common fine roots; 30 percent limestone fragments 1/4 to 1 1/2 inches in diameter; mildly alkaline.

R—28 inches; limestone.

Solum thickness and depth to bedrock range from 20 to 40 inches. Reaction ranges from slightly acid to mildly alkaline.

The A horizon has hues of 10YR or 7.5YR, a value of 3, and chromas of 2 or 3. Thickness ranges from 12 to 24 inches. It is dominantly silt loam but in places is silty clay loam. Coarse fragments, ranging from 1/8 to 3 inches in diameter, make up 0 to 20 percent of the volume.

The B horizon has hues of 10YR or 7.5YR, a value of 4, and chromas of 3 or 4. The fine earth fraction is silt loam, silty clay loam, loam, or clay loam. Coarse fragments, ranging from 1/8 to 6 inches in diameter, range from 15 to 60 percent by volume by individual layers, but the weighted average is less than 35 percent.

Some pedons have a 2 to 4 inch thick C horizon with similar color and texture ranges to those of the B horizon.

Brassfield Series

The Brassfield series consists of moderately deep, well drained soils that have moderate permeability. They formed in residuum from interbedded calcareous siltstone, sandstone, shale, and limestone. Brassfield soils are on moderately steep landscapes throughout the county. Slope ranges from 20 to 30 percent.

The Brassfield soils are associated with the Beasley, Caneyville, Faywood, Hagerstown, and Nicholson soils. All of the associated soils except Beasley are underlain by hard bedrock. All except the Nicholson soils have finer textures. Beasley soils also have a paralithic contact below 40 inches. Hagerstown soils are deep to bedrock. Nicholson soils are moderately well drained and have a fragipan.

Typical pedon of Brassfield silt loam in an area of Brassfield silt loam, 20 to 30 percent slopes, 2 miles southeast of Westport, 0.3 mile northeast of the junction of Kentucky Highway 524 and Smith Lane, and 120 feet south of Smith Lane:

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; common roots; 6 to 8 percent soft weathered calcareous siltstone and sandstone fragments 1/8 to 1/4 inch in diameter; mildly alkaline; calcareous; abrupt smooth boundary.

B—5 to 14 inches; light olive brown (2.5Y 5/4) silt loam; common medium distinct mottles of yellowish brown (10YR 5/6); friable; few roots; 8 to 10 percent soft weathered calcareous siltstone and sandstone fragments, 1/8 to 1/2 inch in diameter; mildly alkaline; calcareous; gradual wavy boundary.

C—14 to 24 inches; mottled light olive brown (2.5Y 5/4), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/6) soft weathered calcareous siltstone and shale that breaks down to loam; platy structure; firm; few roots; 10 to 15 percent hard calcareous siltstone and sandstone fragments 1/2 to 3 inches in diameter; mildly alkaline; calcareous; clear smooth boundary.

Cr—24 inches; calcareous interbedded shale, siltstone, and limestone.

Solum thickness ranges from 10 to 30 inches, and depth to soft bedrock is 20 to 40 inches. The profile is mildly alkaline and calcareous throughout. The B and C horizons have a calcium carbonate equivalent of more than 40 percent. Coarse fragments more than 1/8 inch in diameter range from 0 to 30 percent by volume throughout the profile.

The Ap horizon has hues of 10YR or 2.5Y, values of 4 or 5, and chromas of 1 or 2. Texture is dominantly silt loam but ranges to loam. Some pedons have A1 horizons 1 or 2 inches thick in the same hue as the Ap horizon with values of 3 or 4 and a chroma of 2.

The B horizon has hues of 10YR through 5Y, values of 5 or 6, and chromas of 1 through 6. Mottled colors are common but those of low chroma are inherited from unweathered shale. Texture is silt loam, loam, or fine sandy loam.

The C horizon has matrix and mottled colors that vary but include light olive brown, light brownish gray, strong brown, greenish gray, olive gray, and yellowish brown.

Caneyville Series

The Caneyville series consists of moderately deep, well drained soils that have moderately slow permeability. They formed in clayey residuum from hard limestone. Caneyville soils are mostly in the western half of the county on convex ridgetops and complex side slopes. Slopes range from 6 to 60 percent but are dominantly 6 to 12 percent.

Caneyville soils are associated with the Beasley, Crider, Hagerstown, and Nicholson soils. Beasley soils are deep and are underlain by soft calcareous siltstone, sandstone, shale, and limestone. Crider soils contain less clay and more silt in the B horizon and are deep to bedrock. Hagerstown soils formed in similar materials but are deep to bedrock. Nicholson soils are deep to bedrock, contain less clay, are moderately well drained, and have a fragipan.

Typical pedon of Caneyville silt loam in an area of Caneyville silt loam, 6 to 12 percent slopes, 660 yards northwest of the confluence of Darby Fork and Darby Creek, 100 yards west of Halls Hill Road:

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many medium roots; slightly acid; clear smooth boundary.

B21t—5 to 12 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; many medium roots; common thin clay films; few dark brown and black concretions; medium acid; gradual wavy boundary.

B22t—12 to 22 inches; reddish brown (5YR 4/4) silty clay; moderate medium subangular and angular blocky structure; firm, sticky and

plastic; common fine roots; thin nearly continuous clay films; few dark brown and black concretions; medium acid; clear wavy boundary.

B23t—22 to 31 inches; reddish brown (5YR 4/4) clay; common medium faint mottles of strong brown (7.5YR 5/6) and grayish brown (10YR 5/2); strong coarse subangular and angular blocky structure; very firm, sticky and plastic; few fine roots; thin nearly continuous clay films; common dark brown and black concretions; common angular fragments of chert 1/4 to 3/4 inch in diameter, in the lower 3 inches; medium acid; clear smooth boundary.

R—31 inches; hard limestone bedrock.

Solum thickness and depth to limestone bedrock range from 20 to 40 inches. Fragments of chert 1/8 to 3 inches in diameter range from 0 to 15 percent in the solum. Reaction ranges from medium acid to neutral in the solum.

The Ap horizon has hues of 10YR or 7.5YR, a value of 4, and chromas of 2 through 4. Texture is silt loam or silty clay loam. Some pedons have A1 horizons 2 to 5 inches thick that have values of 3 through 5 and chromas of 2 or 3.

The B21t horizon has a hue of 5YR, values of 4 or 5, and chromas of 4 through 6. Texture is silty clay loam, silty clay, or clay.

The B22t and B23t horizons have hues of 5YR through 10YR, values of 4 or 5, and chromas of 4 through 6. Some pedons have mottles in shades of brown, red, or gray, but the gray mottles are below the upper 10 inches of the argillic horizon. Texture is silty clay or clay.

Some pedons have B3 or C horizons with color and texture ranges similar to those of the B22t and B23t horizons.

Soils with B21t horizons of 7.5YR or 10YR hues were considered Caneyville in naming the mapping units. Their behavior is enough like that of Caneyville soils that nothing would be gained by adding another series name.

Crider Series

The Crider series consists of deep, well drained soils that have moderate permeability. They formed in a loess mantle and the underlying limestone residuum. Crider soils are mostly in the western half of the county on convex ridgetops and side slopes. Some areas are karst. Slope ranges from 0 to 12 percent but is dominantly 2 to 6 percent.

The Crider soils are associated with the Beasley, Caneyville, Hagerstown, Lawrence, and Nicholson soils. All but the Lawrence and Nicholson soils are more clayey in the upper part of the B horizon. Beasley soils are formed in residuum from interbedded, soft, calcareous siltstone, sandstone, shale, and limestone. Caneyville soils are underlain by hard limestone at depths of 20 to 40 inches. Lawrence and Nicholson soils are wetter than Crider soils and have a fragipan.

Typical pedon of Crider silt loam in an area of Crider silt loam, 2 to 6 percent slopes, approximately 200 feet west of the junction of Kentucky Highways 329 and 1694, and 150 feet south of Kentucky Highway 1694:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B1—7 to 13 inches; brown (7.5YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; few thin patchy clay films; many fine roots; slightly acid; gradual smooth boundary.

B21t—13 to 30 inches; brown (7.5YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; common fine roots; common thin patchy clay films; medium acid; gradual smooth boundary.

B22t—30 to 40 inches; reddish brown (5YR 4/4) silty clay loam with a few mottles of strong brown (7.5YR 5/6); moderate medium subangular blocky structure; friable; few fine roots; common thin patchy clay films; medium acid; clear wavy boundary.

IIB23t—40 to 59 inches; dark red (2.5YR 3/6) silty clay loam with a few mottles of strong brown (7.5YR 5/6); moderate medium and coarse subangular blocky structure; firm; thin nearly continuous clay films; common dark brown stains; strongly acid; gradual wavy boundary.

IIB24t—59 to 98 inches; dark red (2.5YR 3/6) silty clay; strong fine and medium subangular blocky structure; firm, sticky and plastic; common thin nearly continuous clay films; few small dark brown concretions; few small angular chert fragments 1/8 to 1/2 inch in diameter; strongly acid.

Solum thickness ranges from 60 to more than 100 inches. Depth to limestone bedrock ranges from 60 to more than 160 inches. Thickness of the loess mantle ranges from 20 to 45 inches. Angular chert fragments range from 0 to 15 percent in the lower solum below the loess mantle. Except where the soil has been limed, reaction ranges from slightly to strongly acid in the upper 40 inches and from medium to strongly acid below 40 inches.

The Ap horizon has hues of 10YR or 7.5YR, value of 4, and chroma of 2 through 4. Texture is silt loam except for some severely eroded areas which are silty clay loam.

The B1 horizon has hues of 7.5YR or 10YR and a value and chroma of 4. Texture is silt loam or silty clay loam.

The B21t horizon has a hue of 7.5YR, values of 4 or 5, and chromas of 4 or 6. Texture is silt loam or silty clay loam.

The B22t horizon has hues of 7.5YR or 5YR, a value of 4, and chromas of 4 through 8. Some pedons have strong brown or yellowish brown mottles. Texture is silt loam or silty clay loam.

The IIB2t horizon has hues of 5YR through 10R, values of 3 through 5, and chromas of 4 through 6. Some pedons have mottles in shades of brown, yellow, or gray. Texture is silty clay loam, silty clay, or clay.

Some pedons have IIB3 or IIC horizons that have color and texture ranges similar to those of the IIB2t horizon.

Cynthiana Series

The Cynthiana series consists of shallow, well drained soils that have moderately slow permeability. They formed in clayey limestone residuum. The Cynthiana soils are mostly in the northeastern portion of the county on complex hillsides. Slopes range from 30 to 60 percent.

Cynthiana soils are associated with the Beasley, Faywood, and Lowell soils. Beasley soils are deep and have a paralithic contact with clayey shale below 40 inches. Faywood and Lowell soils formed in similar materials but are deeper to hard limestone bedrock.

Typical pedon of Cynthiana silty clay loam in an area of Cynthiana-Faywood-Beasley complex, 30 to 60 percent slopes, 1.5 miles southeast of Ballardsville, 0.5 mile south of Kentucky Highway 22, and 185 yards south of the East Fork of Floyds Fork:

Ap—0 to 5 inches; brown (10YR 4/3) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; 5 percent coarse fragments 1/8 to 1/2 inch in diameter; neutral; clear smooth boundary.

Bt—5 to 17 inches; yellowish brown (10YR 5/4) silty clay; many fine and medium distinct mottles of light yellowish brown (10YR 6/4); moderate medium angular blocky structure; firm, plastic and sticky; nearly continuous clay films; 10 to 15 percent fragments of limestone 1/4 to 3/4 inch in diameter; mildly alkaline.

R—17 inches; limestone bedrock.

Solum thickness and depth to bedrock range from 10 to 20 inches. Thin, flat limestone and shale fragments 1 to 24 inches in diameter range from 0 to 30 percent in the Ap horizon and from 5 to 30 percent in the Bt horizon. Reaction ranges from slightly acid to mildly alkaline throughout the profile.

The Ap horizon has hues of 10YR or 2.5Y, a value of 4, and chromas of 2 through 4. Texture is silt loam, silty clay loam, or silty clay. Some pedons have an A1 horizon less than 4 inches thick with a value of 3 or less.

The Bt horizon has hues of 10YR through 5Y, values of 4 or 5, and chromas of 4 through 6. Some pedons have mottles in shades of brown or olive. Texture of the fine earth is silty clay or clay.

Some pedons have C horizons 3 to 6 inches thick with textures similar to those of the Bt horizon and with matrix and mottle colors in shades of brown, olive, or gray.

Elk Series

The Elk series consists of deep, well drained soils that have moderate permeability. They formed in mixed alluvium, and a few low areas are subject to occasional flooding. Elk soils are on stream terraces along the Ohio River, Harrods Creek, Floyds Fork, and their tributaries. Slope ranges from 2 to 6 percent.

Elk soils are associated with the Huntington, Lindside, Newark, Nolin, Otwell, Weinbach, and Wheeling soils. Huntington, Lindside, Newark, and Nolin soils are on flood plains and occupy lower landscape positions. Otwell, Weinbach, and Wheeling soils occupy similar landscape positions. Otwell and Weinbach soils are wetter than Elk soils and and have a fragipan. Wheeling soils are similar to Elk soils in drainage characteristics but contain more sand in the lower part of the solum.

Typical pedon of Elk silt loam in an area of Elk silt loam, 2 to 6 percent slopes, 1 mile southeast of the junction of U.S. Highway 42 and Kentucky Highway 53, 500 yards southwest of bridge across Kentucky Highway 53, 75 feet east of Harrods Creek:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

B1—7 to 12 inches; brown (7.5YR 4/4) silt loam; weak and moderate fine and medium subangular blocky structure; friable; common fine roots; thin patchy clay films; few small dark brown concretions; medium acid; gradual smooth boundary.

B21t—12 to 22 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin nearly continuous clay films; common dark brown concretions; medium acid; gradual wavy boundary.

B22t—22 to 36 inches; brown (7.5YR 4/4) silty clay loam; few medium distinct mottles of yellowish brown (10YR 5/6) and brown (10YR 5/3); moderate medium subangular blocky structure; friable; few fine roots; thin nearly continuous clay films; few dark brown concretions; very strongly acid; gradual wavy boundary.

B3—36 to 50 inches; dark yellowish brown (10YR 4/4) silt loam; many medium distinct mottles of yellowish brown (10YR 5/6); weak coarse subangular blocky structure; friable; thin patchy clay films; few small rounded dark brown concretions; very strongly acid; clear wavy boundary.

C—50 to 62 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct mottles of dark yellowish brown (10YR 4/4); massive; slightly firm; common dark brown rounded concretions; 10 percent gravel 1/4 to 3/4 inch in diameter; slightly acid.

Solum thickness ranges from 36 to 54 inches, and depth to bedrock ranges from 4 to more than 20 feet. Coarse fragments range from none to 5 percent in the upper 40 inches and from none to 35 percent below this depth. Reaction of the solum ranges from medium to very strongly acid, unless limed, and the C horizon ranges from slightly to strongly acid. Flakes of mica are in most pedons along the Ohio River.

The Ap horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 2 through 4. Texture is mostly silt loam but ranges from loam to silty clay loam.

The B horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 4 through 6. Some pedons have few to common gray mottles below the upper 10 inches of the argillic horizon. Texture is silt loam or silty clay loam.

The C horizon has a color range similar to that of the B horizon. Texture is mostly silt loam or silty clay loam, but some pedons have thin stratified layers of fine sandy loam, loam, clay loam, or silty clay.

Faywood Series

The Faywood series consists of moderately deep, well drained soils that have moderately slow permeability. They formed in clayey limestone residuum. Faywood soils are on smooth convex ridgetops and strongly sloping to moderately steep hillsides throughout the county. Slopes range from 6 to 30 percent but are dominantly 12 to 30 percent.

Faywood soils are associated with the Beasley, Cynthiana, Lowell, and Nicholson soils. Beasley soils are deep and are underlain by interbedded, soft, calcareous siltstone, sandstone, shale, and limestone. Cynthiana soils formed in similar materials but are shallow to limestone bedrock and have more flagstones on the surface. Lowell soils also formed in similar materials but are deep to limestone bedrock. Nicholson soils are deep to bedrock, less clayey, moderately well drained, and have a fragipan.

Typical pedon of Faywood silt loam in an area of Faywood silt loam, 12 to 30 percent slopes, 1.5 miles south of Ballardsville and 160 yards west of Kentucky Highway 1315:

Ap—0 to 4 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—4 to 12 inches; yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure; firm, sticky and plastic; common fine roots; thin nearly continuous clay films; few small black concretions; strongly acid; clear wavy boundary.

B22t—12 to 31 inches; yellowish brown (10YR 5/6) clay; weak coarse subangular blocky structure; very firm, plastic and sticky; thick continuous clay films; common small black concretions; slightly acid; clear smooth boundary.

R—31 inches; hard limestone.

Solum thickness and depth to limestone bedrock range from 20 to 40 inches. Reaction ranges from strongly acid to neutral in the solum.

The Ap horizon has a hue of 10YR, a value of 4, and chromas of 2 or 3. Texture is silt loam or silty clay loam.

Some pedons have B1 horizons, 2 to 5 inches thick, with a hue of 10YR, a value of 5, and a chroma of 4. Texture is silt loam or silty clay loam.

The B2t horizon has hues of 7.5YR through 2.5Y, values of 4 or 5, and chromas of 4 or 6. Some pedons have mottles with a chroma of 2 below the upper 10 inches of the argillic horizon. Texture is silty clay loam, silty clay, or clay.

Some pedons have silty clay or clay C horizons with color ranges similar to those of the lower B2t horizon. They contain up to 25 percent limestone and shale fragments 2 to 10 inches in diameter.

Hagerstown Series

The Hagerstown series consists of deep, well drained soils that have moderate permeability. They formed in

residuum from limestone. Hagerstown soils are mostly in the western half of the county on smooth convex ridgetops and side slopes. Slope ranges from 2 to 12 percent but is dominantly 6 to 12 percent.

Hagerstown soils are associated with the Beasley, Caneyville, Crider, and Nicholson soils. Beasley soils are underlain by soft, calcareous siltstone, sandstone, shale, and limestone. Caneyville soils are moderately deep to bedrock. Crider soils have less clay in the upper part of the solum than Hagerstown soils. Nicholson soils have less clay in the upper part of the solum, are moderately well drained, and have a fragipan.

Typical pedon of Hagerstown silt loam in an area of Hagerstown silt loam, 6 to 12 percent slopes, 2 miles north of Brownsboro, 3/4 mile north of Halls Hill Road, and 1/4 mile west of Darby Creek:

Ap—0 to 5 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many medium roots; slightly acid; abrupt smooth boundary.

B1—5 to 16 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; many medium roots; thin patchy clay films; common dark brown concretions; medium acid; gradual smooth boundary.

B21t—16 to 27 inches; red (2.5YR 4/6) silty clay; strong medium and coarse subangular blocky structure; firm, plastic and sticky; common fine roots; thin nearly continuous clay films; common dark brown concretionary material; few angular fragments of chert less than 1/4 inch in diameter; medium acid; gradual wavy boundary.

B22t—27 to 47 inches; dark red (2.5YR 3/6) silty clay with a few streaks of yellowish red (5YR 5/6); moderate and strong, medium and coarse subangular blocky structure; firm, plastic and sticky; few fine roots; nearly continuous clay films; common dark brown stains; few angular fragments of chert less than 1/4 inch in diameter; strongly acid; gradual diffuse boundary.

B3—47 to 60 inches; dark red (2.5YR 3/6) silty clay; moderate and strong fine and medium subangular blocky structure; firm, sticky and plastic; thin patchy clay films; common dark brown stains; few angular fragments of chert less than 1/4 inch in diameter; medium acid; gradual diffuse boundary.

C—60 to 76 inches; dark red (2.5YR 3/6) silty clay; massive parting to very weak blocky structure; few round dark brown concretions; few fragments of chert less than 1/4 inch in diameter; neutral.

Solum thickness ranges from 40 to 60 inches, and depth to limestone bedrock ranges from 4 to 7 feet. Coarse fragments, mostly angular chert, range from none to 15 percent in the solum. Reaction of the upper part of the solum ranges from medium to strongly acid, unless limed. In the lower part of the solum and in the C horizon it ranges from strongly acid to neutral.

The Ap horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 2 through 4. Texture is silt loam or silty clay loam.

The B1 horizon has hues of 7.5YR or 5YR, values of 4 or 5, and chromas of 4 through 8. Texture is silt loam or silty clay loam.

The B21t horizon has hues of 7.5YR through 2.5YR, values of 4 or 5, and chroma of 4 through 6. Texture ranges from silty clay loam to clay, averaging between 35 and 60 percent clay.

The B22t horizon and B3 horizons have hues of 7.5YR through 2.5YR, values of 3 through 6, and chromas of 4 through 6. Texture ranges are the same as the B21t horizon.

The C horizon has hues of 10YR through 2.5YR, values of 3 through 6, and chromas of 4 through 8. Some pedons are mottled in shades of gray. Texture ranges from silty clay loam to clay.

The color value of 3 in the lower part of the argillic horizon of the typical pedon is slightly outside the range of the official series description.

Huntington Series

The Huntington series consists of deep, well drained soils that have moderate permeability. They formed in mixed alluvium and are subject to brief flooding in winter and spring. Huntington soils are mostly on flood plains along the Ohio River. Slopes range from 0 to 2 percent.

Huntington soils are associated with the Elk, Lindside, Newark, Otwell, Weinbach, and Wheeling soils. All of the associated soils lack a mollic epipedon. The Elk soils formed in similar materials but are on stream terraces. The Lindside and Newark soils are in similar landscape positions but are wetter. The Otwell and Weinbach soils are on stream terraces, are wetter, and have a fragipan. The Wheeling soils are on stream terraces and are more sandy.

Typical pedon of Huntington silt loam in an area of Huntington silt loam, 1.4 miles northwest of the junction of U.S. Highway 42 and Kentucky Highway 393, 0.25 mile southwest of the confluence of Dunbar Hollow and the Ohio River, and across the chute from Eighteen Mile Island:

Ap—0 to 10 inches; dark brown (10YR 3/3) silt loam; moderate medium granular structure; very friable; many fine roots; few fine pores; slightly acid; clear smooth boundary.

B21—10 to 22 inches; brown (10YR 4/3) silt loam; moderate medium and coarse prismatic parting to moderate medium subangular blocky structure; friable; few fine roots; few fine pores; few wormcasts and holes between prisms; continuous dark brown (10YR 3/3) coatings; slightly acid; gradual smooth boundary.

B22—22 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and coarse prismatic parting to moderate medium subangular blocky structure; firm; few fine roots; few fine pores; continuous brown (10YR 4/3) coatings; medium acid; gradual smooth boundary.

B23—29 to 37 inches; brown (10YR 4/3) silty clay loam; moderate medium and coarse prismatic parting to moderate medium subangular blocky structure; firm; few fine roots; few fine pores; continuous dark grayish brown (10YR 4/2) coatings on prisms; few black coatings and soft black accumulations or stains; medium acid; gradual smooth boundary.

B24—37 to 60 inches; brown (7.5YR 4/4) silty clay loam; few medium faint dark grayish brown mottles (10YR 4/2); moderate medium and coarse prismatic structure parting to moderate coarse subangular blocky structure; very firm; few fine pores; continuous grayish brown (10YR 5/2) coatings on peds and in a few channels; few black coatings and soft black accumulations or stains; medium acid; gradual smooth boundary.

B25—60 to 72 inches; brown (10YR 4/3) silty clay loam; moderate medium and coarse prismatic structure; very firm; few fine pores; continuous light brownish gray (10YR 6/2) coatings on peds and in a few larger channels; medium acid.

Solum thickness is more than 40 inches, and depth to bedrock commonly is 10 to more than 20 feet. Coarse fragments are lacking in most pedons but range up to 5 percent. Flakes of mica are in most pedons along the Ohio River. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has hues of 10YR or 7.5YR, values of 2 or 3, and chromas of 1 through 3. Texture is dominantly silt loam but is silty clay loam or loam in some pedons.

Some pedons have a 3 to 6 inch thick A3 or B1 horizon that has similar color and texture ranges to those of the Ap horizon.

The B2 horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 3 or 4. Texture is silt loam or silty clay loam.

Some pedons have a C horizon that has similar color ranges to those of the B2 horizon. Textures are commonly stratified with layers of loam, fine sandy loam, or gravelly sandy loam.

Laboratory data are available from a pedon within the same delineation as the typical pedon. These data indicate the weighted average clay content in the control section is 32.5 percent. This is slightly outside the range allowed for the series (upper limit of 30 percent), but it is within the normal error of estimate.

Lawrence Series

The Lawrence series consists of deep, somewhat poorly drained soils that have a slowly permeable fragipan. They formed in a loess mantle over clayey residuum from limestone, siltstone, and shale. The Lawrence soils are on nearly level broad upland flats throughout the county. They have a water table at 1 to 2 feet below the surface in late winter and early spring. Slope ranges from 0 to 4 percent.

Lawrence soils are associated with the Beasley, Crider, Lowell, and Nicholson soils. The Beasley and Lowell soils are well drained, clayey, and lack a fragipan. The Crider soils are well drained and lack a fragipan. Nicholson soils are moderately well drained.

Typical pedon of Lawrence silt loam in an area of Lawrence silt loam, 1 mile northwest of LaGrange, 325 yards south of Laundry Road:

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable; many fine roots; few dark brown stains; neutral; abrupt smooth boundary.

B21t—8 to 17 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint spots of grayish brown material in the upper 2 inches similar to layer above; moderate fine and medium subangular blocky structure; friable; many fine roots; thin patchy clay films; strongly acid; clear smooth boundary.

B22t—17 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; common fine and medium distinct mottles of light brownish gray (10YR 6/2); moderate fine and medium subangular blocky structure; friable; common fine roots; thin patchy clay films; very strongly acid; clear smooth boundary.

Bx1—22 to 29 inches; mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6, 5/8) silty clay loam; moderate very coarse prismatic structure parting to moderate medium subangular and angular blocky; very firm; brittle and compact; few fine roots between prisms; nearly continuous clay films; many dark brown concretions; very strongly acid; gradual wavy boundary.

Bx2—29 to 38 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct mottles of light brownish gray (10YR 6/2); moderate very coarse prismatic structure parting to moderate medium angular blocky; very firm, brittle and compact; nearly continuous clay films; common dark brown concretions; strongly acid; gradual wavy boundary.

B3—38 to 53 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct mottles of light brownish gray; moderate; very coarse prismatic structure; firm; very strongly acid; gradual wavy boundary.

IIC—53 to 63 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/6) silty clay; massive parting to angular blocky; very firm; very strongly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock ranges from 60 to more than 100 inches. Except where the soil has been limed, reaction from the surface through the fragipan is strongly or very strongly acid. The B3 and IIC horizons range from very strongly acid to neutral.

The Ap horizon has hues of 2.5Y or 10YR, values of 4 or 5, and chromas of 2 through 4. Texture is silt loam.

Some pedons have a 3 to 6 inch silt loam B1 horizon with hues of 2.5Y or 10YR, values of 5 or 6, and chroma of 3 through 6.

The B2t horizon has hues of 2.5Y or 10YR, values of 5 or 6, and chromas of 3 through 6. It has few to many mottles of chroma 2 or less. Texture is silt loam or silty clay loam.

The Bx horizon has hues of 5Y through 7.5YR, values of 5 through 7, and chromas of 1 through 8. Many pedons are equally mottled in shades of gray and brown. Texture is silt loam or silty clay loam. Structure is weak or moderate, very coarse, prismatic.

The B3 and C horizons have hues of 5Y through 5YR, values of 5 through 7, and chromas of 1 through 6. Some pedons are equally mottled in shades of gray and brown. Texture ranges from silt loam to clay.

Lindside Series

The Lindside series consists of deep, moderately well drained soils that have moderate permeability. They formed in mixed alluvium and are subject to brief flooding in winter and spring. Lindside soils are on flood plains of major streams and their tributaries. They have a water table at depths of 1 1/2 to 3 feet in late winter and early spring. Slopes range from 0 to 2 percent.

Lindside soils are associated with the Boonesboro, Elk, Huntington, Newark, Nolin, and Wheeling soils. Boonesboro soils are well drained, moderately deep to bedrock, and contain more coarse fragments than Lindside soils. Elk and Wheeling soils are well drained, are on stream terraces, and occupy higher landscape positions. Huntington and Nolin are well drained, and Huntington soils have a darker A horizon than Lindside soils. Newark soils are somewhat poorly drained.

Typical pedon of Lindside silt loam in an area of Lindside silt loam, 0.5 mile east of Floydsburg, 500 yards northeast of Kentucky Highway 1408, 170 feet north of Currys Fork:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B21—8 to 21 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common fine roots; neutral; clear wavy boundary.

B22—21 to 36 inches; brown (10YR 4/3) silt loam; few fine faint mottles of grayish brown (10YR 5/2); weak fine granular structure; friable; few fine roots; few dark brown concretions; neutral; gradual wavy boundary.

B23—36 to 48 inches; brown (10YR 4/3) silt loam; few fine faint mottles of grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4); weak fine granular structure; friable; few fine roots; few dark brown concretions; neutral; clear wavy boundary.

C—48 to 60 inches; brown (10YR 4/3) thin stratified layers of silt loam, loam, and fine sandy loam; common fine faint mottles of grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4); slightly firm; many dark brown concretions; few small pebbles 1/4 to 1/2 inch in diameter; mildly alkaline.

Solum thickness ranges from 25 to 50 inches. Depth to bedrock ranges from about 5 feet to more than 20 feet. Coarse fragments are generally lacking but range up to 5 percent. Reaction ranges from medium acid to neutral except for the C horizon, which ranges to mildly alkaline. Depth to low chroma mottles ranges from 14 to 24 inches. Flakes of mica are in most pedons along the Ohio River.

The Ap horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 2 or 3. Texture is dominantly silt loam but in places is silty clay loam or loam.

The B horizon has hues of 7.5YR through 2.5Y, values of 4 or 5, and chroma of 3 through 6. Mottles with chroma of 2 or less are common in the lower part. Texture is silt loam, silty clay loam, or loam.

The C horizon has hues of 7.5YR through 2.5Y, values of 4 through 6, and chromas of 1 through 4. It is weakly stratified with silty clay loam, silt loam, loam, and fine sandy loam.

Lowell Series

The Lowell series consists of deep, well drained soils that have moderately slow permeability. They formed in clayey residuum derived from limestone, siltstone, and shale. Lowell soils are on smooth convex ridgetops and side slopes mostly in the southeastern portion of the county. Slopes range from 2 to 12 percent but are dominantly 6 to 12 percent.

Lowell soils are associated with the Beasley, Cynthiana, Faywood, and Nicholson soils. Beasley soils are underlain by interbedded, soft limestone and calcareous siltstone, sandstone, and shale. Cynthiana and Faywood soils are shallower to hard bedrock and contain more rock fragments than Lowell soils. Nicholson soils are moderately well drained, contain less clay, and have a fragipan.

Typical pedon of Lowell silt loam in an area of Lowell silt loam, 6 to 12 percent slopes, 1.5 miles southeast of Ballardsville, 0.5 mile south of Kentucky Highway 22, and 220 yards south of the East Fork of Floyds Fork:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many medium roots; very strongly acid; clear smooth boundary.

B1—6 to 14 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; common medium roots; thin nearly continuous clay films; very strongly acid; gradual smooth boundary.

B21t—14 to 27 inches; strong brown (7.5YR 5/6) silty clay; moderate medium subangular blocky structure; firm; few fine roots; nearly continuous clay films; common small dark brown and black concretions; very strongly acid; gradual wavy boundary.

B22t—27 to 36 inches; yellowish brown (10YR 5/6) clay; common fine distinct mottles of light yellowish brown (10YR 6/4); moderate medium subangular and angular blocky structure; very firm, sticky and plastic; few fine roots; continuous clay films; few small dark brown and black concretions; very strongly acid; clear wavy boundary.

B31—36 to 43 inches; mottled yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4) clay; weak coarse subangular blocky structure; very firm, sticky and plastic; few fine roots; nearly continuous clay films; many dark brown and black concretions in the upper part; slightly acid; gradual wavy boundary.

B32—43 to 59 inches; mottled strong brown (7.5YR 5/6), yellowish brown (10YR 5/4), and light yellowish brown (10YR 6/4) clay; weak coarse subangular blocky structure; very firm, sticky and plastic; few fine roots; nearly continuous clay films; 10 percent fragments of limestone 1/4 to 1 inch in diameter; mildly alkaline.

R—59 inches; limestone bedrock.

Solum thickness ranges from 30 to 60 inches, and depth to hard bedrock ranges from 40 to 80 inches or more. Thin, flat fragments of rock up to 10 inches in diameter cover 0 to 5 percent of the surface. Coarse fragments of limestone and siltstone range from 0 to 5 percent in the upper part of the solum, 0 to 10 percent in the lower part of the solum, and 0 to 10 percent in the C horizon. Reaction of the upper part of the solum ranges from slightly acid to very strongly acid, unless limed. The lower part of the solum ranges from strongly acid to mildly alkaline, except the layer immediately above the bedrock which ranges from medium acid to mildly alkaline.

The Ap horizon has hues of 10YR or 7.5YR, a value of 4, and chromas of 2 or 3. Texture is silt loam or silty clay loam.

The B1 horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 3 through 6. Texture is silty clay loam or silty clay.

The B2t horizon has hues of 7.5YR through 2.5Y, values of 4 or 5, and chromas of 4 or 6. Some pedons have mottles with a chroma of 2 below the upper 10 inches of the argillic horizon. Texture is silty clay loam, silty clay, or clay.

The B3 horizon has hues of 10YR through 5Y, values of 5, and chromas of 3 through 6. It is mottled in shades of brown, gray, yellow, and olive. Texture is silty clay or clay.

Some pedons have a C horizon with color and texture ranges similar to those of the B3 horizon.

Newark Series

The Newark series consists of deep, somewhat poorly drained soils that have moderate permeability. They formed in mixed alluvium and are subject to brief flooding in winter and spring. Newark soils are on flood plains of major streams and their tributaries. They have a water table at depths of 1/2 to 1 1/2 feet in late winter and early spring. Slopes range from 0 to 2 percent.

Newark soils are associated with the Elk, Huntington, Lindside, Nolin, and Wheeling soils. Elk and Wheeling soils are well drained, are on stream terraces, and occupy higher landscape positions. Huntington and Nolin are well drained, and the Huntington soils have a darker A horizon than Newark soils. Lindside soils are better drained than Newark soils.

Typical pedon of Newark silt loam in an area of Newark silt loam, 0.5 mile south of the junction of Kentucky Highway 1793 and Rose Island Road, 75 feet west of Rose Island Road:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B21—9 to 15 inches; brown (10YR 5/3) silt loam; many medium faint mottles of light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/4); weak fine granular structure; very friable; many fine roots; few dark brown concretions; slightly acid; clear wavy boundary.

B22g—15 to 25 inches; grayish brown (2.5Y 5/2) silt loam; common medium distinct mottles of brown (7.5YR 4/4); weak medium subangular blocky structure; friable; few fine roots; common dark brown and black concretions; slightly acid; clear smooth boundary.

B3g—25 to 38 inches; light brownish gray (2.5Y 6/2) silt loam; many medium distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); weak coarse subangular blocky structure; friable; few fine roots; few dark brown and black concretions; medium acid; gradual smooth boundary.

C—38 to 68 inches; mottled light brownish gray (2.5Y 6/2), brown (7.5YR 4/4), and yellowish brown (10YR 5/6) silt loam; massive, friable; few dark brown concretions; medium acid.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock ranges from about 5 to more than 20 feet. Coarse fragments, mostly pebbles, range from 0 to 5 percent throughout the solum and substratum. Reaction ranges from medium acid to mildly alkaline throughout. Flakes of mica are in most pedons along the Ohio River.

The Ap horizon has hues of 7.5YR or 2.5Y, values of 4 or 5, and chromas of 2 through 4. Texture is mostly silt loam but ranges from loam to silty clay loam.

The B21 horizon has hues of 10YR or 2.5Y, values of 4 or 5, and chromas of 2 through 4. Mottles in shades of gray or brown are few to many. Texture is silt loam or silty clay loam.

The B22g and B3g horizons have hues of 10YR or 2.5Y, values of 4 or 5, and chromas of 2 through 4. Mottles in shades of gray range from few to many. Texture is silt loam or silty clay loam.

The C horizon has color ranges similar to those of the B22g and B3g horizons. It may, however, be equally mottled in shades of brown and

gray. Texture is dominantly silt loam, or silty clay loam, but in places is stratified with thin layers of loam, fine sandy loam, or silty clay.

Nicholson Series

The Nicholson series consists of deep, moderately well drained soils that have a slowly permeable fragipan. They formed in a loess mantle and the underlying clayey residuum derived from limestone, siltstone, and shale. Nicholson soils are on smooth convex ridgetops and side slopes throughout the county. They have a water table at depths of 1 1/2 to 2 1/2 feet in late winter and early spring. Slope ranges from 2 to 12 percent but is dominantly 6 to 12 percent.

Nicholson soils are associated with the Beasley, Crider, Lawrence, and Lowell soils. Beasley and Lowell soils are well drained and clayey. Crider soils are well drained and lack the fragipan. Lawrence soils are wetter.

Typical pedon of Nicholson silt loam in an area of Nicholson silt loam, 2 to 6 percent slopes, 3 miles south of Ballardsville, 0.5 mile southwest of Kentucky Highway 1315, 0.4 mile southeast of Floyds Fork, and 200 yards south of gravel road:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

B21t—7 to 15 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; many fine roots; common thin patchy clay films; medium acid; gradual smooth boundary.

B22t—15 to 27 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; common thin patchy clay films; medium acid; clear wavy boundary.

Bx—27 to 36 inches; yellowish brown (10YR 5/4) silty clay loam with common medium distinct mottles of light brownish gray (10YR 6/2), brown (7.5YR 4/4), and pale brown (10YR 6/3); moderate very coarse prismatic parting to moderate medium subangular blocky structure; firm, brittle and compact; few fine roots between prisms; nearly continuous clay films on prism faces; common light gray (10YR 7/1) silt coatings on ped surfaces; few black concretions; strongly acid; clear wavy boundary.

IIB3—36 to 50 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct mottles of light brownish gray (10YR 6/2); weak coarse subangular blocky structure; very firm, plastic and sticky; thick nearly continuous clay films on ped surfaces; common black concretions; slightly acid; gradual wavy boundary.

IIC—50 to 58 inches; yellowish brown (10YR 5/6) clay with few common distinct mottles of light yellowish brown (2.5YR 6/4); massive; very firm, plastic and sticky; common black concretions; neutral.

Solum thickness ranges from 40 to 80 inches, and depth to bedrock ranges from 48 to 100 inches. The upper part of the solum through the fragipan is commonly free of coarse fragments, but the IIB and IIC horizon is 0 to 15 percent coarse fragments. Reaction ranges from very strongly to medium acid through the fragipan except where the surface has been limed. Below the fragipan, reaction ranges from strongly acid to mildly alkaline.

The Ap horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 2 or 3. Texture is dominantly silt loam but is silty clay loam in some pedons.

Some pedons have a 3 to 8 inch thick B1 horizon with hues of 10YR or 7.5YR, values of 4 or 5, and chroma of 3 through 6. Texture is silt loam or silty clay loam.

The B2 horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 3 through 6. Some pedons have thin silt coatings on ped faces in the argillic horizon. Few to common mottles with a chroma of 2 are below the upper 10 inches of the argillic horizon in some pedons. Texture is silt loam or silty clay loam.

The Bx horizon has hues of 7.5YR through 2.5Y, values of 3 through 5, chromas of 4 through 8, and few to many mottles with a chroma of 2 or less. Texture is silt loam or silty clay loam. Structure is weak or moderate very coarse prismatic.

The IIB horizon is mottled and has hues of 2.5YR through 2.5Y, values of 4 or 5, and chromas of 2 through 6. Texture is silty clay or clay.

The IIC horizon has similar color and texture ranges as the IIB horizon.

Nolin Series

The Nolin series consists of deep, well drained soils that have moderate permeability. They formed in mixed alluvium and are subject to brief flooding in winter and spring. Nolin soils are on flood plains of major streams and their tributaries. Slope ranges from 0 to 2 percent.

Nolin soils are associated with the Boonesboro, Elk, Lindside, Newark, Otwell, and Weinbach soils. Boonesboro soils are moderately deep to bedrock and generally contain more coarse fragments. Elk, Otwell, and Weinbach soils are on stream terraces and occupy higher landscape positions. Lindside and Newark soils are wetter and contain low chroma mottles above 24 inch depths.

Typical pedon of Nolin silt loam in an area of Nolin silt loam, 1/2 mile east of Floydsburg, 230 yards northeast of Kentucky Highway 1408, and 75 feet west of Currys Fork:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine and medium roots; neutral; clear smooth boundary.

B21—8 to 24 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure parting to weak fine granular; friable; common fine roots; neutral; gradual smooth boundary.

B22—24 to 61 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common fine roots; neutral; clear wavy boundary.

B23—61 to 72 inches; brown (10YR 4/3) silt loam; few fine faint grayish brown (10YR 5/2) mottles; weak fine granular structure; friable; neutral; clear wavy boundary.

C—72 to 85 inches; brown (10YR 4/3) silt loam; common fine faint mottles of grayish brown (10YR 5/2); massive; friable; common dark brown concretions; few small pebbles 1/8 to 1/2 inch in diameter; mildly alkaline.

Solum thickness ranges from 42 to more than 72 inches. Depth to bedrock is more than 48 inches. Gravel in the solum ranges from 0 to 5 percent. Reaction ranges from medium acid to neutral except for the C horizon which ranges to mildly alkaline.

The Ap horizon has a hue of 10YR, values of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam, but in places is loam or silty clay loam.

The B horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 3 or 4. In some pedons, mottles with chroma of 2 or less are at depths below 24 inches. Texture is silt loam or silty clay loam.

The C horizon has hues of 10YR or 2.5Y, values of 4 or 5, and chromas of 2 through 4. The content of gravel ranges from 0 to 20 percent. Texture is silt loam and may have stratifications of loam and fine sandy loam.

Otwell Series

The Otwell series consists of deep, moderately well drained soils that have a very slowly permeable fragipan. They formed in mixed alluvium and a few low areas are subject to occasional flooding. Otwell soils are on stream terraces along the Ohio River, Harrods Creek, Floyds Fork, and their tributaries. They have a water table at

depths of 1 1/2 to 2 1/2 feet in late winter or early spring. Slope ranges from 2 to 6 percent.

Otwell soils are associated with the Elk, Huntington, Lindside, Newark, Nolin, Weinbach, and Wheeling soils. Elk soils are well drained, and Weinbach soils are somewhat poorly drained. Wheeling soils are well drained and contain more sand than Otwell soils. Huntington, Lindside, Newark, and Nolin soils are on flood plains and occupy lower positions on the landscape.

Typical pedon of Otwell silt loam in an area of Otwell silt loam, 2 to 6 percent slopes, 0.6 mile northeast of Floydsburg, 150 yards north of Currys Fork:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B1—7 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; common fine roots; thin patchy clay films; few dark brown concretions; neutral; clear wavy boundary.

B21t—11 to 17 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; friable; common fine roots; thin nearly continuous clay films; few small rounded black concretions; slightly acid; clear smooth boundary.

B22t—17 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint mottles of light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 4/4); moderate medium subangular blocky structure; slightly firm; few fine roots; thin nearly continuous clay films; common dark brown and black stains; very strongly acid; clear wavy boundary.

Bx—24 to 33 inches; mottled yellowish brown (10YR 5/4), brown (7.5YR 4/4), and light brownish gray (10YR 6/2) silty clay loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm, brittle and compact; continuous clay film on prism faces; few somewhat flattened pebbles 1/4 to 3/4 inch in diameter; few dark brown concretions; very strongly acid; clear wavy boundary.

B31—33 to 42 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct mottles of light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/4); weak coarse subangular blocky structure; firm; common rounded pebbles 1/4 to 1 1/2 inches in diameter; many dark brown concretions; medium acid; gradual wavy boundary.

B32—42 to 51 inches; grayish brown (2.5Y 5/2) silty clay; common medium distinct mottles of yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4); weak coarse subangular blocky structure; very firm; few small rounded pebbles 1/4 to 1 inch in diameter; common dark brown concretions; medium acid; clear wavy boundary.

C—51 to 62 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium distinct mottles of yellowish brown (10YR 5/6) and brown (7.5YR 4/4); massive; very firm; few pebbles 1/4 to 3/4 inch in diameter; few dark brown concretions; neutral.

Solum thickness ranges from 40 to more than 80 inches. Depth to bedrock ranges from 4 to more than 10 feet, except along the Ohio River, where it ranges to more than 20 feet. Coarse fragments are absent in most pedons, but range from 0 to 5 percent in the solum and up to 20 percent in the C horizon. Reaction in the upper part of the solum ranges from neutral to very strongly acid, and the fragipan is very strongly acid. The lower part of the solum and C horizon range from medium to very strongly acid except in some pedons where reaction of the C horizon is neutral. Flakes of mica are in most pedons along the Ohio River.

The Ap horizon has a hue of 10YR, values of 4 or 5, and chroma of 2 through 4. Texture is silt loam.

The B1 horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chroma of 3 through 6. Texture is silt loam or silty clay loam.

The B2t horizon has a hue of 10YR, values of 4 or 5, and chromas of 3 through 6. Some pedons have chromas of 1 or 2 below the upper 10 inches of the argillic horizon. Texture is silt loam or silty clay loam.

The Bx horizon has hues of 7.5YR through 2.5Y, values of 4 through 7, and chromas of 3 through 6. Texture is silt loam or silty clay loam. Structure is moderate to strong, very coarse, prismatic.

The B3 and C horizons have hues of 10YR or 2.5Y, values of 4 through 6, and chromas of 2 through 6. Textures are silt loam, silty clay loam, or silty clay, but stratified layers of loam or fine sandy loam are present in places.

Weinbach Series

The Weinbach series consists of deep, somewhat poorly drained soils that have a slowly permeable fragipan. They formed in mixed alluvium, and a few low areas are subject to occasional flooding. Weinbach soils are on stream terraces along the Ohio River, Harrods Creek, Floyds Fork, and their tributaries. They have a water table at depths of 1 to 2 feet in late winter and early spring. Slope ranges from 0 to 4 percent.

Weinbach soils are associated with the Elk, Huntington, Lindside, Newark, Nolin, Otwell, and Wheeling soils. Elk and Wheeling soils are well drained and lack a fragipan. Huntington, Lindside, Newark, and Nolin soils are on flood plains and occupy positions on the lower part of the landscape. Otwell soils are moderately well drained.

Typical pedon of Weinbach silt loam in an area of Weinbach silt loam, 0.5 mile north of the junction of Rose Island Road and Belknap Beach Road and 135 yards west of Rose Island Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; very friable; many medium roots; few fine flakes of mica; slightly acid; clear smooth boundary.

B1—8 to 12 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct mottles of light brownish gray (10YR 6/2); weak moderate subangular blocky structure; friable; common medium roots; few fine flakes of mica; common dark brown and black concretions; medium acid; gradual wavy boundary.

B2g—12 to 23 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct mottles of dark yellowish brown (10YR 5/4); moderate medium subangular blocky structure; firm; few fine roots; few fine flakes of mica; common dark brown and black concretions; medium acid; abrupt wavy boundary.

Bxg—23 to 39 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); strong very coarse prismatic structure parting to moderate medium angular blocky; very firm, brittle and compact; few fine roots along prism faces; thin continuous clay films on prism faces; few fine flakes of mica; few dark brown and black concretions; very strongly acid; gradual smooth boundary.

B3—39 to 49 inches; brown (10YR 4/3) silty clay loam; common medium distinct mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4); moderate coarse prismatic structure; firm; few thin clay films on prism faces; few fine flakes of mica; few dark brown and black concretions; very strongly acid; gradual wavy boundary.

C—49 to 54 inches; dark yellowish brown (10YR 4/4) silty clay loam; massive; firm; few fine flakes of mica; few dark brown and black concretions; strongly acid.

Solum thickness ranges from 42 to 60 inches. Depth to bedrock ranges from 5 to more than 10 feet except along the Ohio River where it ranges to more than 20 feet. Coarse fragments are usually lacking in the solum but range from 0 to 20 percent in the C horizon. Reaction of the solum ranges from medium to very strongly acid except where the soil has been limed. The C horizon is strongly or very strongly acid. Flakes of mica are in most pedons along the Ohio River.

The Ap horizon has a hue of 10YR, values of 2 through 4, and chromas of 2 or 3. Texture is silt loam. Some pedons have a silt loam A2 horizon, 3 to 6 inches thick, with a hue of 10YR, values of 5 or 6, and chromas of 2 or 3.

The B1 horizon has a hue of 10YR, values of 5 or 6, chromas of 2 through 4, and common to many mottles with chroma of 1 through 4. Texture is silt loam or silty clay loam.

The B2g horizon has a hue of 10YR, values of 5 or 6, chromas of 2 or less, and common to many mottles with chromas of 3 or 4. Texture is silt loam or silty clay loam.

The Bx horizon has hues of 10YR or 2.5Y, values of 4 through 6, a chroma of 2 or less, and common to many mottles with chromas of 1 through 6. Texture is silt loam or silty clay loam. Structure is moderate to strong, very coarse, prismatic.

The B3 horizon has a hue of 10YR, values of 4 through 6, chromas of 2 through 4, and common to many mottles with chromas of 1 through 4. Texture is silty clay loam or silt loam.

The C horizon has hues of 10YR or 2.5Y, values of 4 or 5, and chromas of 2 through 4. Some pedons have few to many mottles with a chroma of 2 or less. Texture is silt loam or silty clay loam, but stratified layers of loam, fine sandy loam, or silty clay are present in places.

Wheeling Series

The Wheeling series consists of deep, well drained soils that have moderate permeability. They formed in mixed alluvium, and a few low areas are subject to occasional flooding. Wheeling soils are on level to moderately steep stream terraces along the Ohio River. Slope ranges from 0 to 30 percent, but is dominantly 2 to 6 percent.

Wheeling soils are associated with the Elk, Huntington, Lindside, Newark, Otwell, and Weinbach soils. Elk, Otwell, and Weinbach soils contain less sand, and the Otwell and Weinbach soils are wetter and have a fragipan. Huntington, Lindside, and Newark soils are on flood plains and occupy lower positions on the landscape.

Typical pedon of Wheeling silt loam in an area of Wheeling silt loam, 0 to 2 percent slopes, 0.4 mile southwest of the junction of Kentucky Highway 1793 and Rose Island Road and 170 yards west of Rose Island Road:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; many fine roots; common fine flakes of mica; neutral; clear smooth boundary.

B21t—10 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin patchy clay films; common fine flakes of mica; medium acid; gradual wavy boundary.

B22t—20 to 28 inches; brown (7.5YR 4/4) silty clay loam (high in fine sand); moderate medium subangular blocky structure; friable; few fine roots; thin patchy clay films; common fine flakes of mica; few dark brown concretions; medium acid; gradual wavy boundary.

B23t—28 to 38 inches; brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine roots; thin patchy clay films; common fine flakes of mica; few dark brown concretions; medium acid; clear wavy boundary.

B3—38 to 46 inches; brown (7.5YR 4/4) loam; common medium distinct mottles of yellowish brown (10YR 5/6); weak coarse subangular blocky structure; friable; 8 to 10 percent gravel 1/8 to 3/4 inch in diameter; common fine flakes of mica; few dark brown concretions; strongly acid; clear wavy boundary.

C—46 to 62 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; common medium distinct mottles of brown (7.5YR 4/4) and yellowish brown (10YR 5/6); massive; friable; 25 to 35 percent gravel 1/4 to 1 inch in diameter; medium acid.

Solum thickness ranges from 40 to 60 inches, and depth to bedrock ranges from 5 to more than 20 feet. Coarse fragments in the upper 40 inches range from 0 to 15 percent. In the underlying material they range from 5 to more than 35 percent. Reaction of the solum ranges from medium to strongly acid unless the surface has been limed. In the C horizon it ranges from neutral to strongly acid. Fine flakes of mica are common throughout the profile.

The Ap horizon has a hue of 10YR, values of 4 or 5, and chromas of 2 or 3. Texture is silt loam, loam, or fine sandy loam.

The B2t horizon has hues of 10YR or 7.5YR, values of 4 or 5, and chromas of 3 through 6. Texture is loam, silt loam, or silty clay loam.

The B3 horizon has colors similar to those in the B2t horizon. Texture ranges from loam to gravelly sandy loam.

The C horizon has colors similar to those in the B2t and B3 horizon. It is stratified with materials that range from very fine sand to gravel.

Woolper Series

The Woolper series consists of deep, well drained soils that have moderately slow permeability. They formed in alluvium and colluvium mostly of limestone origin. Woolper soils are on concave foot slopes throughout the county. Slopes range from 2 to 12 percent.

Woolper soils are associated with the Boonesboro, Cynthiana, Elk, Faywood, and Nolin soils. Boonesboro soils are on flood plains, contain less clay than Woolper soils, and are moderately deep to bedrock. Cynthiana and Faywood soils are on upland side slopes and are shallower to bedrock than Woolper soils. Elk soils are on stream terraces. Nolin soils are on flood plains. They contain less clay than Woolper soils.

Typical pedon of Woolper silty clay loam in an area of Woolper silty clay loam, 2 to 6 percent slopes, 0.5 mile northeast of Floydsburg, 600 yards northeast of Kentucky Highway 1408, and 275 yards northeast of Currys Fork:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate fine and medium granular structure; firm; many fine roots; slightly acid; clear smooth boundary.

B21t—7 to 18 inches; very dark grayish (10YR 3/2) silty clay; moderate medium subangular and angular blocky structure; firm; common fine roots; thin nearly continuous clay films; slightly acid; clear wavy boundary.

B22t—18 to 30 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct mottles of brown (10YR 5/3) and dark yellowish brown (10YR 4/4); moderate medium angular blocky structure; very firm, sticky and plastic; thin patchy clay films; common dark brown concretions; slightly acid; gradual wavy boundary.

B3—30 to 43 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct mottles of dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2); weak coarse subangular blocky structure; very firm, sticky and plastic; common dark brown concretions; slightly acid; clear smooth boundary.

C—43 to 55 inches; mottled yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) clay; massive; very firm, sticky and plastic; common dark brown concretions; few limestone fragments 1/8 to 1/2 inch in diameter; neutral.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock ranges from 60 to more than 100 inches. Coarse fragments range from 0 to 10 percent. Some pedons contain thin, flat limestone slabs either on the surface or scattered throughout the soil. Reaction ranges from mildly alkaline to slightly acid. Thickness of the mollic epipedon ranges from 14 to about 30 inches.

The Ap horizon has hues of 10YR or 7.5YR, values of 2 or 3, and chromas of 2 or 3. Texture is silty clay loam or silt loam. Some pedons have A1, A3, or B1 horizons with color and texture ranges similar to those of the Ap horizon.

The B21t horizon has hues of 10YR or 7.5YR, values of 2 through 5, and chromas of 2 through 6. Some pedons have few to common mottles in shades of gray below the upper 10 inches of the argillic horizon. Texture is silty clay loam or silty clay.

The B22t and B3 horizons have hues of 7.5YR through 2.5Y, values of 4 or 5, and chromas of 3 through 6. Texture is silty clay loam, silty clay, or clay.

The C horizon has hues of 10YR or 2.5Y, values of 4 through 6, and chromas of 2 through 6. Some pedons are equally mottled in shades of brown and gray. Texture is silty clay or clay.

Classification

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to the latest literature available (*8, 12, 16*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplaquents (*Hapl*, meaning simple horizons, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies for the subgroup that is thought to typify the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, nonacid, mesic, Typic Haplaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	Less than 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils com-

monly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime. Excess carbonates. Excessive carbonates, or lime, restrict the growth of some plants.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May,* for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. Hydrous calcium sulphate.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Landslide. The rapid downhill movement of a mass of soil and loose rock generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Pan. A compact, dense layer in a soil. A pan impedes the movement of water and the growth of roots. The word "pan" is commonly combined with other words that more explicitly indicate the nature of the layer; for example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water of subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in a landscape where limestone has been locally dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stratified. Arranged in strata, or layers. The term refers to geologic 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 which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or " very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diamter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Illustrations

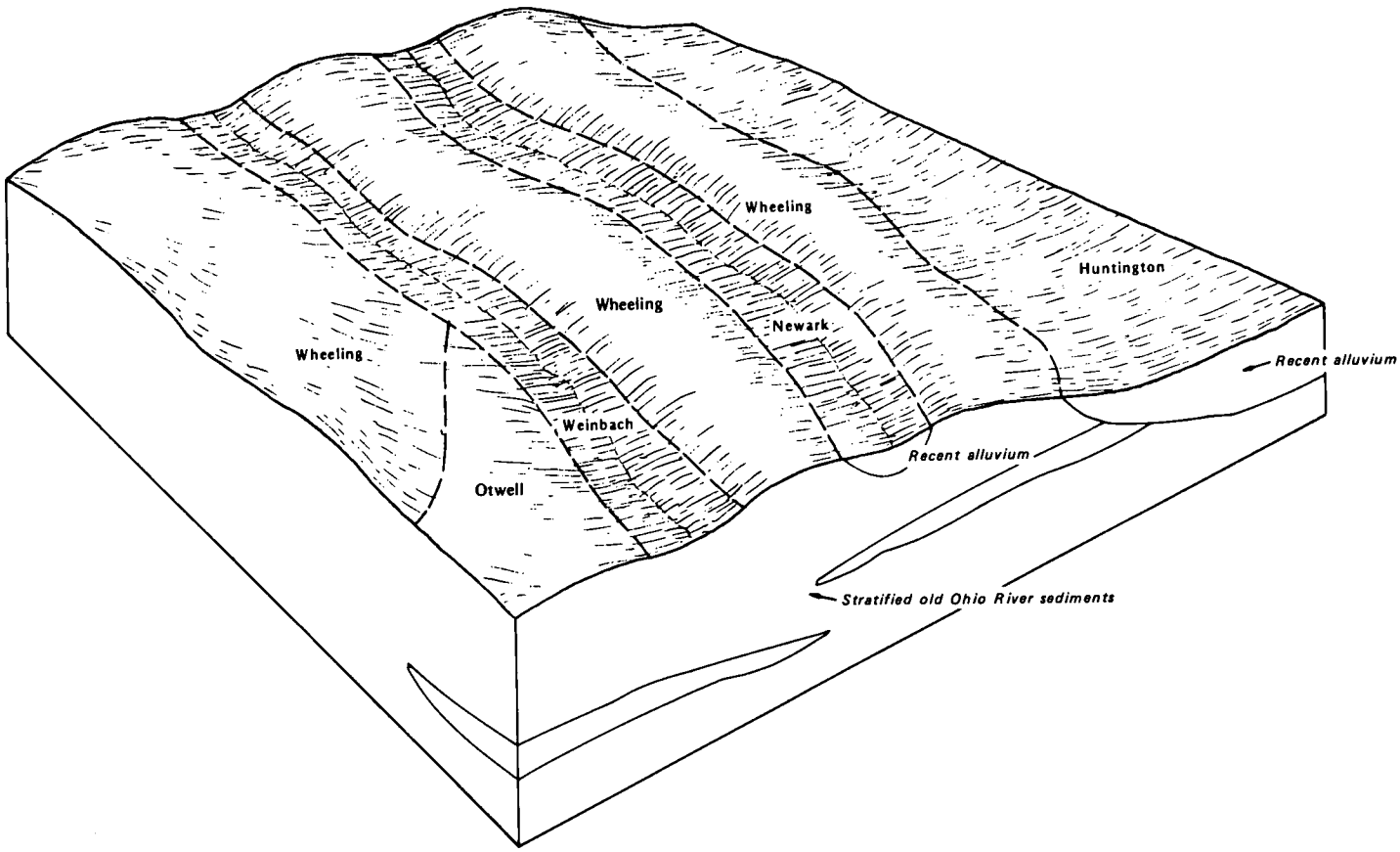

Figure 1.—Pattern of soils and underlying material in Wheeling-Huntington Association.

Figure 2.—Corn on Wheeling-Huntington association and woodland in background on Beasley-Caneyville association.

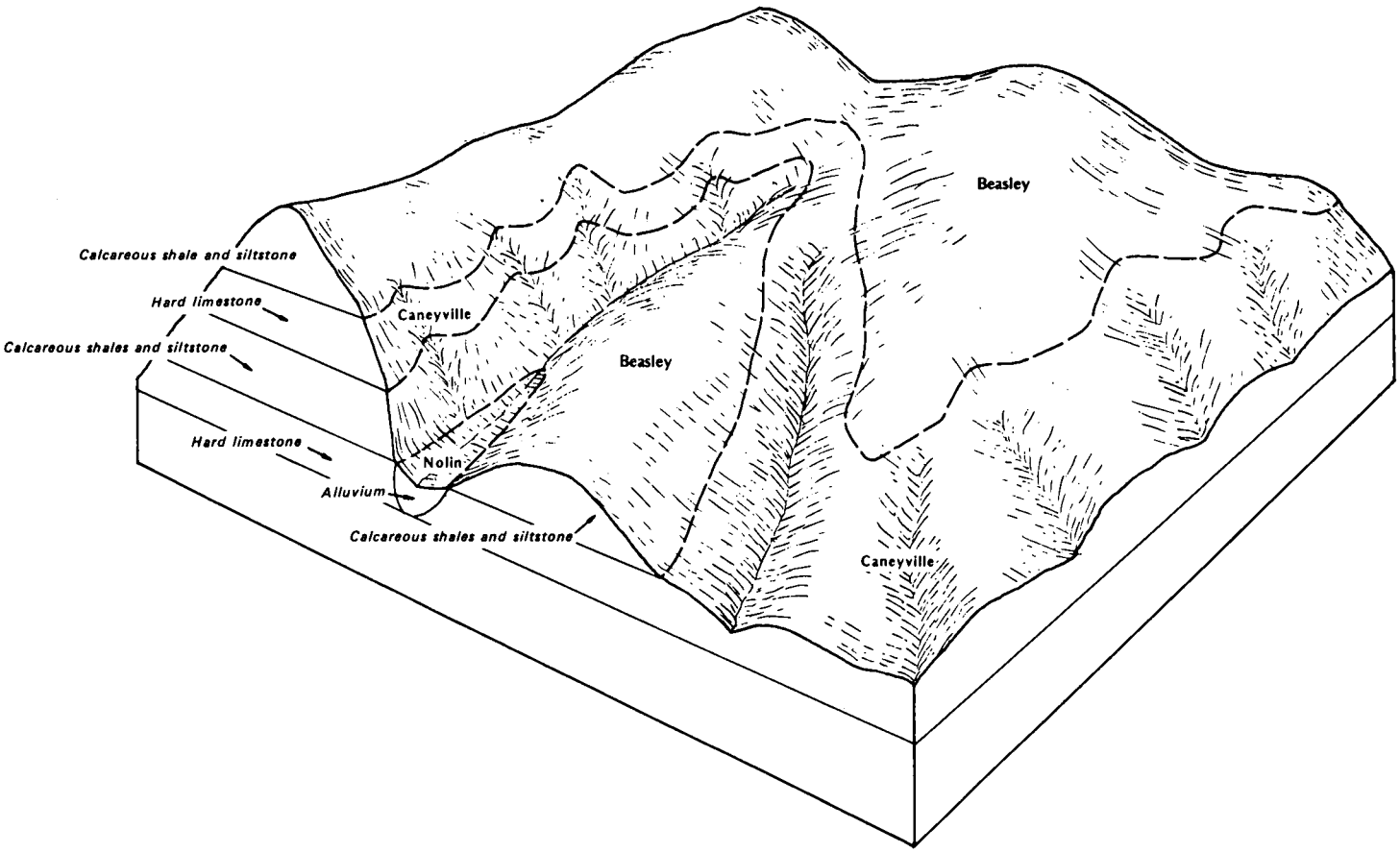

Figure 3.—Pattern of soils and underlying material in Beasley-Caneyville association.

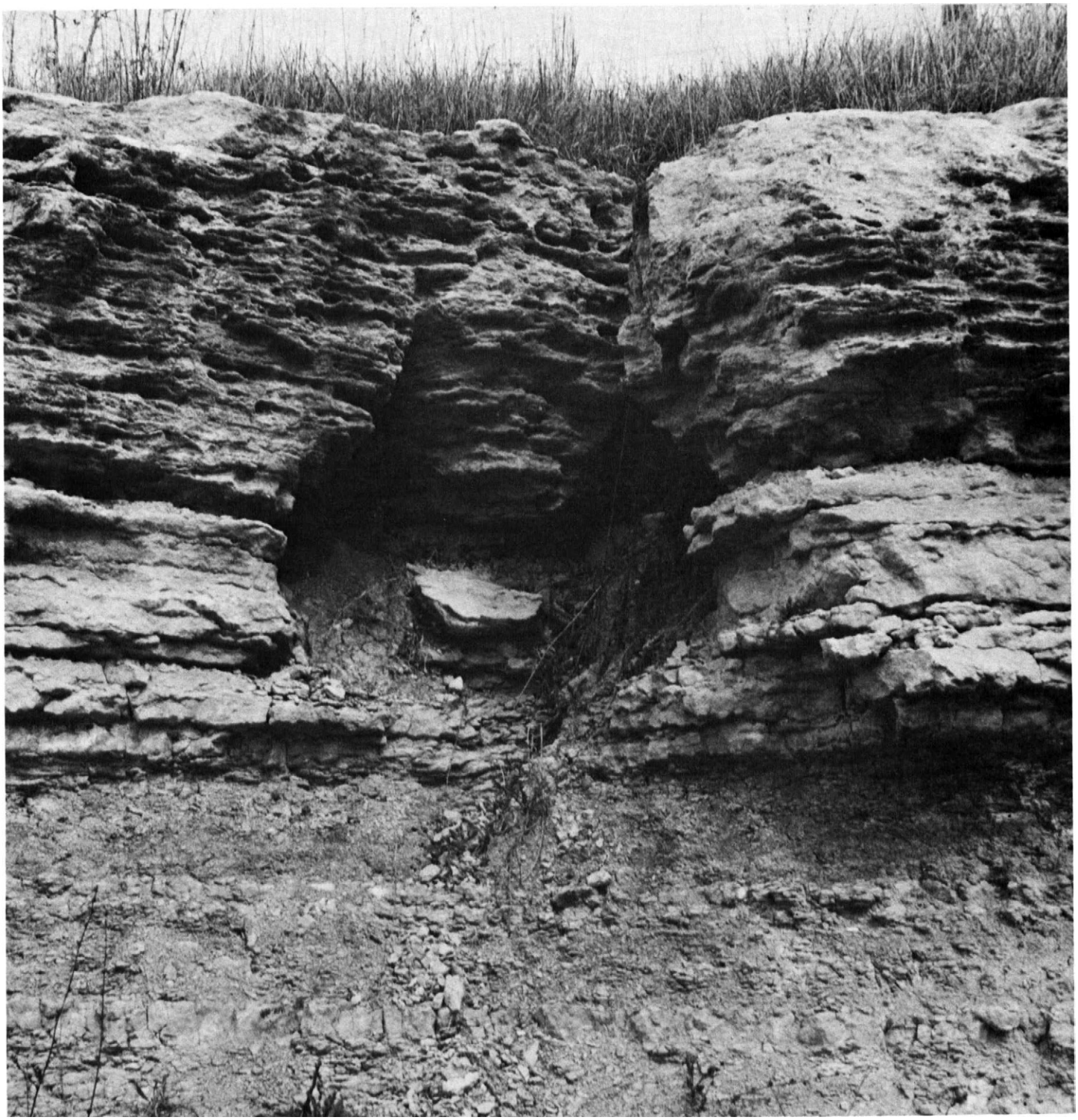

Figure 4.—Sinkhole in the limestone parent material of the Crider-Nicholson association.

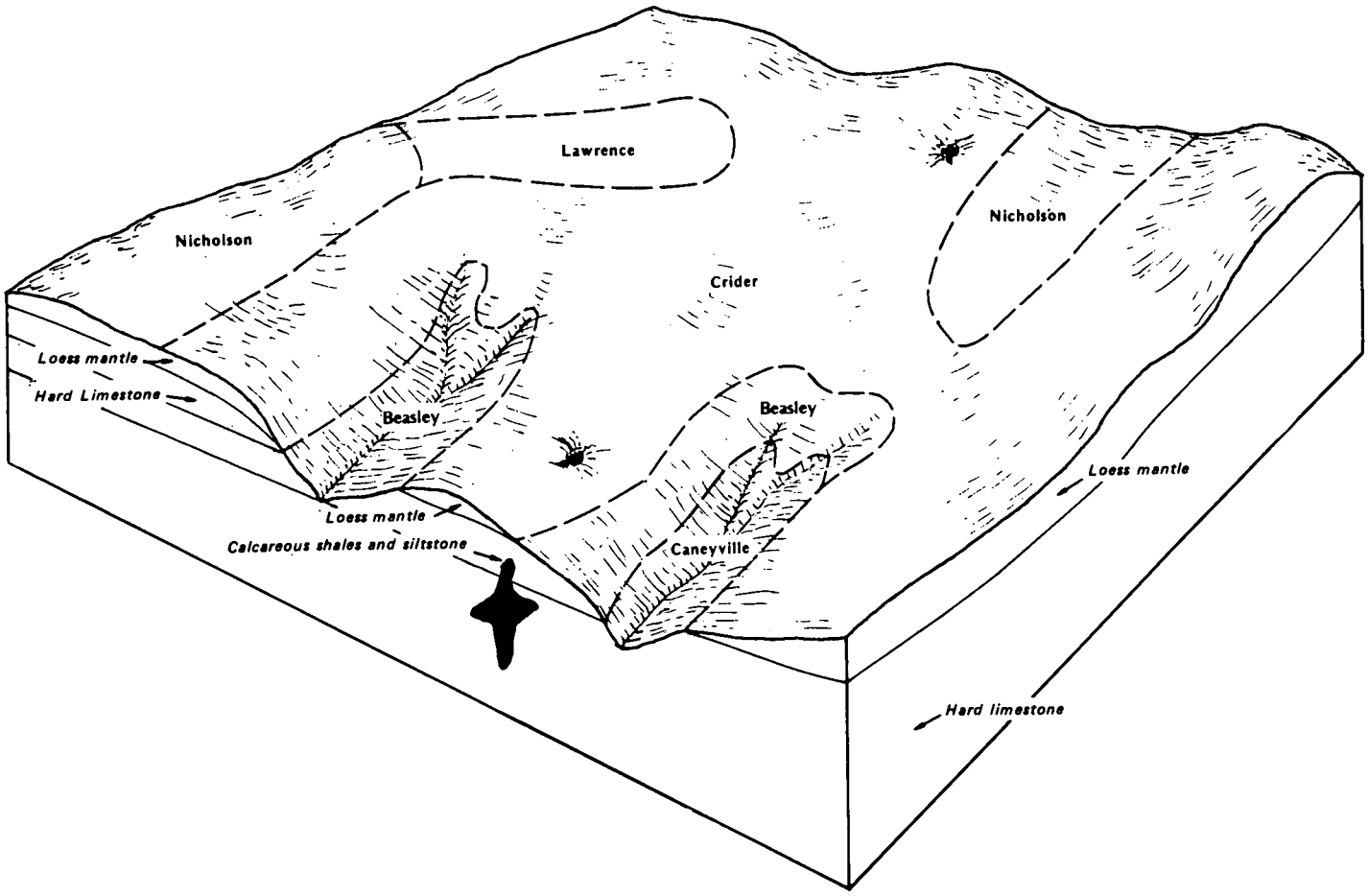

Figure 5.—Pattern of soils and underlying material in Crider-Nicholson association.

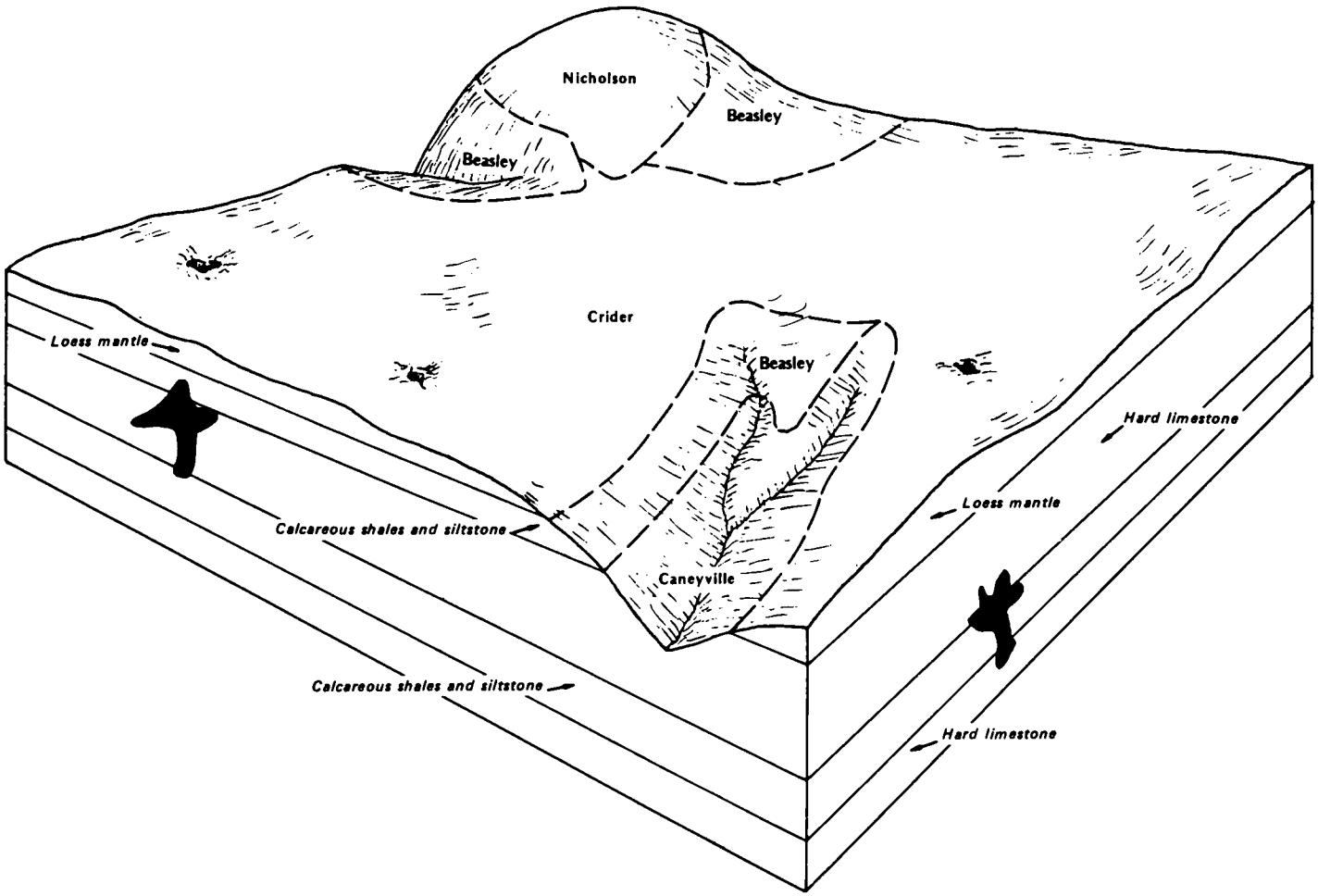

Figure 6.—Pattern of soils and underlying material in Crider-Beasley association.

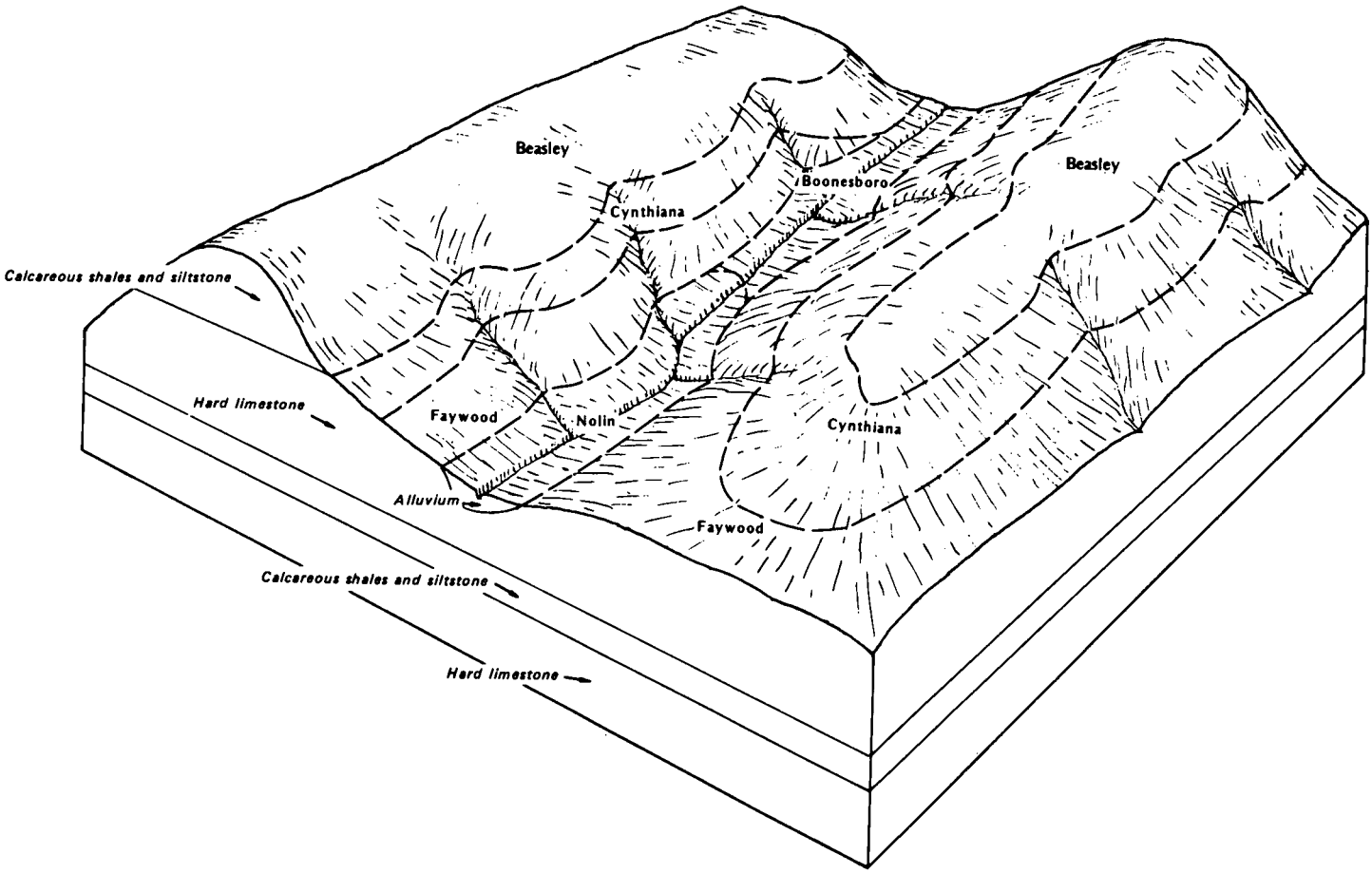

Figure 7.—Pattern of soils and underlying material in Beasley-Cynthiana-Faywood association.

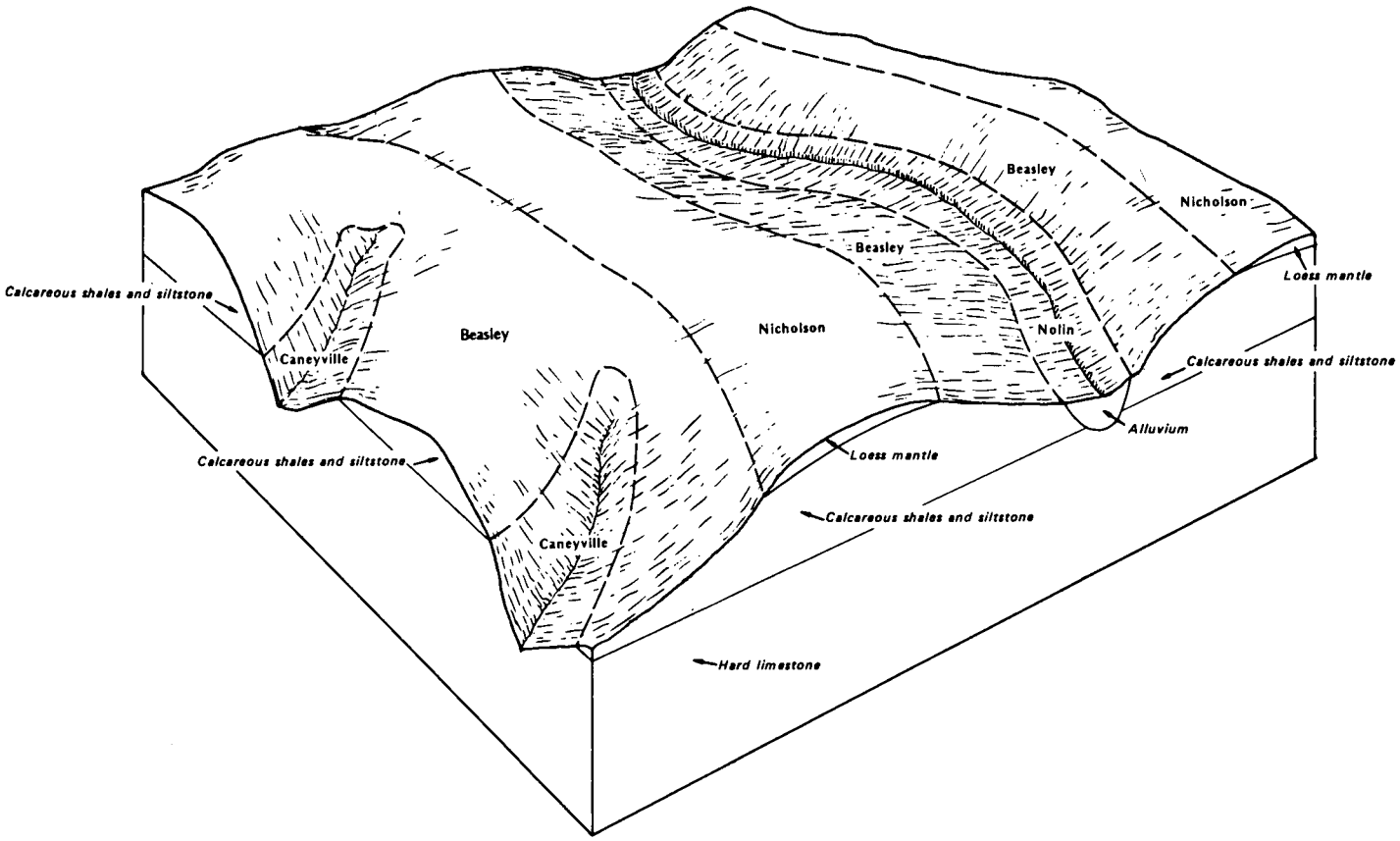

Figure 8.—Pattern of soils and underlying material in Beasley-Nicholson association.

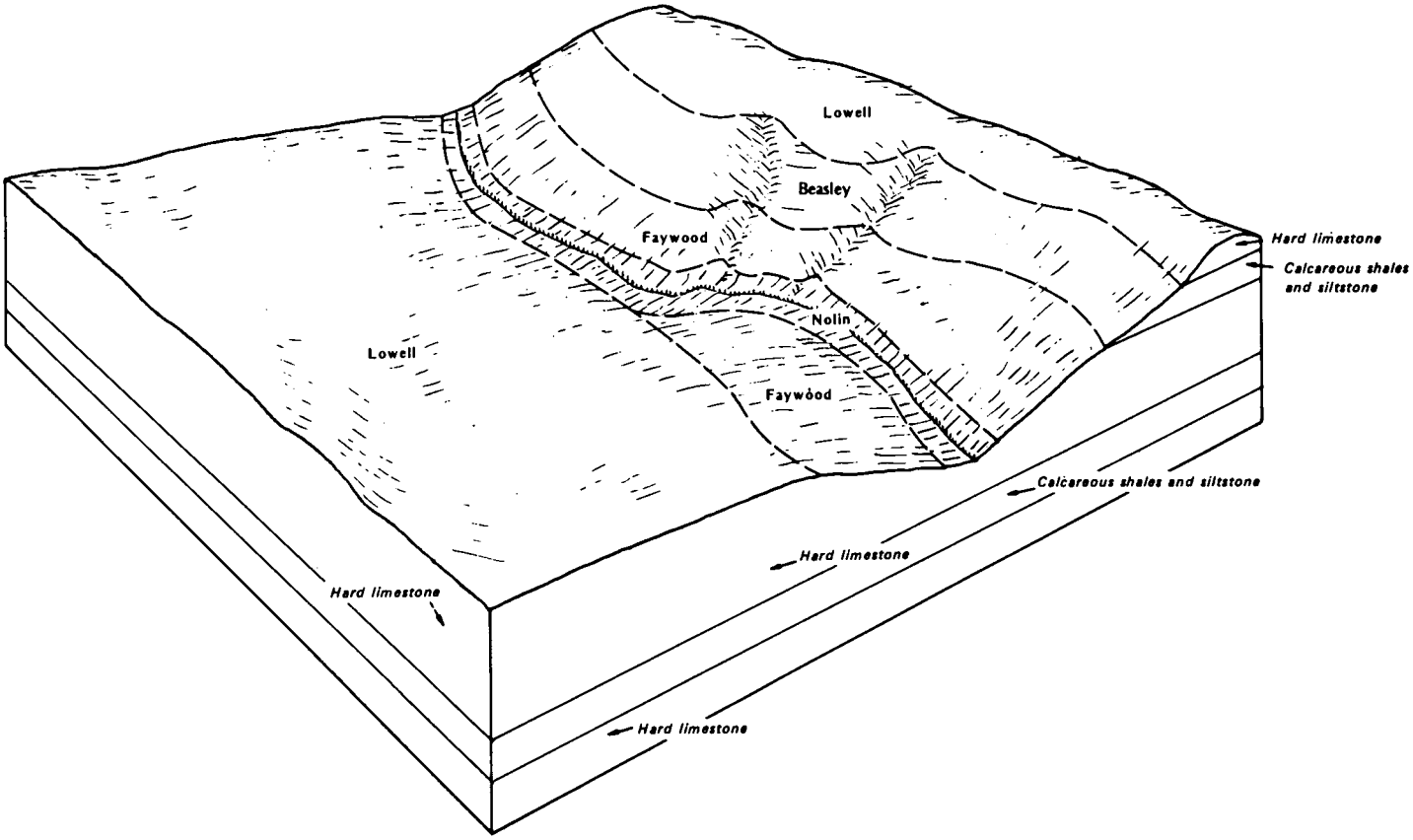

Figure 9.—Pattern of soils and underlying material in Lowell-Faywood-Beasley association.

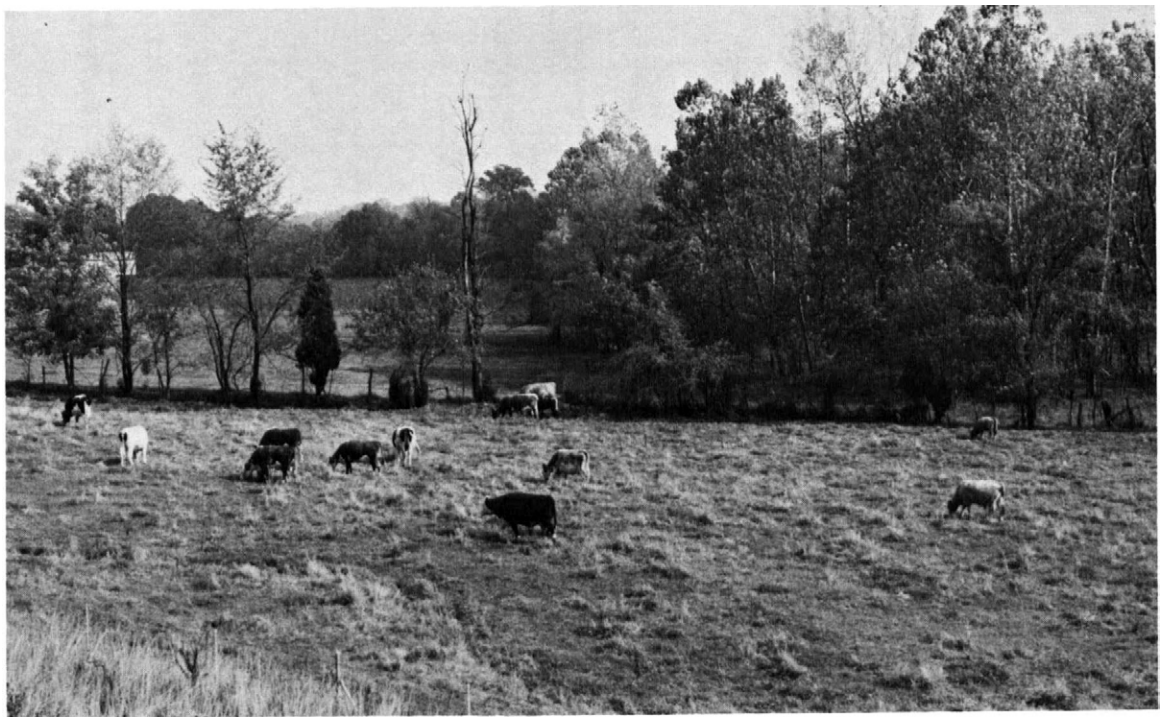

Figure 10.—Beef cattle on Lindside silt loam. Woodland is in area of Beasley silt loam, 12 to 20 percent slopes.

Figure 11.—Burley tobacco on Lowell silt loam, 2 to 6 percent slopes, and pasture on Lowell silt loam, 6 to 12 percent slopes.

Figure 12.—Urban development crowding out cropland and pasture on Crider silt loam, 2 to 6 percent slopes. (Courtesy of Billy Davis, The Courier-Journal and Louisville Times)

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]						Precipitation[1]				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[2]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	F	F	F	F	F	Units	In	In	In		In
January----	41.9	25.0	33.5	69	-5	6	3.28	1.89	4.41	6	5.2
February---	45.5	27.2	36.4	70	0	11	3.40	1.64	4.83	6	4.6
March------	54.5	35.0	44.8	82	15	72	4.73	2.35	6.66	8	4.2
April------	67.7	45.8	56.8	87	27	228	4.14	2.10	5.80	8	.2
May--------	76.4	54.3	65.4	92	35	477	4.19	2.72	5.52	8	.0
June-------	84.4	63.1	73.8	97	47	714	3.46	1.68	4.91	6	.0
July-------	87.9	67.2	77.5	98	52	853	4.02	2.19	5.51	7	.0
August-----	86.9	65.5	76.2	98	52	812	3.11	1.24	4.61	5	.0
September--	80.8	58.6	69.7	96	40	591	3.18	1.53	4.52	5	.0
October----	69.6	46.3	58.0	89	27	266	2.33	1.28	3.18	5	.0
November---	55.1	36.2	45.7	80	16	23	3.36	1.86	4.58	6	1.5
December---	45.2	29.0	37.1	71	3	22	3.41	2.04	4.63	7	2.4
Year-----	66.3	46.1	56.2	100	-7	4,075	42.61	37.36	47.69	77	18.1

[1]Recorded in the period 1951-74 at Louisville, Ky.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature[1]		
	24 F or lower	28 F or lower	32 F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 2	April 7	April 26
2 years in 10 later than--	March 28	April 3	April 21
5 years in 10 later than--	March 16	March 27	April 11
First freezing temperature in fall:			
1 year in 10 earlier than--	November 1	October 19	October 13
2 years in 10 earlier than--	November 5	October 24	October 17
5 years in 10 earlier than--	November 13	November 2	October 26

[1]Recorded in the period 1951-74 at Louisville, Ky.

TABLE 3.--GROWING SEASON LENGTH

Probability	Daily minimum temperature during growing season[1]		
	Higher than 24 F	Higher than 28 F	Higher than 32 F
	Days	Days	Days
9 years in 10	221	198	176
8 years in 10	228	206	183
5 years in 10	241	220	197
2 years in 10	254	234	211
1 year in 10	261	241	218

[1]Recorded in the period 1951-74 at Louisville, Ky.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
BeB	Beasley silt loam, 2 to 6 percent slopes	2,280	1.9
BeC	Beasley silt loam, 6 to 12 percent slopes	17,000	14.4
BeD	Beasley silt loam, 12 to 20 percent slopes	1,840	1.6
BfC3	Beasley silty clay loam, 6 to 12 percent slopes, severely eroded	5,440	4.6
BfD3	Beasley silty clay loam, 12 to 20 percent slopes, severely eroded	3,790	3.2
BnF	Beasley-Caneyville rocky silt loams, 30 to 60 percent slopes	5,050	4.3
Bo	Boonesboro silt loam	850	0.7
BsE	Brassfield-Beasley silt loams, 20 to 30 percent slopes	4,140	3.5
CaC	Caneyville silt loam, 6 to 12 percent slopes	820	0.7
CbD	Caneyville-Beasley rocky silt loams, 12 to 30 percent slopes	5,040	4.3
CrA	Crider silt loam, 0 to 2 percent slopes	380	0.3
CrB	Crider silt loam, 2 to 6 percent slopes	16,670	14.2
CrC	Crider silt loam, 6 to 12 percent slopes	6,510	5.5
CyF	Cynthiana-Faywood-Beasley complex, 30 to 60 percent slopes	7,330	6.2
ElB	Elk silt loam, 2 to 6 percent slopes	570	0.5
FaC	Faywood silt loam, 6 to 12 percent slopes	210	0.2
FaD	Faywood silt loam, 12 to 30 percent slopes	560	0.5
FsD3	Faywood silty clay, 12 to 30 percent slopes, severely eroded	1,220	1.0
HaB	Hagerstown silt loam, 2 to 6 percent slopes	350	0.3
HaC	Hagerstown silt loam, 6 to 12 percent slopes	3,510	3.0
HsC3	Hagerstown silty clay loam, 6 to 12 percent slopes, severely eroded	370	0.3
Hu	Huntington silt loam	790	0.7
La	Lawrence silt loam	1,030	0.9
Ln	Lindside silt loam	1,940	1.7
LoB	Lowell silt loam, 2 to 6 percent slopes	2,470	2.1
LoC	Lowell silt loam, 6 to 12 percent slopes	3,940	3.4
LsC3	Lowell silty clay loam, 6 to 12 percent slopes, severely eroded	440	0.4
Ne	Newark silt loam	680	0.6
NhB	Nicholson silt loam, 2 to 6 percent slopes	13,640	11.6
NhC	Nicholson silt loam, 6 to 12 percent slopes	1,820	1.5
No	Nolin silt loam	2,710	2.3
OtB	Otwell silt loam, 2 to 6 percent slopes	1,020	0.9
Pt	Pits	180	0.2
We	Weinbach silt loam	560	0.5
WhA	Wheeling silt loam, 0 to 2 percent slopes	230	0.2
WhB	Wheeling silt loam, 2 to 6 percent slopes	650	0.6
WhC	Wheeling silt loam, 6 to 12 percent slopes	310	0.3
WlD	Wheeling soils, 12 to 30 percent slopes	400	0.3
WoB	Woolper silty clay loam, 2 to 6 percent slopes	280	0.2
WoC	Woolper silty clay loam, 6 to 12 percent slopes	230	0.2
	Water	250	0.2
	Total	117,500	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1975. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Corn	Soybeans	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Lb	Tons	AUM[1]
Beasley:					
BeB	100	30	2,600	3.0	8.0
BeC	90	25	2,300	2.5	7.0
BeD	75	---	2,000	2.0	6.0
BfC3	70	---	---	2.0	5.0
BfD3	---	---	---	1.5	4.0
[2]BnF	---	---	---	---	---
Boonesboro:					
Bo	100	40	2,200	3.5	8.5
Brassfield:					
[2]BsE	---	---	---	---	3.0
Caneyville:					
CaC	75	20	1,800	3.0	7.0
[2]CbD	---	---	---	---	3.0
Crider:					
CrA	125	45	3,200	4.5	10.5
CrB	120	45	3,200	4.5	10.5
CrC	95	35	2,900	4.0	9.0
Cynthiana:					
[2]CyF	---	---	---	---	---
Elk:					
ElB	125	40	3,200	4.5	9.0
Faywood:					
FaC	80	25	2,000	3.0	7.0
FaD	---	---	---	2.0	6.0
FsD3	---	---	---	1.5	4.0
Hagerstown:					
HaB	125	45	3,200	4.5	10.0
HaC	95	35	2,900	4.0	9.0
HsC3	80	25	---	3.0	8.0
Huntington:					
Hu	130	45	3,200	4.5	8.0
Lawrence:					
La	80	35	---	30	5.5
Lindside:					
Ln	130	45	3,000	4.0	8.5
Lowell:					
LoB	110	35	2,900	3.0	8.0
LoC	100	30	2,600	3.0	8.0
LsC3	75	---	---	2.0	5.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Tobacco	Grass-legume hay	Pasture
	Bu	Bu	Lb	Tons	AUM[1]
Newark:					
Ne	110	40	2,500	3.5	8.5
Nicholson:					
NhB	90	40	2,600	3.5	8.5
NhC	85	35	2,400	3.5	8.0
Nolin:					
No	135	45	3,200	4.5	9.5
Otwell:					
OtB	95	40	2,600	3.5	8.5
Pits:					
Pt	---	---	---	---	---
Weinbach:					
We	90	35	---	3.5	6.5
Wheeling:					
WhA	125	40	3,000	4.0	9.5
WhB	125	40	3,000	4.0	9.0
WhC	115	35	2,800	3.5	8.5
WlD	90	---	---	3.0	7.5
Woolper:					
WoB	115	40	2,900	3.0	8.0
WoC	100	25	2,600	3.0	8.0

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.
[2]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas excluded. Absence of an entry means no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	6,050	---	---	---
II	39,460	37,930	680	850
III	35,940	34,350	1,590	---
IV	8,490	8,490	---	---
V	---	---	---	---
VI	14,750	9,710	---	5,040
VII	12,380	7,330	---	5,050
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Important trees	Site index	Trees to plant
Beasley:								
BeB, BeC	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern white pine Virginia pine Eastern redcedar	63 69 70 38	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
BeD	3c	Severe	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine Eastern redcedar	63 69 70 38	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
BfC3, BfD3	4c	Severe	Severe	Slight	Slight	Northern red oak Virginia pine Eastern redcedar	60 60 40	Shortleaf pine, loblolly pine, black locust, eastern redcedar.
[1]BnF:								
Beasley part	3c	Severe	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine Eastern redcedar	63 69 70 38	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
Caneyville part	3c	Severe	Severe	Slight	Moderate	Northern red oak Yellow-poplar Eastern redcedar	69 80 45	Eastern redcedar, Virginia pine.
Boonesboro:								
Bo	1o	Slight	Slight	Slight	Severe	Northern red oak	85	Black walnut, eastern cottonwood, sweetgum, yellow-poplar, white ash, eastern white pine, shortleaf pine.
Brassfield:								
[1]BsE:								
Brassfield part	4d	Severe	Moderate	Slight	Slight	Scarlet oak Eastern redcedar	45 40	Eastern redcedar, Virginia pine, Scotch pine.
Beasley part	3c	Severe	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine Eastern redcedar	63 69 70 38	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
Caneyville:								
CaC	3c	Moderate	Moderate	Slight	Moderate	Northern red oak Eastern white pine Yellow-poplar Eastern redcedar	69 80 45	Eastern redcedar, Virginia pine.
[1]CbD:								
Caneyville part	3c	Severe	Severe	Slight	Moderate	Northern red oak Yellow-poplar Eastern redcedar	69 80 45	Eastern redcedar, Virginia pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Important trees	Site index	Trees to plant
Caneyville:								
[1]CbD:								
Beasley part	3c	Severe	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine Eastern redcedar	63 69 70 38	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
Crider:								
CrA, CrB, CrC	1o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Virginia pine Shortleaf pine	88 97 78 80	Eastern white pine, yellow-poplar, black walnut, loblolly pine, white ash.
Cynthiana:								
[1]CyF:								
Cynthiana part	4d	Severe	Severe	Severe	Slight	Eastern redcedar	42	Eastern redcedar, Virginia pine.
Faywood part	3c	Severe	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	70 70 70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar.
Beasley part	3c	Severe	Severe	Slight	Moderate	Northern red oak Virginia pine Eastern white pine Eastern redcedar	63 70 69 38	Shortleaf pine, loblolly pine, eastern white pine, black locust, white ash, eastern redcedar.
Elk:								
ElB	2o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Shortleaf pine Eastern white pine	80 90 80 90	Eastern white pine, yellow-poplar, black walnut, loblolly pine.
Faywood:								
FaC, FaD	3c	Moderate	Severe	Slight	Moderate	Northern red oak Eastern white pine Virginia pine	70 70 70	Shortleaf pine, loblolly pine, eastern white pine, black locust, eastern redcedar.
FsD3	4c	Moderate	Severe	Moderate	Slight	Northern red oak Virginia pine	60 60	Virginia pine, eastern redcedar.
Hagerstown:								
HaB, HaC, HsC3	1o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar	85 95	Black walnut, yellow-poplar, eastern white pine.
Huntington:								
Hu	1o	Slight	Slight	Slight	Severe	Yellow-poplar Northern red oak	95 85	Yellow-poplar, black walnut, eastern white pine.
Lawrence:								
La	2w	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar Sweetgum	70 84 87	Yellow-poplar, white ash, loblolly pine, American sycamore.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Important trees	Site index	Trees to plant
Lindside:								
Ln	1o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar	85 95	Eastern white pine, yellow-poplar, white ash, black walnut.
Lowell:								
LoB, LoC, LsC3	2c	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar Shortleaf pine Virginia pine	70 90 80 80	Yellow-poplar, eastern white pine, shortleaf pine, black walnut, loblolly pine.
Newark:								
Ne	1w	Slight	Moderate	Slight	Severe	Pin oak Eastern cottonwood Northern red oak Yellow-poplar Sweetgum	99 94 85 95 88	Eastern cottonwood, sweetgum, American sycamore, loblolly pine, eastern white pine, yellow-poplar.
Nicholson:								
NhB, NhC	2o	Slight	Slight	Slight	Severe	Northern red oak	80	Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash.
Nolin:								
No	1o	Slight	Slight	Slight	Severe	Sweetgum Yellow-poplar	85 107	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak.
Otwell:								
OtB	3o	Slight	Slight	Slight	Moderate	White oak Yellow-poplar Sugar maple	70 80 70	Eastern white pine, yellow-poplar, white ash.
Weinbach:								
We	2w	Slight	Moderate	Slight	Severe	White oak Pin oak Yellow-poplar Sweetgum	75 85 85 88	Eastern white pine, baldcypress, white ash, American sycamore, yellow-poplar.
Wheeling:								
WhA, WhB, WhC	2o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar, black walnut.
WlD	2r	Moderate	Moderate	Slight	Severe	Northern red oak Yellow-poplar	80 90	Eastern white pine, yellow-poplar, black walnut.
Woolper:								
WoB, WoC	2c	Slight	Moderate	Slight	Severe	Northern red oak Yellow-poplar Shortleaf pine	80 90 80	Black walnut, yellow-poplar, eastern white pine.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

["Depth to rock" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Beasley:					
BeB	Moderate: too clayey.	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.
BeC, BfC3	Moderate: too clayey, slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.
BeD, BfD3	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]BnF:					
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Caneyville part	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Boonesboro:					
Bo	Severe: floods, depth to rock.	Severe: floods.	Severe: floods, depth to rock.	Severe: floods.	Severe: floods.
Brassfield:					
[1]BsE:					
Brassfield part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Caneyville:					
CaC	Severe: depth to rock.	Moderate: low strength, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: low strength, slope, depth to rock.
[1]CbD:					
Caneyville part	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Crider:					
CrA	Slight	Slight	Slight	Slight	Slight.
CrB	Slight	Slight	Slight	Moderate: slope.	Slight.
CrC	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Cynthiana:					
[1]CyF:					
Cynthiana part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Cynthiana:					
[1]CyF:					
Faywood part	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Elk:					
ElB	Slight	Slight	Slight	Moderate: slope.	Slight.
Faywood:					
FaC	Severe: depth to rock.	Moderate: slope, depth to rock, low strength.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, low strength.
FaD, FsD3	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.
Hagerstown:					
HaB	Moderate: depth to rock, too clayey.	Moderate: low strength.	Moderate: depth to rock, low strength.	Moderate: slope, low strength.	Moderate: low strength.
HaC, HsC3	Moderate: slope, depth to rock, too clayey.	Moderate: slope, low strength.	Moderate: slope, depth to rock, low strength.	Severe: slope.	Moderate: low strength, slope.
Huntington:					
Hu	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Lawrence:					
La	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.
Lindside:					
Ln	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods.
Lowell:					
LoB	Moderate: too clayey, depth to rock.	Moderate: low strength.	Moderate: low strength, depth to rock.	Moderate: slope, low strength.	Moderate: low strength.
LoC, LsC3	Moderate: slope, too clayey, depth to rock.	Moderate: slope, low strength.	Moderate: slope, low strength, depth to rock.	Severe: slope.	Moderate: slope, low strength.
Newark:					
Ne	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.
Nicholson:					
NhB	Moderate: wetness.	Moderate: wetness, low strength.	Severe: wetness.	Moderate: slope, wetness, low strength.	Moderate: low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Nicholson:					
NhC	Moderate: wetness, slope.	Moderate: slope, wetness, low strength.	Severe: wetness.	Severe: slope.	Moderate: slope, low strength.
Nolin:					
No	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Otwell:					
OtB	Moderate: wetness.	Moderate: low strength.	Severe: wetness.	Moderate: low strength, slope.	Moderate: low strength.
Pits:					
Pt.					
Weinbach:					
We	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, low strength.
Wheeling:					
WhA	Slight	Slight	Slight	Slight	Slight.
WhB	Slight	Slight	Slight	Moderate: slope.	Slight.
WhC	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
WlD	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Woolper:					
WoB	Moderate: too clayey.	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength.
WoC	Moderate: slope, too clayey.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 9.--SANITARY FACILITIES

["Depth to rock" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry means soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Beasley:					
BeB	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: too clayey.
BeC, BfC3	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: too clayey.
BeD, BfD3	Severe: slope, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: slope.	Poor: slope, too clayey.
[1]BnF:					
Beasley part	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, too clayey.
Caneyville part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, too clayey.
Boonesboro:					
Bo	Severe: floods, depth to rock.	Severe: floods, depth to rock.	Severe: floods, depth to rock.	Severe: floods, seepage.	Fair: thin layer.
Brassfield:					
[1]BsE:					
Brassfield part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
Beasley part	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, too clayey.
Caneyville:					
CaC	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: too clayey.
[1]CbD:					
Caneyville part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, too clayey.
Beasley part	Severe: slope, percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.	Poor: slope, too clayey.
Crider:					
CrA, CrB	Slight	Moderate: seepage.	Slight	Slight	Good.
CrC	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
Cynthiana:					
[1]CyF:					
Cynthiana part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Cynthiana:					
Faywood part	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, too clayey.
Beasley part	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, too clayey.
Elk:					
ElB	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
Faywood:					
FaC	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: too clayey.
FaD, FsD3	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, too clayey.
Hagerstown:					
HaB	Moderate: depth to rock.	Moderate: slope, seepage.	Severe: depth to rock.	Slight	Fair: too clayey.
HaC, HsC3	Moderate: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Fair: too clayey, slope.
Huntington:					
Hu	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Lawrence:					
La	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Good.
Lindside:					
Ln	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
Lowell:					
LoB	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock.	Slight	Poor: too clayey.
LoC, LsC3	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Poor: too clayey.
Newark:					
Ne	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
Nicholson:					
NhB	Severe: percs slowly, wetness.	Moderate: slope.	Severe: depth to rock, wetness.	Moderate: wetness.	Good.
NhC	Severe: percs slowly, wetness.	Severe: slope.	Severe: depth to rock, wetness.	Moderate: wetness, slope.	Fair: slope.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Nolin:					
No	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
Otwell:					
OtB	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Good.
Pits:					
Pt.					
Weinbach:					
We	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Good.
Wheeling:					
WhA	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
WhB	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
WhC	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope.
WlD	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
Woolper:					
WoB	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: too clayey.
WoC	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Poor: too clayey.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 10.--CONSTRUCTION MATERIALS

["Low strength" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry means soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Beasley:				
BeB, BeC, BfC3	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
BeD, BfD3	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
[1]BnF:				
Beasley part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Caneyville part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Boonesboro:				
Bo	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Brassfield:				
[1]BsE:				
Brassfield part	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Beasley part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Caneyville:				
CaC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
[1]CbD:				
Caneyville part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Beasley part	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Crider:				
CrA, CrB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
CrC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Cynthiana:				
[1]CyF:				
Cynthiana part	Poor: slope, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer, too clayey.
Faywood part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cynthiana:				
Beasley part	Poor: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Elk:				
ElB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Faywood:				
FaC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
FaD, FsD3	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, too clayey.
Hagerstown:				
HaB	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
HaC, HsC3	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Huntington:				
Hu	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Lawrence:				
La	Fair: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Lindside:				
Ln	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Lowell:				
LoB, LoC, LsC3	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.
Newark:				
Ne	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Nicholson:				
NhB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
NhC	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.
Nolin:				
No	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Otwell:				
OtB	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Pits:				
Pt.				
Weinbach:				
We	Fair: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Wheeling:				
WhA, WhB	Fair: low strength.	Fair: excess fines.	Fair: excess fines.	Good.
WhC	Fair: low strength.	Fair: excess fines.	Fair: excess fines.	Fair: slope.
W1D	Fair: slope, low strength.	Fair: excess fines.	Fair: excess fines.	Poor: slope.
Woolper:				
WoB, WoC	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: too clayey.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 11.--WATER MANAGEMENT

["Seepage," and some of the other terms that describe restrictive soil features are defined in the Glossary. Absence of an entry means soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Beasley:					
BeB, BeC, BeD, BfC3, BfD3	Slope	Low strength, compressible.	Not needed	Slope	Erodes easily, slope.
[1]BnF:					
Beasley part	Slope	Low strength, compressible.	Not needed	Slope: erodes easily.	Erodes easily, slope.
Caneyville part	Depth to rock, slope.	Low strength, thin layer, compressible.	Not needed	Depth to rock, slope.	Slope, erodes easily, rooting depth.
Boonesboro:					
Bo	Seepage, depth to rock.	Seepage, thin layer.	Not needed	Depth to rock	Rooting depth.
Brassfield:					
[1]BsE:					
Brassfield part	Seepage, slope.	Low strength, piping, hard to pack.	Not needed	Erodes easily, slope, depth to rock.	Slope, erodes easily.
Beasley part	Slope	Low strength, compressible.	Not needed	Slope, erodes easily.	Erodes easily, slope.
Caneyville:					
CaC	Depth to rock, slope.	Low strength, thin layer, compressible.	Not needed	Depth to rock, slope, erodes easily.	Slope, erodes easily, rooting depth.
[1]CbD:					
Caneyville part	Depth to rock, slope.	Low strength, thin layer, compressible.	Not needed	Depth to rock, slope, erodes easily.	Slope, erodes easily, rooting depth.
Beasley part	Slope	Low strength, compressible.	Not needed	Slope, erodes easily.	Erodes easily, slope.
Crider:					
CrA, CrB, CrC	Slope, seepage.	Low strength, compressible, hard to pack.	Not needed	Slope	Erodes easily, slope.
Cynthiana:					
[1]CyF:					
Cynthiana part	Depth to rock, slope.	Thin layer, compressible, low strength.	Not needed	Depth to rock, slope.	Slope, rooting depth.
Faywood part	Depth to rock, slope.	Low strength, thin layer, compressible.	Not needed	Depth to rock, slope.	Slope, erodes easily, rooting depth.
Beasley part	Slope	Low strength, compressible.	Not needed	Slope: erodes easily.	Erodes easily, slope.
Elk:					
ElB	Slope, seepage.	Low strength, piping.	Not needed	Slope, erodes easily.	Slope, erodes easily.
Faywood:					
FaC, FaD, FsD3	Depth to rock, slope.	Low strength, thin layer, compressible.	Not needed	Depth to rock, slope.	Slope, erodes easily, rooting depth.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Hagerstown: HaB, HaC, HsC3	Seepage	Compressible, low strength.	Not needed	Favorable	Favorable.
Huntington: Hu	Slope, seepage.	Low strength, compressible, piping.	Not needed	Not needed	Not needed.
Lawrence: La	Favorable	Low strength, compressible, piping.	Percs slowly, wetness.	Not needed	Percs slowly, wetness, rooting depth.
Lindside: Ln	Seepage	Piping, low strength, compressible.	Floods	Not needed	Not needed.
Lowell: LoB, LoC, LsC3	Slope	Low strength, compressible.	Not needed	Slope	Erodes easily, slope.
Newark: Ne	Seepage	Low strength, piping, compressible.	Wetness, floods, poor outlets.	Not needed	Wetness.
Nicholson: NhB, NhC	Depth to rock, slope.	Compressible, low strength.	Percs slowly, wetness, slope.	Percs slowly, wetness, erodes easily.	Percs slowly, erodes easily.
Nolin: No	Seepage	Piping, low strength.	Not needed	Not needed	Not needed.
Otwell: OtB	Favorable	Low strength, compressible.	Percs slowly, wetness.	Not needed	Erodes easily, percs slowly.
Pits: Pt.					
Weinbach: We	Favorable	Low strength, compressible, piping.	Percs slowly, wetness.	Not needed	Not needed.
Wheeling: WhA, WhB, WhC, WlD	Seepage, slope.	Seepage, piping, low strength.	Not needed	Slope, piping.	Slope, erodes easily.
Woolper: WoB, WoC	Slope	Low strength, compressible.	Not needed	Slope	Erodes easily, slope.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

["Percs slowly" and some of the other terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry means soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Beasley:				
BeB	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
BeC	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
BeD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
BfC3	Moderate: slope, percs slowly, too clayey.	Moderate: too clayey, slope.	Severe: slope.	Moderate: too clayey.
BfD3	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey.
[1]BnF:				
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Caneyville part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Boonesboro:				
Bo	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Brassfield:				
[1]BsE:				
Brassfield part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Caneyville:				
CaC	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
[1]CbD:				
Caneyville part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Crider:				
CrA	Slight	Slight	Slight	Slight.
CrB	Slight	Slight	Moderate: slope.	Slight.
CrC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Cynthiana:				
[1]CyF:				
Cynthiana part	Severe: slope, large stones.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Cynthiana:				
Faywood part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Beasley part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Elk:				
ElB	Slight	Slight	Moderate: slope.	Slight.
Faywood:				
FaC	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.
FaD, FsD3	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Hagerstown:				
HaB	Slight	Slight	Moderate: slope.	Slight.
HaC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
HsC3	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
Huntington:				
Hu	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Lawrence:				
La	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: wetness, percs slowly.	Moderate: wetness.
Lindside:				
Ln	Severe: floods.	Moderate: floods, wetness.	Moderate: floods, wetness.	Slight.
Lowell:				
LoB	Moderate: percs slowly.	Slight	Moderate: percs slowly, slope.	Slight.
LoC	Moderate: percs slowly, slope.	Moderate: slope.	Severe: slope.	Slight.
LsC3	Moderate: percs slowly, slope, too clayey.	Moderate: too clayey.	Severe: slope.	Moderate: too clayey.
Newark:				
Ne	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: wetness.
Nicholson:				
NhB	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight.
NhC	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Nolin:				
No	Severe: floods.	Moderate: floods.	Moderate: floods.	Slight.
Otwell:				
OtB	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight.
Pits:				
Pt.				
Weinbach:				
We	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: percs slowly, wetness.	Moderate: wetness.
Wheeling:				
WhA	Slight	Slight	Slight	Slight.
WhB	Slight	Slight	Moderate: slope.	Slight.
WhC	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
WlD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Woolper:				
WoB	Moderate: percs slowly, too clayey.	Moderate: too clayey.	Moderate: percs slowly, too clayey.	Moderate: too clayey.
WoC	Moderate: percs slowly, slope, too clayey.	Moderate: too clayey, slope.	Severe: slope.	Moderate: too clayey.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Beasley:										
BeB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BeC, BfC3	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BeD, BfD3	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
[1]BnF:										
Beasley part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Caneyville part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Boonesboro:										
Bo	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Brassfield:										
[1]BsE:										
Brassfield part	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Beasley part	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Caneyville:										
CaC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
[1]CbD:										
Caneyville part	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Beasley part	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Crider:										
CrA	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Cynthiana:										
[1]CyF:										
Cynthiana part	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Faywood part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Beasley part	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Elk:										
ElB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Faywood:										
FaC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FaD, FsD3	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hagerstown:										
HaB	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HaC, HsC3	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Huntington:										
Hu	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lawrence:										
La	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Lindside:										
Ln	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Lowell:										
LoB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LoC, LsC3	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Newark:										
Ne	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Nicholson:										
NhB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
NhC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Nolin:										
No	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Otwell:										
OtB	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pits:										
Pt.										
Weinbach:										
We	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Wheeling:										
WhA	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WlD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Woolper:										
WoB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WoC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Beasley:											
BeB, BeC, BeD-----	0-5	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	75-100	25-35	4-10
	5-34	Silty clay, clay	CH, CL	A-7	0	95-100	90-100	85-100	75-100	45-70	20-40
	34-50	Silty clay, clay loam, loam.	CL, ML, CL-ML	A-7, A-6, A-4	0-10	90-100	85-100	75-100	60-95	20-55	4-25
BfC3, BfD3--------	0-5	Silty clay loam	CL	A-6, A-7	0-5	95-100	90-100	80-100	75-100	34-42	15-22
	5-29	Silty clay, clay	CH, CL	A-7	0-5	95-100	90-100	85-100	75-100	45-70	20-40
	29-46	Silty clay, clay loam, loam.	CL, ML, CL-ML	A-7, A-6, A-4	0-10	90-100	85-100	75-100	60-95	20-55	4-25
[1]BnF:											
Beasley part----	0-5	Silt loam-------	ML, CL, CL-ML	A-4	0-5	95-100	90-100	80-100	75-100	25-35	4-10
	5-34	Silty clay, clay	CH, CL	A-7	0-5	95-100	90-100	85-100	75-100	45-70	20-40
	34-50	Silty clay, clay loam, loam.	CL, ML, CL-ML	A-7, A-6, A-4	0-10	90-100	85-100	75-100	60-95	20-55	4-25
Caneyville part-	0-5	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-6	90-100	85-100	75-100	60-95	20-35	2-12
	5-31	Silty clay, clay, silty clay loam.	CH, CL	A-7, A-6	0-3	90-100	85-100	75-100	65-100	35-70	20-45
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Boonesboro:											
Bo----------	0-14	Silt loam-------	ML, CL, CL-ML	A-4, A-6, A-7	0-5	90-100	85-100	80-100	70-95	25-42	5-20
	14-28	Gravelly silt loam, gravelly silty clay loam, very gravelly clay loam.	ML, GC, CL, CL-ML, GC-GM	A-2, A-4, A-6, A-7	0-20	50-75	40-70	35-65	25-60	25-42	5-20
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Brassfield:											
[1]BsE:											
Brassfield part-	0-5	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-10	85-95	70-90	70-90	55-85	<35	NP-15
	5-24	Silt loam, loam, silty clay loam.	ML, CL-ML, CL, SM	A-4	5-15	80-90	70-90	50-90	35-85	<35	NP-10
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Beasley part----	0-5	Silt loam-------	ML, CL, CL-ML	A-4	0-5	95-100	90-100	80-100	75-100	25-35	4-10
	5-34	Silty clay, clay	CH, CL	A-7	0-5	95-100	90-100	85-100	75-100	45-70	20-40
	34-50	Silty clay, clay loam, loam.	CL, CH, ML, CL-ML	A-7, A-6, A-4	0-10	90-100	85-100	75-100	60-95	20-55	4-35
Caneyville:											
CaC----------	0-5	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-6	90-100	85-100	75-100	60-95	20-35	2-12
	5-31	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	35-70	20-45
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Caneyville:											
[1]CbD:											
Caneyville part-	0-5	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	5-31	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Beasley part----	0-5	Silt loam-------	ML, CL, CL-ML	A-4	0-5	95-100	90-100	80-100	75-100	25-35	4-10
	5-34	Silty clay, clay	CH, CL	A-7	0-5	95-100	90-100	85-100	75-100	45-70	20-40
	34-50	Silty clay, clay loam, gravelly loam.	CL, CH, CL-ML, ML	A-7, A-6, A-4	0-10	90-100	85-100	75-100	60-95	20-55	4-35
Crider:											
CrA, CrB, CrC-----	0-13	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	13-40	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	40-98	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
Cynthiana:											
[1]CyF:											
Cynthiana part--	0-5	Silty clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0-30	70-100	65-100	60-100	55-100	25-42	4-20
	5-17	Flaggy clay, flaggy silty clay, clay.	MH, CH, CL	A-7	5-30	70-100	65-100	60-100	55-100	45-75	20-45
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Faywood part----	0-4	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-15	90-100	90-100	80-100	70-95	25-42	4-20
	4-31	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	40-70	20-45
	31	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Beasley part----	0-5	Silt loam-------	ML, CL, CL-ML	A-4	0-5	95-100	90-100	80-100	75-100	25-35	4-10
	5-34	Silty clay, clay	CH, CL	A-7	0-5	95-100	90-100	85-100	75-100	45-70	20-40
	34-50	Silty clay, clay loam, gravelly loam.	CL, CH, ML, CL-ML	A-7, A-6, A-4	0-10	90-100	85-100	75-100	60-95	20-55	4-35
Elk:											
ElB----------	0-7	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	70-95	25-35	3-10
	7-36	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
	36-62	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	50-95	25-40	5-15
Faywood:											
FaC, FaD----------	0-4	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-15	90-100	90-100	80-100	70-95	25-42	4-20
	4-31	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	40-70	20-45
	31	Weathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Faywood:											
FsD3	0-4	Silty clay	CL, CH, MH	A-7	0-15	90-100	90-100	85-100	80-100	45-60	20-30
	4-27	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	40-70	20-45
	27	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Hagerstown:											
HaB, HaC	0-5	Silt loam	CL-ML, CL	A-4, A-6	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	5-76	Clay, silty clay, silty clay loam.	CH, MH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	33-71	13-37
HsC3	0-5	Silty clay loam	CL	A-7, A-6	0-5	85-100	80-100	80-100	70-95	25-50	15-25
	5-71	Clay, silty clay, silty clay loam.	CH, MH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	33-71	13-37
Huntington:											
Hu	0-10	Silt loam	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
	10-72	Silt loam, loam, silty clay loam.	ML, CL	A-4, A-6	0	95-100	95-100	85-100	60-95	25-35	5-15
Lawrence:											
La	0-8	Silt loam	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-100	25-35	2-10
	8-22	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	22-38	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	38-63	Silty clay, silty clay loam, silt loam.	ML, CL, MH, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	75-100	25-60	5-25
Lindside:											
Ln	0-48	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	85-100	60-95	25-50	2-25
	48-60	Stratified silty clay loam to fine sandy loam.	ML, CL, SM, SC	A-2, A-4, A-6	0	100	95-100	60-100	30-95	20-50	1-25
Lowell:											
LoB, LoC	0-6	Silt loam	ML, CL, CL-ML	A-4	0-2	100	95-100	90-100	85-100	25-35	4-10
	6-27	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0-2	100	95-100	90-100	85-100	35-65	15-45
	27-59	Clay, silty clay	CH, MH, CL	A-7	0-10	95-100	90-100	85-100	75-100	45-75	20-45
	59	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LsC3	0-6	Silty clay loam	CL	A-6, A-7	0-2	100	95-100	90-100	85-100	34-42	15-22
	6-21	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7	0-2	100	95-100	90-100	85-100	35-65	15-45
	21-53	Clay, silty clay	CH, MH, CL	A-7	0-10	95-100	90-100	85-100	75-100	45-75	20-45
	53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Newark:											
Ne	0-9	Silt loam	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<35	NP-10
	9-38	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	25-42	5-20
	38-68	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	25-42	5-20
Nicholson:											
NhB, NhC	0-7	Silt loam	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	7-27	Silty clay loam, silt loam.	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	95-100	85-100	80-100	25-45	5-20
	27-36	Silty clay loam, silt loam.	CL, ML, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	36-58	Silty clay, clay, channery clay.	CH, MH, CL	A-7	0-10	80-100	70-100	60-100	55-95	45-70	20-40
Nolin:											
No	0-8	Silt loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	8-85	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	100	80-100	70-100	55-90	25-40	5-18
Otwell:											
OtB	0-7	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	7-24	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	24-33	Silty clay loam, loam, silt loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	85-100	65-90	35-50	5-20
	33-62	Silty clay, silty clay loam, silty clay, loam.	CL, ML, MH	A-6, A-7, A-4	0	95-100	80-100	72-100	60-95	30-55	5-25
Pits:											
Pt.											
Weinbach:											
We	0-8	Silt loam	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	60-90	20-35	5-15
	8-23	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	8-15
	23-39	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	70-90	25-35	8-15
	39-54	Silty clay loam, silt loam.	CL, ML, CL-ML	A-6, A-7, A-4	0	90-100	85-100	75-100	65-95	30-45	5-20
Wheeling:											
WhA, WhB, WhC, WlD	0-10	Silt loam	ML, CL, CL-ML	A-4, A-6, A-7	0	90-100	90-100	85-100	65-90	<35	NP-10
	10-46	Silty clay loam, loam, gravelly sandy loam.	ML, CL, SM, CL-ML	A-4, A-6, A-7	0-5	90-100	75-100	45-95	35-85	<35	NP-20
	46-62	Stratified very fine sand to gravel.	GM, SM, SC-SM, SC	A-2, A-3	0-10	55-90	50-75	45-70	12-25	<15	NP-5
Woolper:											
WoB, WoC	0-7	Silty clay loam	CL, ML	A-6, A-7, A-4	0-10	95-100	90-100	85-100	75-100	34-42	10-22
	7-43	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	90-100	85-100	75-100	35-65	15-40
	43-55	Clay, silty clay	CH, CL	A-7	0-10	95-100	90-100	85-100	75-100	45-75	20-45

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than. The erosion tolerance factor (T) is for the entire profile. Absence of an entry means data were not available or were not estimated.

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Beasley:									
BeB, BeC, BeD-----	0-5	0.6-2.0	0.18-0.23	4.5-6.0	Low-------	Moderate------	Moderate-------	0.43	3
	5-34	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	Moderate------	Moderate-------	0.28	
	34-50	0.2-0.6	0.10-0.16	6.6-8.4	Moderate	Low----------	Low----------	0.28	
BfC3, BfD3--------	0-5	0.6-2.0	0.18-0.23	4.5-6.0	Low-------	Moderate------	Moderate-------	0.43	3
	5-29	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	Moderate------	Moderate-------	0.28	
	29-46	0.2-0.6	0.10-0.16	6.6-8.4	Moderate	Low----------	Low----------	0.28	
[1]BnF:									
Beasley part----	0-5	0.6-2.0	0.18-0.23	4.5-6.0	Low-------	Moderate------	Moderate-------	0.43	3
	5-34	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	Moderate------	Moderate-------	0.28	
	34-50	0.2-0.6	0.10-0.16	6.6-8.4	Moderate	Low----------	Low----------	0.28	
Caneyville part-	0-5	0.6-2.0	0.15-0.22	5.6-7.3	Low-------	Moderate------	Moderate-------	0.43	3
	5-31	0.2-0.6	0.12-0.18	5.6-7.3	Moderate	High----------	Moderate-------	0.28	
	31	---	---	---	----------	----------	----------	---	
Boonesboro:									
Bo----------	0-14	0.6-2.0	0.18-0.23	6.1-7.8	Low-------	Low----------	Low----------	0.37	3
	14-28	6.0-20.0	0.06-0.12	6.1-7.8	Low-------	Low----------	Low----------	0.17	
	28	---	---	---	----------	----------	----------	---	
Brassfield:									
[1]BsE:									
Brassfield part-	0-5	0.6-2.0	0.14-0.20	7.4-8.4	Low-------	Low----------	Low----------	0.43	2
	5-24	0.6-2.0	0.10-0.18	7.4-8.4	Low-------	Low----------	Low----------	0.17	
	24	---	---	---	----------	----------	----------	---	
Beasley part----	0-5	0.6-2.0	0.18-0.23	4.5-6.0	Low-------	Moderate------	Moderate-------	0.43	3
	5-34	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	Moderate------	Moderate-------	0.28	
	34-50	0.2-0.6	0.10-0.16	6.6-8.4	Moderate	Low----------	Low----------	0.28	
Caneyville:									
CaC----------	0-5	0.6-2.0	0.15-0.22	5.6-7.3	Low-------	Moderate------	Moderate-------	0.43	3
	5-31	0.2-0.6	0.12-0.18	5.6-7.3	Moderate	High----------	Moderate-------	0.28	
	31	---	---	---	----------	----------	----------	---	
[1]CbD:									
Caneyville part-	0-5	0.6-2.0	0.15-0.22	5.6-7.3	Low-------	Moderate------	Moderate-------	0.43	3
	5-31	0.2-0.6	0.12-0.18	5.6-7.3	Moderate	High----------	Moderate-------	0.28	
	31	---	---	---	----------	----------	----------	---	
Beasley part----	0-5	0.6-2.0	0.18-0.23	4.5-6.0	Low-------	Moderate------	Moderate-------	0.43	3
	5-34	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	Moderate------	Moderate-------	0.28	
	34-50	0.2-0.6	0.10-0.16	6.6-8.4	Moderate	Low----------	Low----------	0.28	
Crider:									
CrA, CrB, CrC-----	0-13	0.6-2.0	0.19-0.23	5.1-6.5	Low-------	Moderate------	Moderate-------	0.32	4
	13-40	0.6-2.0	0.18-0.23	5.1-6.5	Low-------	Moderate------	Moderate-------	0.28	
	40-98	0.6-2.0	0.12-0.18	5.1-6.0	Moderate	Moderate------	Moderate-------	0.28	
Cynthiana:									
[1]CyF:									
Cynthiana part--	0-5	0.6-2.0	0.15-0.20	6.1-7.8	Moderate	Moderate------	Low----------	0.37	2
	5-17	0.2-0.6	0.08-0.15	6.1-7.8	Moderate	Moderate------	Low----------	0.28	
	17	---	---	---	----------	----------	----------	---	
Faywood part----	0-4	0.6-2.0	0.18-0.22	5.1-7.3	Low-------	High----------	Moderate-------	0.37	3
	4-31	0.06-0.6	0.12-0.17	5.1-7.3	Moderate	High----------	Moderate-------	0.28	
	31	---	---	---	----------	----------	----------	---	
Beasley part----	0-5	0.6-2.0	0.18-0.23	4.5-6.0	Low-------	Moderate------	Moderate-------	0.43	3
	5-34	0.2-0.6	0.12-0.18	4.5-6.0	Moderate	Moderate------	Moderate-------	0.28	
	34-50	0.2-0.6	0.10-0.16	6.6-8.4	Moderate	Low----------	Low----------	0.28	

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Elk:									
ElB	0-7	0.6-2.0	0.18-0.23	4.5-6.0	Low	Moderate	Moderate	0.32	4
	7-36	0.6-2.0	0.18-0.22	4.5-6.0	Low	Moderate	Moderate	0.28	
	36-62	0.6-2.0	0.14-0.20	5.1-6.5	Low	Moderate	Moderate	0.28	
Faywood:									
FaC, FaD	0-4	0.6-2.0	0.18-0.22	5.1-7.3	Low	High	Moderate	0.37	3
	4-31	0.06-0.6	0.12-0.17	5.1-7.3	Moderate	High	Moderate	0.28	
	31	---	---	---	---	---	---	---	
FsD3	0-4	0.2-0.6	0.14-0.18	5.1-7.3	Moderate	High	Moderate	0.37	2
	4-27	0.06-0.6	0.12-0.17	5.1-7.3	Moderate	High	Moderate	0.28	
	27	---	---	---	---	---	---	---	
Hagerstown:									
HaB, HaC, HsC3	0-16	0.6-6.0	0.16-0.24	5.1-6.5	Low	Moderate	Low	0.32	4
	16-76	0.6-2.0	0.10-0.24	5.1-7.3	Moderate	Moderate	Low	0.28	
Huntington:									
Hu	0-10	0.6-2.0	0.18-0.24	5.6-7.8	Low	Low	Moderate	0.43	5
	10-72	0.6-2.0	0.10-0.16	5.6-7.8	Low	Low	Moderate	0.43	
Lawrence:									
La	0-8	0.6-2.0	0.19-0.23	4.5-5.5	Low	High	High	0.43	3
	8-22	0.6-2.0	0.18-0.22	4.5-5.5	Low	High	High	0.37	
	22-38	0.06-0.2	0.08-0.12	4.5-5.5	Low	High	High	0.43	
	38-63	0.06-0.6	0.08-0.12	4.5-7.3	Low	High	High	0.37	
Lindside:									
Ln	0-48	0.6-2.0	0.18-0.26	5.6-7.3	Low	Moderate	Low	0.43	5
	48-60	0.6-2.0	0.12-0.18	5.6-7.8	Low	Moderate	Moderate	0.43	
Lowell:									
LoB, LoC	0-6	0.6-2.0	0.18-0.23	4.5-6.5	Low	High	Moderate	0.37	3
	6-27	0.2-2.0	0.13-0.19	4.5-6.5	Moderate	High	Moderate	0.28	
	27-59	0.2-0.6	0.12-0.17	5.1-7.8	Moderate	High	Moderate	0.28	
	59	---	---	---	---	---	---	---	
LsC3	0-6	0.6-2.0	0.18-0.23	4.5-6.5	Low	High	Moderate	0.37	3
	6-21	0.2-2.0	0.13-0.19	4.5-6.5	Moderate	High	Moderate	0.28	
	21-53	0.2-0.6	0.12-0.17	5.1-7.8	Moderate	High	Moderate	0.28	
	53	---	---	---	---	---	---	---	
Newark:									
Ne	0-9	0.6-2.0	0.15-0.23	5.6-7.8	Low	High	Low	0.43	5
	9-68	0.6-2.0	0.18-0.23	5.6-7.8	Low	High	Low	0.43	
Nicholson:									
NhB, NhC	0-7	0.6-2.0	0.19-0.23	4.5-6.0	Low	Moderate	Moderate	0.43	3
	7-27	0.6-2.0	0.18-0.22	4.5-6.0	Low	Moderate	Moderate	0.43	
	27-36	0.06-0.2	0.07-0.12	4.5-6.0	Low	Moderate	Moderate	0.43	
	36-58	0.06-0.6	0.07-0.12	5.1-7.8	Moderate	High	Moderate	0.37	
Nolin:									
No	0-8	0.6-2.0	0.18-0.23	5.6-8.4	Low	Low	Moderate	0.43	5
	8-85	0.6-2.0	0.18-0.23	5.6-7.8	Low	Low	Moderate	0.43	
Otwell:									
OtB	0-7	0.6-2.0	0.22-0.24	4.5-7.3	Low	Moderate	High	0.43	3
	7-24	0.06-0.2	0.18-0.22	5.1-5.5	Low	Moderate	High	0.43	
	24-33	<0.06	0.06-0.08	4.5-5.5	Low	Moderate	High	0.43	
	33-62	0.06-0.2	0.06-0.08	4.5-7.3	Low	Moderate	High	0.37	
Pits:									
Pt.									

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T
	In	In/hr	In/in	pH					
Weinbach:									
We	0-8	0.6-2.0	0.20-0.24	4.5-7.3	Low	High	High	0.43	3
	8-23	0.6-2.0	0.20-0.22	4.5-6.0	Low	High	High	0.43	
	23-39	<0.2	0.06-0.08	4.5-5.5	Low	High	High	0.43	
	39-54	<0.2	0.06-0.08	4.5-5.5	Low	High	High	0.43	
Wheeling:									
WhA, WhB, WhC, WlD	0-10	0.6-6.0	0.12-0.18	5.1-6.0	Low	Low	Moderate	0.32	4
	10-46	0.6-2.0	0.08-0.12	5.1-6.0	Low	Low	Moderate	0.28	
	46-62	6.0-20	0.04-0.08	5.1-7.3	Low	Low	Moderate	0.24	
Woolper:									
WoB, WoC	0-7	0.6-2.0	0.18-0.22	6.1-7.8	Low	Moderate	Low	0.37	3
	7-43	0.2-2.0	0.13-0.19	6.1-7.8	Moderate	Moderate	Low	0.28	
	43-55	0.06-0.6	0.12-0.17	6.1-7.8	Moderate	Moderate	Low	0.28	

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See text for descriptions of symbols and such terms as "rare," "brief," and "perched." The symbol < means less than; > means greater than]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
Beasley:									
BeB, BeC, BeD, BfC3, BfD3	C	None	---	---	>6.0	---	---	>60	---
[1]BnF:									
Beasley part	C	None	---	---	>6.0	---	---	>60	---
Caneyville part	C	None	---	---	---	---	---	20-40	Hard
Boonesboro:									
Bo	B	Frequent	Brief	Jan-Apr	---	---	---	20-40	Hard
Brassfield:									
[1]BsE:									
Brassfield part	B	None	---	---	>6.0	---	---	20-40	Rippable
Beasley part	C	None	---	---	>6.0	---	---	>60	---
Caneyville:									
CaC	C	None	---	---	---	---	---	20-40	Hard
[1]CbD:									
Caneyville part	C	None	---	---	---	---	---	20-40	Hard
Beasley part	C	None	---	---	>6.0	---	---	>60	---
Crider:									
CrA, CrB, CrC	B	None	---	---	>6.0	---	---	>60	Hard
Cynthiana:									
[1]CyF:									
Cynthiana part	D	None	---	---	---	---	---	10-20	Hard
Faywood part	C	None	---	---	---	---	---	20-40	Hard
Beasley part	C	None	---	---	>6.0	---	---	>60	---
Elk:									
ElB	B	None	---	---	>6.0	---	---	>60	---
Faywood:									
FaC, FaD, FsD3	C	None	---	---	---	---	---	20-40	Hard
Hagerstown:									
HaB, HaC, HsC3	C	None	---	---	>6.0	---	---	>48	Hard
Huntington:									
Hu	B	Frequent	Brief	Jan-May	4.0-6.0	Apparent	Dec-Apr	>60	---
Lawrence:									
La	C	None	---	---	1.0-2.0	Perched	Dec-Apr	>60	---
Lindside:									
Ln	C	Frequent	Brief	Jan-May	1.5-3.0	Apparent	Dec-Apr	>60	---
Lowell:									
LoB, LoC, LsC3	C	None	---	---	>6.0	---	---	>40	Hard
Newark:									
Ne	C	Frequent	Brief	Jan-May	0.5-1.5	Apparent	Dec-Apr	>60	---
Nicholson:									
NhB, NhC	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>48	Hard

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness
					Ft			In	
Nolin:									
No	B	Frequent	Brief	Jan-May	4.0-6.0	Apparent	Feb-Mar	>60	---
Otwell:									
OtB	C	None common.	---	---	1.5-2.5	Perched	Jan-Apr	>60	---
Pits:									
Pt.									
Weinbach:									
We	C	None	---	---	1.0-2.0	Perched	Jan-Apr	>60	---
Wheeling:									
WhA, WhB, WhC, WlD	B	None	---	---	>6.0	---	---	>60	---
Woolper:									
WoB, WoC	C	None	---	---	>6.0	---	---	>60	---

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior of the whole mapping unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Beasley	Fine, mixed, mesic Typic Hapludalfs
Boonesboro	Fine-loamy, mixed, mesic Fluventic Hapludolls
Brassfield	Fine-loamy, carbonatic, mesic Rendollic Eutrochrepts
Caneyville	Fine, mixed, mesic Typic Hapludalfs
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Cynthiana	Clayey, mixed, mesic Lithic Hapludalfs
Elk	Fine-silty, mixed, mesic Ultic Hapludalfs
Faywood	Fine, mixed, mesic Typic Hapludalfs
Hagerstown	Fine, mixed, mesic Typic Hapludalfs
Huntington	Fine-silty, mixed, mesic Fluventic Hapludolls
Lawrence	Fine-silty, mixed, mesic Aquic Fragiudalfs
Lindside	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Lowell	Fine, mixed, mesic Typic Hapludalfs
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Otwell	Fine-silty, mixed, mesic Typic Fragiudalfs
Weinbach	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Wheeling	Fine-loamy, mixed, mesic Ultic Hapludalfs
Woolper	Fine, mixed, mesic Typic Argiudolls

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