United States
Department of
Agriculture

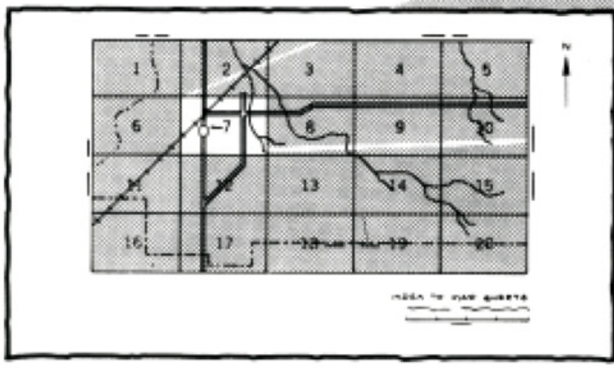
Soil
Conservation
Service

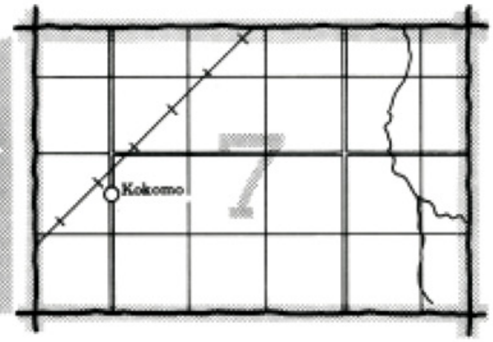
In cooperation with
Kentucky Natural Resources
and Environmental
Protection Cabinet and
Kentucky Agricultural
Experiment Station

Soil Survey of Mason County, Kentucky

HOW TO USE

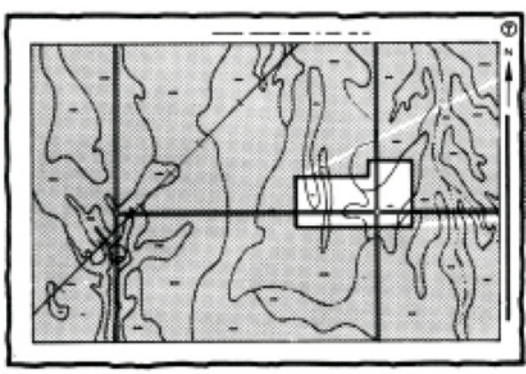
1. Locate your area of interest on the "Index to Map Sheets"

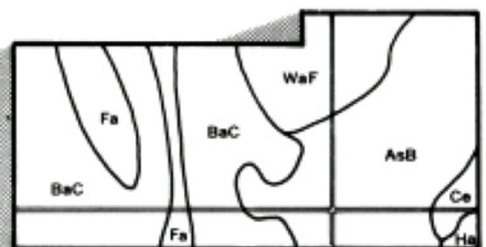




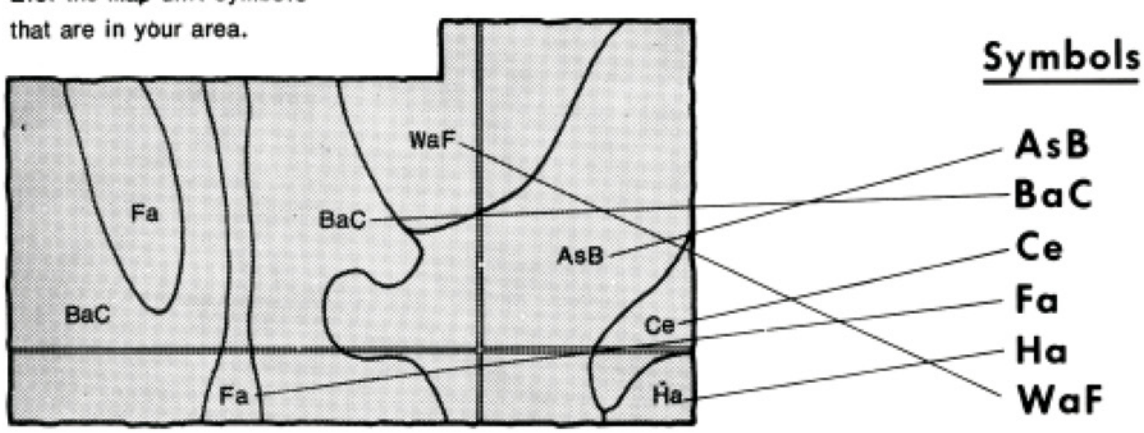
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



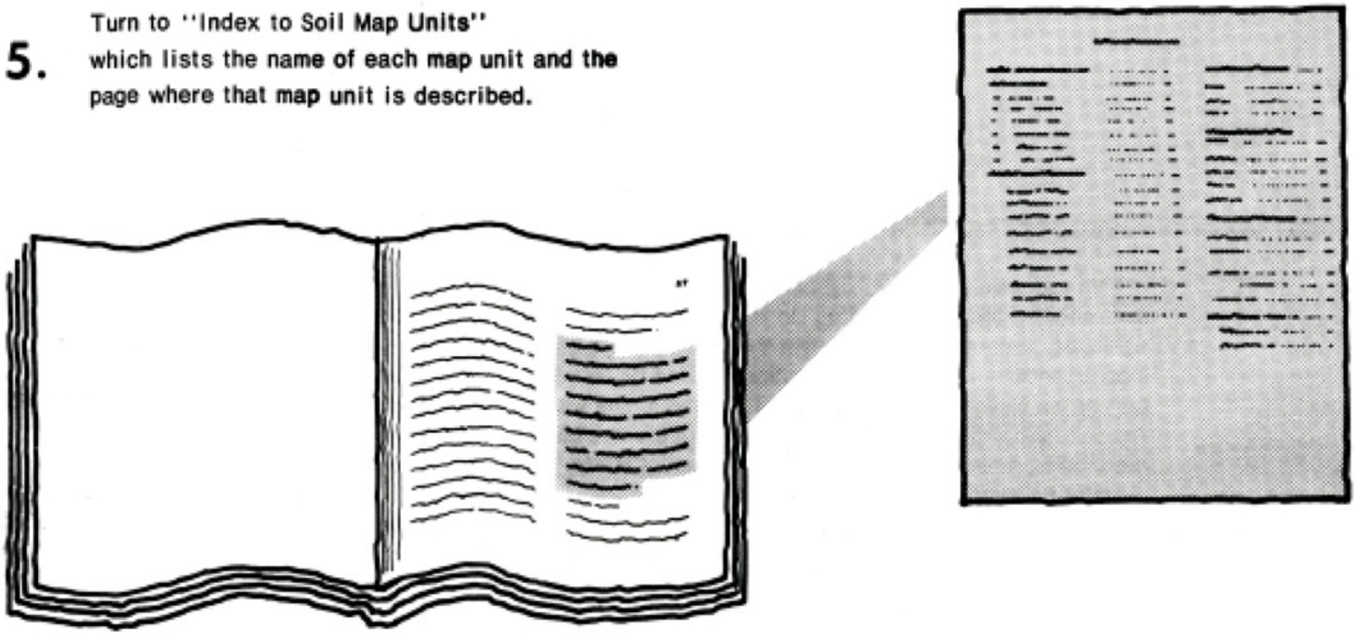


4. List the map unit symbols that are in your area.

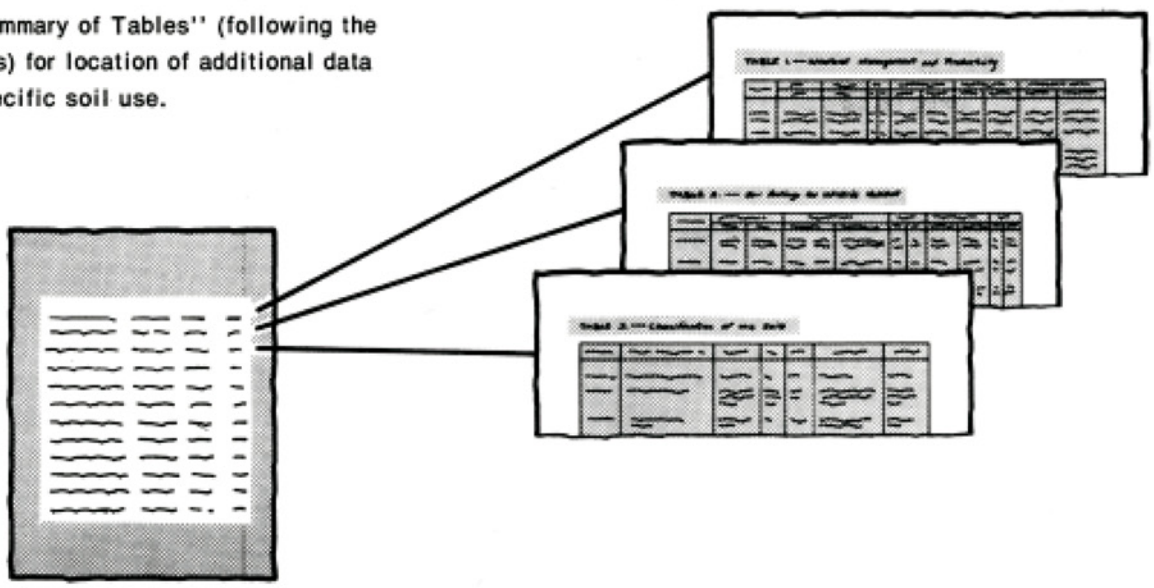


THIS SOIL SURVEY

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

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This soil survey was made cooperatively by the Soil Conservation Service, the Kentucky Natural Resources and Environmental Protection Cabinet, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Mason County Conservation District.

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

The first soil survey of Mason County was published in 1903. The present survey updates the first survey and provides additional information and larger maps that show the soils in greater detail than in the first soil survey.

Cover: Farmstead and tobacco in an area of Nicholson silt loam, 2 to 6 percent slopes.

Contents

Soil Series

Issued September 1986

Index to Map Units

Summary of Tables

Foreword

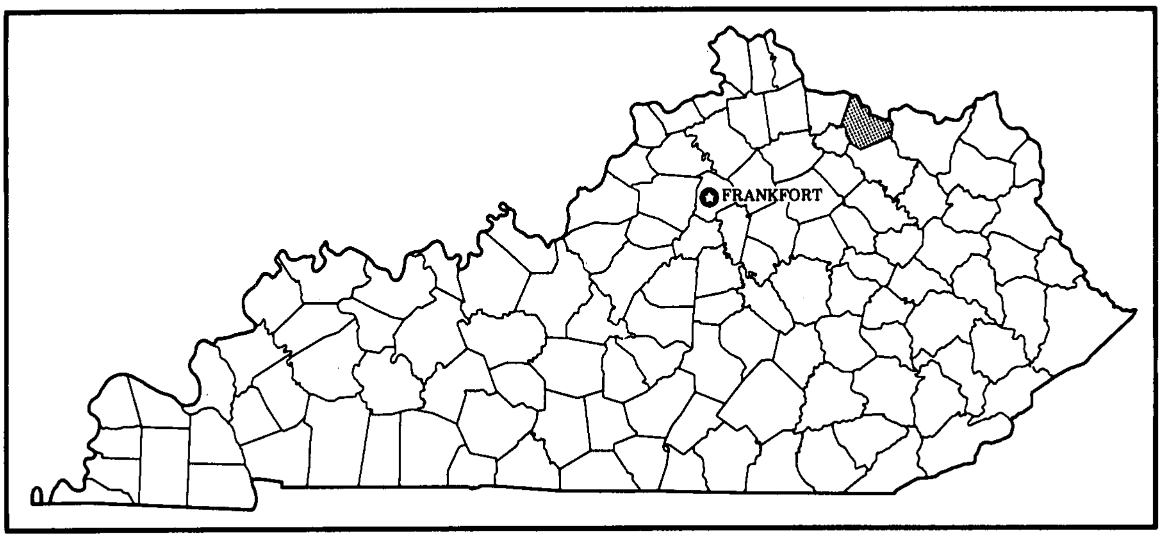
This soil survey contains information that can be used in land-planning programs in Mason County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of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

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

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

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

Randall W. Giessler
State Conservationist
Soil Conservation Service



Location of Mason County in Kentucky.

Soil Survey of
Mason County, Kentucky

By Rudy Forsythe and Steve E. Jacobs, Soil Conservation Service

Fieldwork by Rudy Forsythe and Steve E. Jacobs,
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
Kentucky Natural Resources and Environmental Protection Cabinet
and Kentucky Agricultural Experiment Station

MASON COUNTY is in the northeastern part of Kentucky. It is bounded on the north by the Ohio River, on the east by Lewis County, on the south by Fleming County, and on the west by Bracken and Robertson Counties.

Mason County has an area of 157,683 acres, or about 246 square miles. Maysville, the county seat, has a population of about 7,983. The population of the county is about 17,760 *(6)*.

The topography of the county is dominantly undulating to very steep and is dissected by many small streams. The North Fork Licking River is the largest stream within the county. It flows through the central part of the county in a westward direction. Elevation in Mason County ranges from about 500 feet above sea level along the Ohio River to about 1,000 feet above sea level southeast of Mays Lick (*9*).

Farming has been important in Mason County since the first settlement. Tobacco, corn, soybeans, wheat, hay, and pasture are the main crops. Dairy cattle, beef cattle, and hogs are the main livestock enterprises in the county.

General Nature of the Survey Area

This section gives general information about Mason County. It discusses climate; physiography, geology, relief, and drainage; farming; and the history and settlement of the area.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Maysville in the period 1951 to 1979. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 23 degrees. The lowest temperature on record, which occurred at Maysville on January 29, 1963, is -19 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred at Maysville on July 15, 1954, is 104 degrees.

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

The total annual precipitation is 44 inches. Of this, 24 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 3.66 inches at Maysville on August 26, 1967. Thunderstorms occur on about 45 days each year, and most occur in summer.

The average seasonal snowfall is 11 inches. The greatest snow depth at any one time during the period of record was 17 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 11 miles per hour, in spring.

Physiography, Geology, Relief, and Drainage

Mason County is located in two physiographic regions: the Outer Bluegrass and the Hills of the Bluegrass. Most of the county is in the Outer Bluegrass Physiographic Region which covers the central, southern, and eastern parts of the county. The remainder of the county, the northern and western parts, are in the Hills of the Bluegrass Physiographic Region.

Mason County is underlain mostly by the Ordovician and Silurian Geologic Systems *(10)*. Table 4 shows the geologic systems of Mason County, their relative thickness, and the predominant soils that formed on them. The Ordovician System is more extensive than the Silurian System, which occurs only in the eastern part of the county. The Silurian System consists of dolomite and dolomitic limestone interbedded with clay shales of the Crab Orchard and Brassfield Formations. The parent material of the Beasley soils is derived from these rocks. The Ordovician System consists of interbedded limestone, shale, and siltstone of the Preachersville Member of Drakes Formation and the Bull Fork, Grant Lake, Fairview, Kope, and Clays Ferry Formations. The parent material of Cynthiana soils is derived mostly from rock of the Bull Fork Formation, and the parent material of Lowell soils is derived mostly from the rock of the Grant Lake Formation. Eden soils formed mostly from the interbedded shale, limestone, and siltstone materials of the Kope and Clays Ferry Formations, which are the lower part of the Ordovician System (fig. 1). The soils of the flood plains and terraces formed in material of the Quaternary System consisting of alluvium, glacial outwash, eolian deposits, and small areas of high level fluvial deposits. Many of the broad ridges have a thin loess mantle.

The relief ranges from undulating to very steep. About one-half of the county consists of undulating ridges and rolling hillsides. The broadest ridges are in the central and west-central parts of the county. The very steep areas are in the northern, western, and eastern parts of the county and along the major streams. The northern third of the county drains north to the Ohio River, and most of the rest of the county is drained to the west by the North Fork Licking River. A small area in the southwestern part of the county drains southwest through Robertson and Fleming Counties to the Licking River.

Farming

Mason County is dominantly agricultural. In 1981, according to the Kentucky Agricultural statistics report *(7)*, there were 938 farms in Mason County, and the average size of a farm was 149 acres. About 92 percent of the county is farmland. Cash receipts, which vary from year to year, are usually made up evenly of total livestock receipts and total crop receipts.

The principal crops grown in Mason County in 1980 were tobacco, corn, soybeans, and winter wheat. Burley tobacco was the chief cash crop. Corn was grown for silage and feed and as a cash crop. About one-half of the wheat was grown for a cash crop; the rest was grown for a winter cover crop. Mason County usually ranks in the top 15 counties in Kentucky in burley tobacco production. Maysville has 14 tobacco warehouses and is known as the world's second largest looseleaf burley tobacco market.

Hay crops and pasture, which are grown for feed, are produced in mixtures of grasses and legumes. The principal hay crops are alfalfa, red clover, timothy, orchardgrass, and Kentucky 31 fescue. The most common pasture plants are Kentucky 31 fescue, Kentucky bluegrass, and orchardgrass. Red clover and white clover are usually used as the legume in the pasture mixtures. Fescue and orchardgrass hay are rolled into round bales and are generally moved to storage areas until taken back to the field for winter feeding (fig. 2).

Dairying is the leading livestock enterprise, followed by beef cattle and hogs. Mason County usually ranks in the top 15 counties in Kentucky in the total milk production. Horses, sheep, poultry, and goats are also raised in the county.

History and Settlement

Mason County was organized in 1788 from part of Bourbon County, Virginia, and was the eighth county to be formed when Kentucky became a state in 1792. Settlement began before the Revolutionary War. In 1751 Christopher Gist entered the area to conduct a limited survey for the Ohio Land Company. He was followed in 1771 by Simon Kenton, who later played a key role in the settlement of the county. Early settlers came from

Figure 1.—Interbedded shale, limestone, and siltstone of the Kope Formation underlie Eden soils.

Pennsylvania, Virginia, North Carolina, Maryland, and New Jersey *(3)*.

Maysville, known as Limestone prior to 1793, was founded as a station on the Ohio River in 1784. Maysville was established as a town in 1787 and became the county seat in 1848. The first turnpike in the state connected Maysville with Paris and Lexington.

Farming has been important in Mason County since the first settlement was established. In 1787 the Legislature of Virginia established the Limestone Warehouse, the first tobacco warehouse in Northern Kentucky, for receiving and inspecting tobacco. The early settlers also grew corn, wheat, flax, and hemp. The surpluses of these crops were floated down the Ohio and Mississippi Rivers to markets in New Orleans where needed commodities, such as sugar or coffee, were purchased and brought back. Hemp was formerly the main cash crop of the county but began to decline after 1847 and is no longer grown. Farming is still the main occupation in Mason County.

The original timber was walnut, butternut, sugar maple, ash, hickory, elm, and bur oak (fig. 3). The early settlers cleared the lightly-timbered lands and the caneland first, and it was some time later that the heavily-wooded areas of the Bluegrass Basin of Mason County were cleared.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material from which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining

Figure 2.—Hayland in the foreground in an area of Lowell silt loam, 2 to 6 percent slopes, and in the background in an area of steeper Faywood-Lowell silt loams, 6 to 12 percent slopes.

Figure 3.—Cattle grazing beneath bur oaks in an area of Lowell soils.

their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. In the detailed soil map units, these latter soils are called inclusions or included soils. In the general soil map units, they are called soils of minor extent.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed, and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Wheeling-Nolin-Otwell

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

This map unit is in the northern part of the county on the terraces and flood plains of the Ohio River. The landscape is characterized by long, wide terraces breaking to short side slopes and descending to narrow flood plains. Slopes range from 0 to 55 percent but are dominantly 0 to 6 percent on the terraces and flood plains and 15 to 35 percent on the terrace side slopes.

Most of the less sloping areas of this map unit are used for residential, commercial, and industrial sites. East Kentucky Spurlock Station, the city of Dover, and most of downtown Maysville are in this map unit. Much of the remaining acreage is in cultivated crops, hay, and pasture. Farmsteads are scattered throughout the mapped area. The steeper areas generally are in brush or woodland. Small tracts of woodland are in the wetter areas. A few creeks or perennial streams as well as a few intermittent streams flow through this map unit. Most of the ponds are pit type.

This map unit makes up about 2 percent of the county. It is about 57 percent Wheeling soils, 18 percent Nolin soils, 12 percent Otwell soils, and 13 percent soils of minor extent.

Wheeling soils are nearly level to very steep, well drained soils on long, wide terraces and terrace side slopes. They have a surface layer of silt loam and a moderately permeable, silty clay loam subsoil.

Nolin soils are nearly level, well drained soils on narrow flood plains. They are moderately permeable and are dominantly silt loam throughout. These soils are subject to brief flooding in winter and in spring.

Otwell soils are gently sloping, moderately well drained soils on long, moderately wide terraces. They are very slowly permeable. They have a surface layer of silt loam and a subsoil of silty clay loam. A compact and brittle fragipan is in the lower part of the subsoil.

Of minor extent are Chavies soils on terraces.

The nearly level and gently sloping soils of this map unit are well suited to cultivated crops commonly grown in the county. These soils are also suited to speciality crops, such as vegetables and nursery plants. The sloping areas are suited to hay, pasture, or woodland. The main limitations to farming are slope, the hazard of erosion, and wetness in low areas.

Most of this map unit is well suited to urban uses. Because of slow permeability, the hazard of flooding in low areas, wetness, seepage, slope, and low strength as it affects local roads and streets, some of this map unit is poorly suited to urban uses.

This map unit has high potential productivity for woodland and is well suited to wildlife habitat.

2. Lowell-Faywood-Nicholson

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

This map unit is in the central part of the county. The landscape is characterized by broad ridgetops breaking to moderately long and short hillsides (fig. 4). The slopes range from 2 to 20 percent.

Most of this map unit is in cultivated crops, hay, and pasture. Small tracts of woodland are on the steeper side slopes. This map unit is dissected by a meandering river, a few perennial streams, many intermittent streams, and small drainageways. A few areas are karst, and water drains through sinks or depressions. The ponds are mostly embankment or pit type. Except for a few small communities, most of this mapped area consists of scattered farmsteads. High-voltage power and gas transmission lines cross this map unit.

This map unit makes up about 48 percent of the county. It is about 70 percent Lowell soils, 8 percent Faywood soils, 7 percent Nicholson soils, and 15 percent soils of minor extent.

The gently sloping to moderately steep, well drained Lowell soils are on ridgetops and hillsides. These deep soils have a surface layer of silt loam and a subsoil that is silty clay loam in the upper part and silty clay and clay in the lower part. Permeability is moderately slow.

The gently sloping to moderately steep, well drained Faywood soils are on ridgetops and hillsides. These moderately deep soils have a surface layer of silt loam. They have a subsoil that is silty clay in the upper part and clay in the lower part. Permeability is moderately slow to slow.

The gently sloping, moderately well drained Nicholson soils are on ridgetops. These deep soils have a silt loam surface layer and silty clay loam subsoil that has a firm, compact, slowly permeable fragipan at a depth of 18 to 30 inches.

Of minor extent are Eden, Shelbyville, Cynthiana, and Fairmount soils on uplands; Elk and Otwell soils on terraces; and Nolin and Boonesboro soils on flood plains.

Most of the acreage of the soils in this map unit has been cleared for cultivated crops, hay, and pasture. Generally, the woodlands that remain are on the steepest slopes.

This map unit is suited to farming. The gently sloping soils are well suited to cultivated crops and specialty crops that are commonly grown in the county (fig. 5.) The soils that have greater slopes are better suited to hay and pasture. The main limitations are the hazard of erosion, slope, and a moderately deep root zone.

Most of this map unit is suited to urban uses. Moderate shrink-swell potential, the clayey subsoil, slow

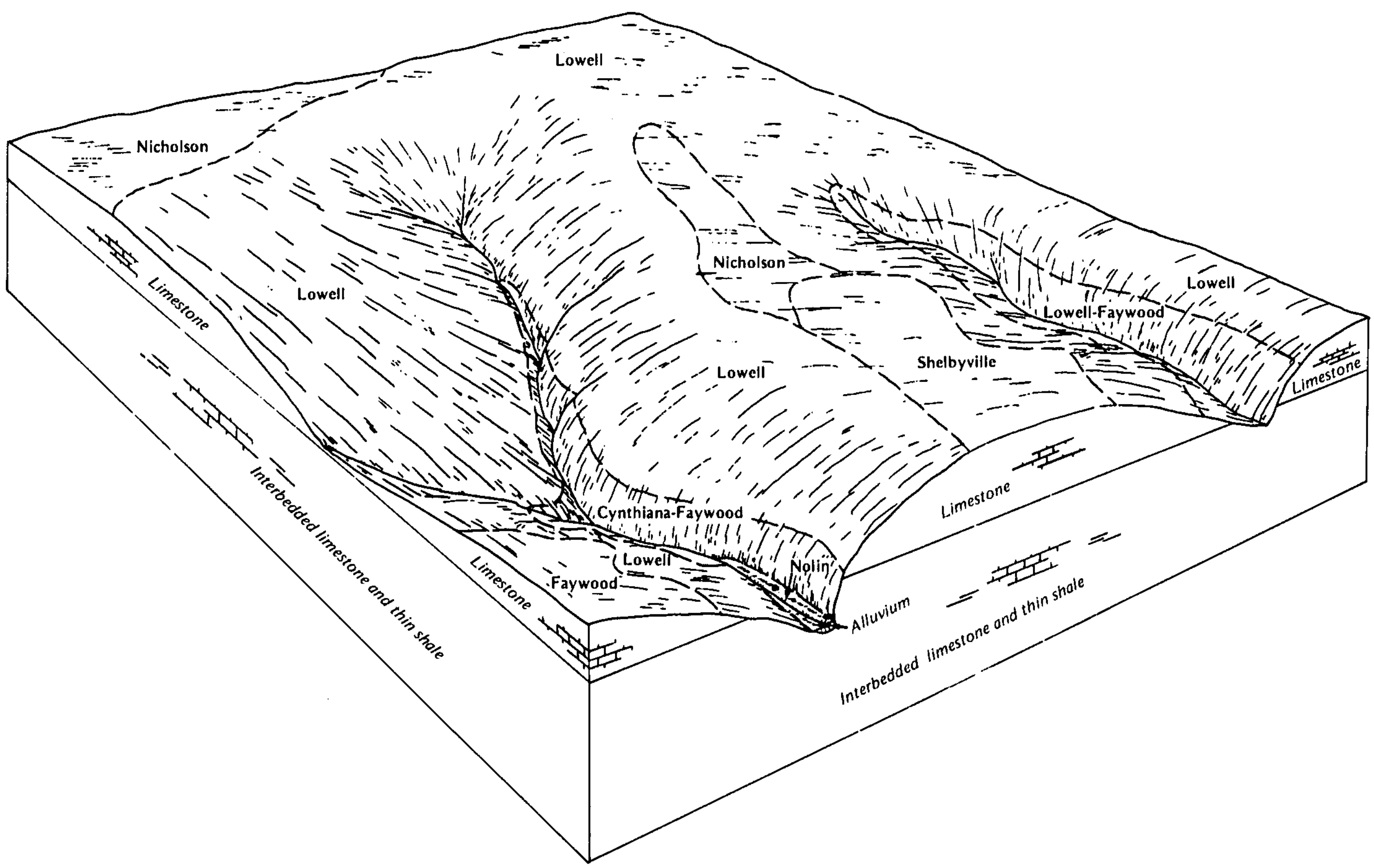


Figure 4.—Typical pattern of soils and parent material in the Lowell-Faywood-Nicholson general soil map unit.

Figure 5.—Burley tobacco on Nicholson silt loam, 2 to 6 percent slopes.

permeability, slope, depth to bedrock, and wetness are the main limitations for residential and other urban uses. Low strength is a limitation for local roads and streets.

This map unit has high potential productivity for woodland and is well suited to wildlife habitat.

3. Eden-Lowell

Moderately deep and deep, well drained, very steep to gently sloping soils that have a clayey subsoil; on hillsides and narrow ridgetops

This map unit is in two irregularly shaped areas in the northwestern and western parts of the county. The landscape is characterized by long, narrow ridgetops breaking to short hillsides and descending to narrow valleys. The slopes range from 2 to 40 percent but are dominantly 20 to 40 percent.

Most of this map unit is in woodland or pasture (fig. 6). Hay and cultivated crops are grown mostly on broader ridges and flood plains. The steeper areas are better suited to pasture and woodland. This map unit is dissected by a meandering river, a few perennial streams, many intermittent streams, and small drainageways. A few areas are karst, and water drains through sinks or depressions. The ponds are mostly embankment or pit type. Except for a few small communities, most of this mapped area consists of scattered farmsteads. High-voltage power and gas transmission lines cross this map unit.

This map unit makes up about 27 percent of the county. It is about 70 percent Eden soils, 15 percent Lowell soils, and 15 percent soils of minor extent.

The very steep to moderately steep, well drained Eden soils are on hillsides and narrow ridgetops, generally at elevations below the Lowell soils (fig. 7). These moderately deep soils have a surface layer of flaggy silty clay loam or silt loam and a slowly permeable, flaggy,

Figure 6.—Pasture on cleared area of Eden silt loam, 6 to 20 percent slopes, eroded, and low-quality woodland on Eden flaggy silty clay loam, 20 to 40 percent slopes, eroded.

clayey subsoil. The steep and very steep areas of Eden soils have common limestone flagstones scattered on the surface and throughout the profile.

The gently sloping to moderately steep, well drained Lowell soils are on ridgetops and hillsides generally at elevations above the Eden soils. These deep soils have a surface layer of silt loam and a subsoil that is silty clay loam in the upper part and silty clay and clay in the lower part. Permeability is moderately slow.

Of minor extent are Fairmount, Nicholson, Faywood, Shelbyville, and Cynthiana soils on uplands; Elk, Wheeling, Otwell, and Chavies soils on terraces; and Nolin and Boonesboro soils on flood plains.

The main limitations of these soils for farming are moderate depth to rock, steep and very steep slopes, the hazard of erosion, and common flagstones.

This map unit is poorly suited to urban uses. Steep slopes, depth to rock, moderate shrink-swell potential, the clayey subsoil, and slow permeability are the main limitations. Low strength is a limitation for local roads and streets.

This map unit has moderately high potential productivity for woodland and is well suited to wildlife habitat.

4. Cynthiana-Faywood-Lowell

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

This map unit is in the east-central part of the county. The landscape is characterized by moderately wide ridgetops breaking to short hillsides and descending to moderately wide and narrow valleys (fig. 8). Slopes range from 2 to 30 percent.

Most of this map unit is used for pasture. Cultivated crops and hay are grown on broad ridgetops and on the minor soils on terraces and flood plains. The steeper areas are in pasture or woodland. This map unit is dissected by a meandering river, a perennial stream, many intermittent streams, and small drainageways. Many areas are karst, and water drains through sinks or depressions. The ponds are mostly embankment or pit type. Except for a few small communities, most of this mapped area consists of scattered farmsteads. High-voltage power and gas transmission lines cross this map unit.

This map unit makes up about 12 percent of the county. It is about 37 percent Cynthiana soils, 29 percent Faywood soils, 16 percent Lowell soils, and 18 percent soils of minor extent.

The steep to strongly sloping, well drained Cynthiana soils are on hillsides and ridgetops adjacent to Faywood soils. These shallow soils have a silty clay loam or silty clay surface layer and a silty clay or clay subsoil. Limestone flagstones are common on the surface and throughout the profile of these soils. Steep and moderately steep areas of these soils have small areas of rock outcrop. Permeability is moderately slow.

The gently sloping to steep, well drained Faywood soils are on ridgetops and hillsides. These moderately deep soils have a surface layer of silt loam or silty clay loam and a subsoil that is silty clay in the upper part and clay in the lower part. Permeability is moderately slow or slow.

The gently sloping to moderately steep, well drained Lowell soils are on ridgetops and hillsides. These deep soils have a surface layer of silt loam and a subsoil that is silty clay loam in the upper part and silty clay and clay in the lower part. Permeability is moderately slow.

Of minor extent are Fairmount and Beasley soils on uplands, Elk soils on terraces, and Nolin and Boonesboro soils on flood plains.

This map unit is poorly suited to specialty crops, cultivated crops, and hay. Most of the map unit is better suited to pasture or woodland. The main limitations for these uses are droughtiness, shallow depth to rock, steep slopes, the hazard of erosion, rock outcrop, and common flagstones.

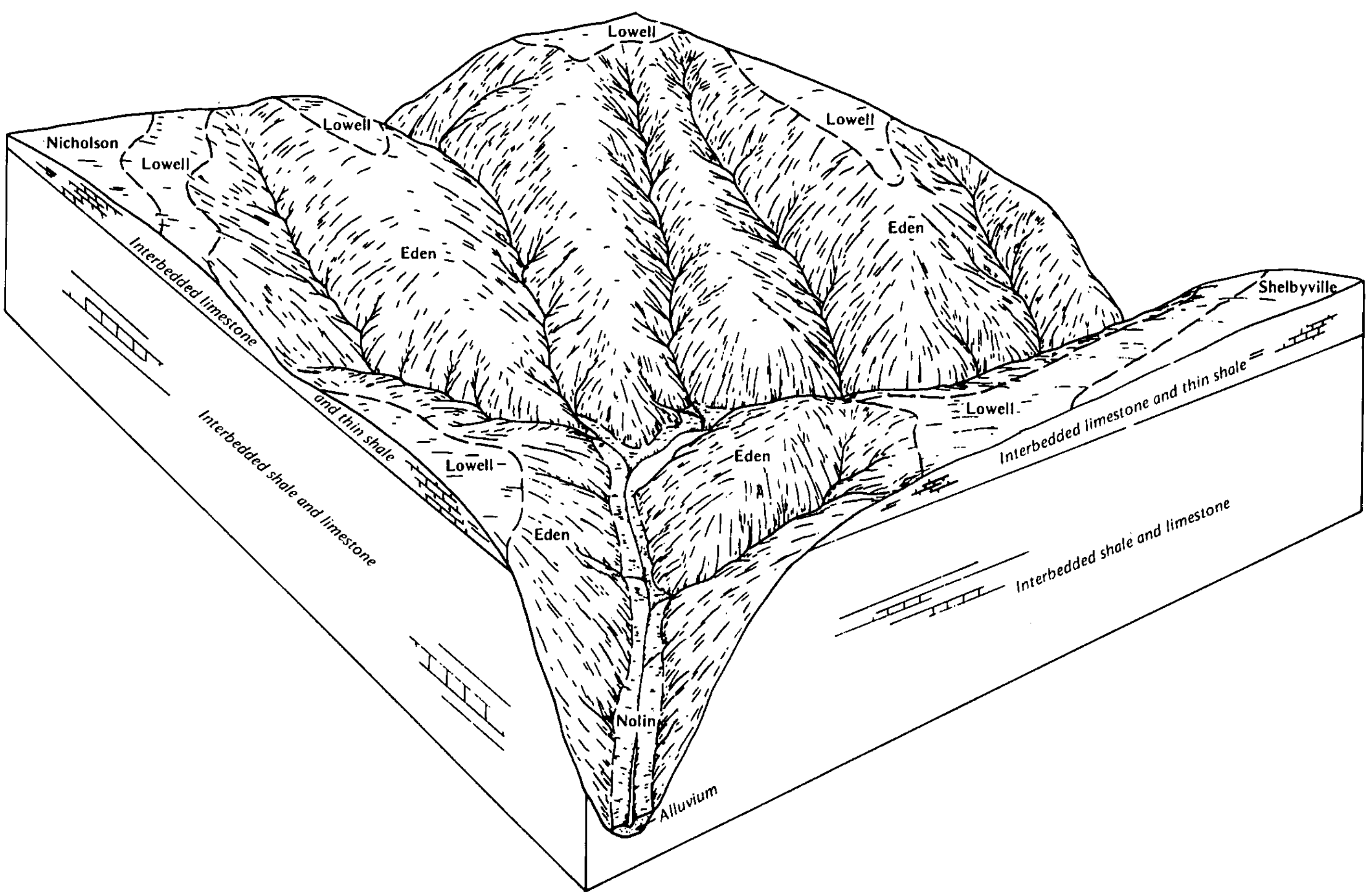


Figure 7.—Typical pattern of soils and parent material in the Eden-Lowell general soil map unit.

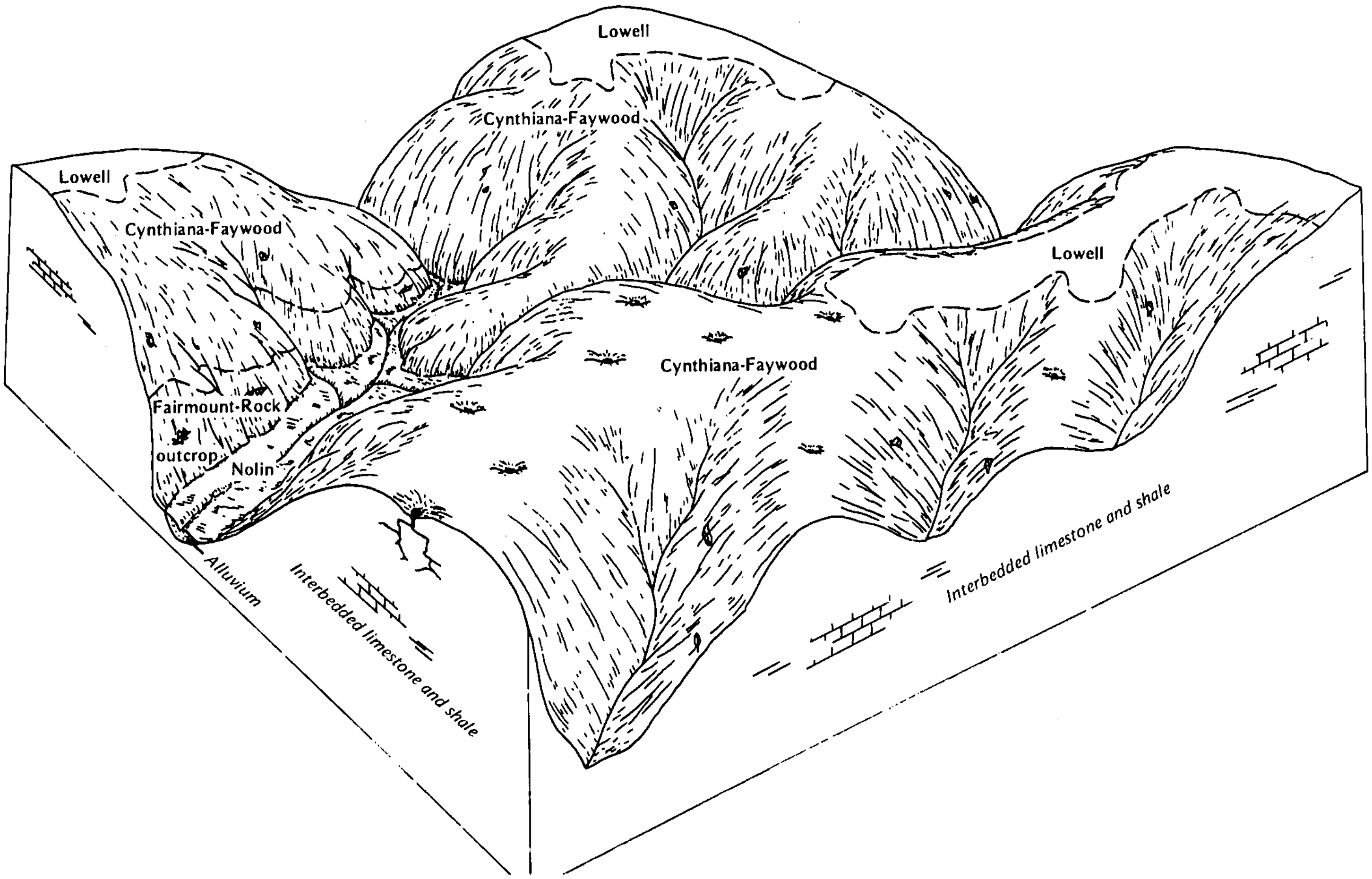


Figure 8.—Typical pattern of soils and parent material in the Cynthiana-Faywood-Lowell general soil map unit.

This map unit is poorly suited to urban uses. Steep slopes, moderate and shallow depth to rock, slow permeability, shrink-swell potential, clayey subsoil, and rock outcrop are the main limitations. Low strength is a limitation for local roads and streets.

This map unit has moderately high potential productivity for woodland and is suited to wildlife habitat.

5. Fairmount-Cynthiana-Faywood

Shallow and moderately deep, well drained, very steep to gently sloping soils that have a clayey subsoil; on hillsides and ridgetops

This map unit is in the north-central part of the county. The landscape is characterized by narrow ridgetops breaking to short hillsides and descending to narrow valleys. Slopes range from 2 to 65 percent but are dominantly 6 to 30 percent.

Most of this map unit is in pasture or woodland. Small areas of cultivated crops and hay are on the less sloping, wider ridgetops, and minor soils are on flood plains. The steeper areas of this map unit are in brush or woodland. A few perennial streams, many intermittent streams, and small drainageways are in this map unit. Some areas are karst, and water drains through sinks or depressions. The ponds are mostly embankment or pit type. Except for the urban development on the less sloping ridges and on the narrow bottoms near Maysville, most of this area consists of scattered farmsteads. Gas transmission lines cross this map unit.

This map unit makes up about 5 percent of the county. It is about 30 percent Fairmount soils, 26 percent Cynthiana soils, 16 percent Faywood soils, and 28 percent soils of minor extent.

The very steep, well drained Fairmount soils are on hillsides below the Cynthiana and Faywood soils. These shallow soils have a flaggy silty clay loam surface layer and a flaggy clay subsoil. Rock outcrops are common on these soils. Permeability is moderately slow to slow.

The steep to strongly sloping, well drained Cynthiana soils are on hillsides and ridgetops adjacent to Faywood soils. These shallow soils have a silty clay loam or silty clay surface layer and a silty clay or clay subsoil. Limestone flagstones are common on the surface and throughout the profile of these soils. Steep areas of these soils have small areas of rock outcrop. Permeability is moderately slow.

The gently sloping to steep, well drained Faywood soils are on ridgetops and hillsides. These moderately deep soils have a surface layer of silt loam or silty clay loam and a subsoil that is silty clay in the upper part and clay in the lower part. Permeability is moderately slow or slow.

Of minor extent are Eden, Lowell, and Nicholson soils on uplands; Wheeling, Chavies, and Otwell soils on terraces; and Nolin and Boonesboro soils on flood plains.

This map unit is poorly suited to specialty crops, cultivated crops, and hay. The ridgetops are suited to pasture, and the hillsides are suited to pasture or woodland. The main limitations to farming are droughtiness, steep and very steep slopes, shallow depth to bedrock, the hazard of erosion, rock outcrop, and common flagstones.

This map unit is poorly suited to urban uses. The main limitations for these uses are slow permeability, shallow depth to bedrock, steep and very steep slopes, rock outcrop, and clayey subsoil. Low strength is a limitation for local roads and streets.

This map unit has moderately high potential productivity for woodland and is suited to wildlife habitat.

6. Beasley-Fairmount-Cynthiana

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

This map unit is in the eastern part of the county. The landscape is characterized by broad to narrow ridgetops breaking to short hillsides and descending to moderately wide and narrow valleys. Slopes range from 2 to 65 percent but are dominantly 2 to 10 percent on the ridgetops and 10 to 40 percent on the hillsides.

Most of the broader, less sloping ridgetops and minor soils on terraces and flood plains in this map unit are used for cultivated crops and hay. The steeper areas are in pasture, brush, or woodland. This map unit is dissected by a meandering river, a perennial stream, many intermittent streams, and small drainageways. Some areas are karst, and water drains through sinks or depressions. The ponds are mostly embankment or pit type. There are numerous springs in the northern half of this map unit. Except for a few small communities, most of this mapped area consists of scattered farmsteads. High-voltage power and gas transmission lines cross this map unit.

This map unit makes up about 6 percent of the county. It is about 48 percent Beasley soils, 19 percent Fairmount soils, 11 percent Cynthiana soils, and 22 percent soils of minor extent.

The gently sloping to steep, well drained Beasley soils are on ridgetops and hillsides, generally above Fairmount and Cynthiana soils. These deep soils have a surface layer of silt loam or silty clay and a clayey subsoil. Permeability is moderately slow.

The very steep, well drained Fairmount soils are on hillsides below Beasley and Cynthiana soils. These shallow soils have a flaggy silty clay loam surface layer and a flaggy clay subsoil. Rock outcrop is common on these soils. Permeability is moderately slow.

The steep to strongly sloping, well drained Cynthiana soils are on hillsides and ridgetops. These shallow soils have a silty clay loam or silty clay surface layer and a silty clay or clay subsoil. Limestone flagstones are common on the surface and throughout the profile of the soils. Steeper areas of these soils have small areas of rock outcrop. Permeability is moderately slow.

Of minor extent are Faywood, Shelbyville, Lowell, and Nicholson soils on uplands; Wheeling, Otwell, and Elk soils on terraces; and Nolin and Boonesboro soils on flood plains.

The gently sloping soils of this map unit are suited to hay, cultivated crops, and specialty crops commonly grown in the county. The sloping to very steep soils are suited to pasture and woodland. The main limitations to farming are the hazard of erosion, steep slopes, shallow depth to rock, rock outcrop, and common flagstones.

Most of this map unit is suited to urban uses. The main limitations are steep and very steep slopes, shallow depth to rock, moderately slow and slow permeability, clayey subsoil, and moderate shrink-swell potential. Low strength is a limitation for local roads and streets.

This map unit has moderately high potential productivity for woodland and is suited to wildlife habitat.

Broad Land Use Considerations

The general soil map broadly shows the landscape and soil features of Mason County for use in general planning. It is not a substitute for detailed maps, which are needed in planning the use of specific sites.

The soils that are well suited to cultivated crops usually are also well suited to other uses. The Wheeling-Nolin-Otwell map unit consists of Wheeling and Otwell soils on wide terraces and Nolin soils on flood plains; this map unit is well suited to all cultivated crops grown in the county. The Lowell-Faywood-Nicholson map unit consists of Lowell and Nicholson soils on broad ridges and Lowell and Faywood soils on hillsides; this map unit is well suited to cultivated crops. The Beasley-Fairmount-Cynthiana map unit consists of Beasley soils on ridges and hillsides and Fairmount and Cynthiana soils on hillsides. Many areas of the Beasley soils are eroded or severely eroded. The smooth areas of the Beasley-Fairmount-Cynthiana map unit are suited to cultivated crops. Most of the Eden-Lowell map unit is poorly suited to cultivated crops because of steep and very steep slopes. The Cynthiana-Faywood-Lowell and Fairmount-Cynthiana-Faywood map units are poorly suited to cultivated crops because of steep slopes and shallow depth to rock.

The Wheeling-Nolin-Otwell, Lowell-Faywood-Nicholson, and Beasley-Fairmount-Cynthiana map units are suited to urban development but are limited by slope, slow permeability, wetness, shrink-swell potential, clayey subsoil, and depth to rock. The Eden-Lowell, Cynthiana-Faywood-Lowell, and Fairmount-Cynthiana-Faywood map units are poorly suited to urban development because of steep slopes, shallow depth to rock, and the clayey texture of the soils.

Specialty crops, including vegetables, small orchards, and nursery plants, are grown in the county. Soils suited to specialty crops are scattered throughout the survey area, but they are very limited in the Eden-Lowell, Cynthiana-Faywood-Lowell, and Fairmount-Cynthiana-Faywood map units. Deep soils that have good natural drainage and that warm up early in the spring are preferred; such soils are more extensive in the Wheeling-Nolin-Otwell map units.

Generally, the soils in the Wheeling-Nolin-Otwell, Lowell-Faywood-Nicholson, Eden-Lowell, and Beasley-Fairmount-Cynthiana map units are suited or well suited to woodland. The soils in the Cynthiana-Faywood-Lowell and Fairmount-Cynthiana-Faywood map units are moderately suited to woodland because of their shallow depth to rock.

Most of the soils in Mason County are not well suited to intensive recreation areas. The Wheeling-Nolin-Otwell and Lowell-Faywood-Nicholson map units are limited for intensive recreation areas because of slow permeability. The Eden-Lowell, Cynthiana-Faywood-Lowell, Fairmount-Cynthiana-Faywood, and Beasley-Fairmount-Cynthiana map units are poorly suited to intensive recreation areas because of steep slopes and shallow depth to rock. All the map units are suited to extensive recreation areas.

Detailed Soil Map Units

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

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the map unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Lowell silt loam, 2 to 6 percent slopes, is one of several phases in the Lowell series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Cynthiana-Faywood silty clay loams, 6 to 12 percent slopes, eroded, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description.

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

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

BaB—Beasley silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on broad, convex ridgetops in the eastern part of the county. A few areas have small sinkholes. Individual areas are from 3 to 45 acres.

Typically, the surface layer is yellowish brown silty loam about 6 inches thick. The upper part of the subsoil, to a depth of 11 inches, is yellowish brown silty clay loam. The lower part, to a depth of 40 inches, is strong brown and light olive brown clay that has mottles in shades of brown, yellow, and gray. The substratum is interbedded greenish gray, soft, calcareous, platy shale, siltstone, and limestone.

The available water capacity of this soil is high, and permeability is moderately slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. Reaction ranges from very strongly acid to neutral in the solum. This soil is fairly easy to till but has a narrow range of moisture content within which it can be worked without danger of clodding or crusting. The root zone is deep. The clayey subsoil is sticky and plastic when wet and has moderate shrink-swell potential.

Included with this soil in mapping are small areas of Faywood, Lowell, Nicholson, and Shelbyville soils. Also included are small areas of a soil that has a yellowish red subsoil.

This Beasley soil is suited to row crops, and most of the acreage is used for corn, soybeans, hay, and pasture. This soil is suited to occasional cultivation. Response of crops to fertilizer and lime is good. The erosion hazard is moderate, and measures for controlling erosion are needed if cultivated crops are grown. Contouring, stripcropping, conservation tillage, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help in controlling erosion and in maintaining organic matter content and soil fertility.

This soil is well suited to pasture and hay crops and produces moderate yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and control of undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has moderately high potential productivity for woodland. Trees suited to this soil include white ash and white oak. Plant competition is the main management concern.

This soil is suited to urban uses. It is poorly suited to septic tank absorption fields because of moderately slow permeability in the clayey subsoil. The clayey texture is a limitation for shallow excavations, the moderate shrink-swell potential is a limitation for buildings, and low strength is a limitation for local roads and streets.

This Beasley soil is in capability subclass IIe and in woodland suitability group 3c.

BaC2—Beasley silt loam, 6 to 12 percent slopes, eroded. This deep, well drained, sloping soil is on ridgetops and hillsides in the eastern part of the county. Most areas of this soil have had 25 to 75 percent of the original surface layer removed by erosion. A few areas have small sinkholes. This soil is on long, narrow ridges and in long, winding areas dissected by many small drainageways. Individual areas are from 3 to 120 acres.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. The upper part of the subsoil, to a depth of 31 inches, is yellowish brown and strong brown silty clay loam and clay. The lower part, to a depth of 40 inches, is light olive brown clay that has mottles in shades of brown, yellow, and gray. The substratum is interbedded greenish gray, soft, calcareous, platy shale, siltstone, and limestone.

The available water capacity of this soil is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from very strongly acid to neutral in the solum. This soil is somewhat difficult to till. The root zone is deep. The clayey subsoil is sticky and plastic when wet and has moderate shrink-swell potential.

Included with this soil in mapping are small areas of Cynthiana, Fairmount, Faywood, Lowell, and Nicholson soils. Also included are small areas of soils that are 20 to 40 inches deep to bedrock and small areas of a similar soil that has a yellowish red subsoil. This map unit includes small areas of severely eroded soils, a few areas that have deep gullies, and small areas of soils that have outcrops of coarse-grained limestone bedrock.

This Beasley soil is suited to row crops. Most of the acreage is in hay or pasture. Some areas are idle or in woods. Although this soil is suited to occasional cultivation, it is better suited to pasture and hay crops. Response of crops to fertilizer and lime is fair. The erosion hazard is severe if this soil is cultivated, and measures for controlling erosion are needed. Some practices that help to slow surface runoff, reduce erosion, and insure continued high crop yields are conservation tillage, contouring, stripcropping, water disposal systems, returning crop residue, cover crops, grasses and legumes in the cropping system, and liming and fertilizing according to crop needs.

This soil is well suited to pasture and hay crops and produces moderate yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

Although most of this soil is cleared, it has moderately high potential productivity for woodland. Trees suited to this soil are white ash and white oak. Plant competition is the main management concern.

This soil is suited to urban uses. It is poorly suited to septic tank absorption fields because of moderately slow permeability in the clayey subsoil. Slope and clayey texture are limitations for shallow excavations. Slope and moderate shrink-swell potential are limitations for buildings. Low strength is a limitation for local roads and streets. To control erosion and reduce sedimentation during development of urban sites, bare areas need to be mulched and revegetated and landscaping and septic tank lines need to be on the contour.

This Beasley soil is in capability subclass IIIe and in woodland suitability group 3c.

BeE3—Beasley silty clay, 12 to 30 percent slopes, severely eroded. This deep, well drained, moderately steep to steep soil is on hillsides dissected by many drainageways. The south-facing slopes are severely eroded, and in many places the underlying substratum is exposed. Most areas have from 5 to 10 percent coarse fragments in the surface layer. This map unit is in the eastern part of the county. Individual areas are from 3 to 200 acres or more.

Typically, the surface layer is dark yellowish brown silty clay about 7 inches thick. The upper part of the subsoil, to a depth of 13 inches, is strong brown clay. The lower part, to a depth of 25 inches, is light olive brown clay. The substratum, to a depth of about 45 inches, is variegated light yellowish brown and pale olive, interbedded clay and shale underlain by soft, calcareous shale, siltstone, and limestone.

The available water capacity of this soil is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is low. Reaction ranges from very strongly acid to neutral in the solum and from neutral to moderately alkaline in the substratum. This soil is difficult to till because of clayey texture and steep slopes. The root zone is moderately deep. The clayey subsoil is sticky and plastic when wet and has moderate shrink-swell potential.

Included with this soil in mapping are small areas of Cynthiana, Fairmount, Faywood, and Lowell soils. This map unit also includes small areas of soils that have outcrops of coarse-grained limestone bedrock.

Areas of this soil are mostly in pasture, but some areas are idle or in brush and low quality woods. This soil is poorly suited to row crops and most urban uses. It is suited to grasses or trees. Numerous springs are present and constitute a low-volume water supply for farm use.

The hazard of erosion is too severe for this soil to be used for cultivated crops. It is suited to pasture and hay, but harvesting of hay is difficult on the steep slopes. Because of steep slopes and the hazard of erosion, gound cover is important for soil protection. Pasture mixtures that produce satisfactory forage, provide adequate ground cover, and require the least frequent renovation should be selected. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has moderate potential productivity for woodland. Trees suited to this soil are Virginia pine, eastern redcedar, white ash, and white oak. The hazard of erosion, equipment limitations, and seedling mortality caused by steepness of slopes and the clayey subsoil are management concerns.

This soil is poorly suited to most urban uses because of steep slopes and the moderately slow permeability in the clayey subsoil.

This Beasley soil is in capability subclass VIe and in woodland suitability group 4c.

Bo—Boonesboro silt loam, frequently flooded. This moderately deep, well drained, nearly level soil is on flood plains in narrow to moderately wide valleys. Slopes are generally uniform and are less than 3 percent. Mapped areas adjacent to streams are commonly flaggy and gravelly because of stream meandering and subsequent erosion. Individual areas range from 3 to 70 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsurface layer, to a depth of about 19 inches, is dark brown silty clay loam. The subsoil, to a depth of about 34 inches, is brown, very gravelly silty clay loam that is about 50 percent gravel. Limestone bedrock is at a depth of about 34 inches.

The available water capacity of this soil is moderate, and permeability is moderate in the upper 19 inches and rapid below 19 inches. Runoff is slow. Natural fertility and organic matter content are high. Areas of this soil that have been cleared for cultivation have good tilth and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction ranges from slightly acid to mildly alkaline throughout the profile. The root zone is moderately deep. Depth to bedrock ranges from 20 to 40 inches. This soil is subject to frequent flooding in winter and spring.

Included with this soil in mapping are small areas of Elk and Nolin soils. Also included are small areas of similar soils that have a dark grayish brown surface layer.

Areas of this soil are mainly used as pasture. A few areas are wooded. This soil is suited to cultivated crops, and corn is the crop commonly grown. Conservation tillage, returning crop residue, cover crops, and grasses and legumes in the cropping system help in maintaining desirable soil structure and organic matter.

Most of the pasture and hay crops commonly grown in the area are suited to this soil, although some may be damaged by flooding. The main management needs are maintaining the desired species, controlling undesirable vegetation, proper stocking, rotation grazing, and applying fertilizer.

This soil has very high potential productivity for woodland. Plant competition is the main management concern. Trees suited to this soil are black walnut, eastern cottonwood, sweetgum, yellow-poplar, and white ash.

This soil is not suited to most urban uses. The hazard of flooding is the main limitation. Depth to bedrock is a limitation for some uses.

This Boonesboro soil is in capability subclass IIIw and in woodland suitability group 1o.

ChB—Chavies fine sandy loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on uniform stream terraces along the Ohio River. Size and shape of mapped areas are variable, ranging from long and narrow to broad. Individual areas are from 2 to 115 acres or more. A large acreage of this soil is used for urban and industrial uses.

Typically, the surface layer is brown fine sandy loam about 12 inches thick. The subsoil, to a depth of 43 inches, is strong brown fine sandy loam. The substratum to a depth of about 70 inches is variegated yellowish brown, brown, and strong brown fine sandy loam.

The available water capacity of this soil is high, and permeability is moderately rapid. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Soil reaction ranges from neutral to very strongly acid through the subsoil and from medium acid to very strongly acid in the substratum. The root zone is deep.

Included with this soil in mapping are small areas of Otwell and Wheeling soils. Also included are small areas underlain by gravel at depths of 36 inches or more, and small areas of a soil that is more sandy throughout. In some areas, the texture varies from loamy sand to fine sandy loam within short distances.

Areas of this soil are used extensively for corn, tobacco, small grains, soybeans, hay, and pasture. Since this loamy, deep soil has good natural drainage and warms up early in the spring, it is well suited to many vegetable crops and orchard and nursery plants. It is well suited to all the cultivated crops commonly grown in the area, and yields are high if properly managed. Response of crops to fertilizer and lime is good. This is a productive soil and can be cropped intensively if properly fertilized and if practices are used to help maintain the organic matter and soil fertility. The erosion hazard is moderate if this soil is cultivated, and some measures for controlling erosion are needed if cultivated crops are grown. Contouring, stripcropping, conservation tillage, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help in controlling soil erosion and in maintaining organic matter and soil fertility.

This soil is well suited to pasture and hay plants commonly grown in the area, and it produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovaton. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are eastern white pine, white oak, northern red oak, shortleaf pine, white ash, yellow-poplar, and black walnut. Plant competition is the main management concern.

This soil is well suited to most urban uses. Seepage is a limitation for sewage lagoons and sanitary landfills.

This Chavies soil is in capability subclass IIe and in woodland suitability group 2o.

ChC—Chavies fine sandy loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is in hummocky areas along the Ohio River. Size and shape of mapped areas are variable. Individual areas are from 3 to 30 acres. A large acreage of this soil is used for urban and industrial uses.

Typically, the surface layer is brown fine sandy loam about 12 inches thick. The subsoil, to a depth of 43 inches, is strong brown fine sandy loam. The substratum to a depth of about 70 inches is variegated yellowish brown, brown, and strong brown fine sandy loam.

The available water capacity of this soil is high, and permeability is moderately rapid. Runoff is medium to rapid. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Soil reaction ranges from neutral to very strongly acid through the subsoil and medium acid to very strongly acid in the substratum. The root zone is deep.

Included with this soil in mapping are small areas of Otwell and Wheeling soils. Also included are small areas underlain by gravel at depths of 36 inches or more, and small areas of a soil that is more sandy throughout. In some areas the texture varies from loamy fine sand to fine sandy loam within short distances.

Most tillable areas of this Chavies soil are used for hay, pasture, and cultivated crops. This soil is suited to most cultivated crops grown in the area. Since this deep, loamy soil has good natural drainage, it is especially well suited to many vegetable crops and orchard and nursery plants. The response of crops to fertilizer and lime is good. If this soil is cultivated, the hazard of erosion is severe, and some measures for controlling erosion and reducing runoff are needed. Stripcropping, conservation tillage, water disposal systems, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help to control erosion and to maintain the organic matter and soil fertility.

This soil is well suited to most pasture and hay plants commonly grown in the area and produces good yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are eastern white pine, white oak, northern red oak, shortleaf pine, white ash, yellow-poplar, and black walnut. Plant competition is the main management concern.

This soil is suited to most urban uses. Slope is a moderate limitation for shallow excavations, dwellings, local roads and streets, and septic tank absorption fields. Seepage is a limitation for sanitary landfills. To control erosion and reduce sedimentation during development of urban sites, bare areas need to be mulched and revegetated and landscaping and septic tank lines need to be on the contour.

This Chavies soil is in capability subclass IIIe and in woodland suitability group 2o.

CnC2—Cynthiana-Faywood silty clay loams, 6 to 12 percent slopes, eroded. This complex consists of shallow and moderately deep, well drained, sloping soils on ridges. It is mainly in the eastern part of the county. Cynthiana and Faywood soils were so intermingled that they could not be separated at the scale selected for mapping. About 3 percent of the mapped area has small sinkholes, generally about 60 feet in diameter. The area around the center of the sinkhole is mostly shallow to bedrock and in places has up to 5 percent loose flagstones on the surface. Individual areas of this map unit are 20 to 200 acres or more.

Cynthiana soil makes up about 50 percent of this complex. Typically, the surface layer is dark brown silty clay loam about 5 inches thick. The subsoil, to a depth of 18 inches, is dark yellowish brown silty clay, flaggy silty clay, and clay. Hard limestone is at a depth of about 18 inches.

Cynthiana soil has very low available water capacity and moderately slow permeablity. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Soil reaction ranges from slightly acid to mildly alkaline throughout the profile. Depth to bedrock ranges from 10 to 20 inches. The shrink-swell potential is moderate in the clayey subsoil.

Faywood soil makes up about 40 percent of the complex. Typically, the surface layer is brown silty clay loam about 3 inches thick. The upper part of the subsoil, to a depth of 15 inches, is strong brown clay. The lower part, to a depth of 26 inches, is light olive brown clay. Hard limestone is at a depth of about 26 inches.

Faywood soil has moderate available water capacity and moderately slow or slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Soil reaction ranges from neutral to strongly acid throughout. The root zone is moderately deep. Depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with these soils in mapping are small areas of Lowell soils and small areas of soils less than 10 inches to bedrock. Also included are small areas of soils that are yellowish red in the upper part of the subsoil.

These soils are suited to limited row crop uses. Most of the acreage is in hay, pasture or unimproved pasture, brush, and low quality woodland. Although these soils are occasionally cultivated, they are better suited to hay and pasture crops. Numerous sinkholes and shallow depth to rock make this map unit impractical for intensive cultivation. If these soils are cultivated, the hazard of erosion is very severe, and measures for controlling erosion are needed. Contouring, stripcropping, conservation tillage, returning crop residue, cover crops, and grasses and legumes in the cropping system help in controlling erosion and maintaining organic matter.

These soils are suited to hay crops and pasture and produce moderate yields if properly managed. To prevent further erosion, plants that provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This Cynthiana soil has moderate potential productivity for woodland, and this Faywood soil has moderately high potential productivity for woodland. Equipment limitations, seedling mortality, and plant competition are the main management concerns. Trees suited to Cynthiana soil are Virginia pine and white ash. Trees suited to Faywood soil are white oak, eastern white pine, and white ash.

These soils are poorly suited to most urban uses because of slope and shallow depth to bedrock. They are poorly suited to septic tank absorption fields because of depth to bedrock and moderately slow or slow permeability in the clayey subsoil.

These soils are in capability subclass IVe. Cynthiana soil is in woodland suitability group 4d, and Faywood soil is in woodland suitability group 3c.

CyE2—Cynthiana-Faywood complex, very rocky, 12 to 30 percent slopes, eroded. This map unit consists of areas of Cynthiana and Faywood soils that were so intermingled they could not be separated at the scale selected for mapping. These are shallow and moderately deep, well drained soils on moderately steep and steep hillsides dissected by many V-shaped hollows. Rock outcrop makes up about 2 percent of the area. Limestone fragments, most under 10 inches long, cover about 6 percent of the surface. Individual areas of this map unit are 20 to 200 acres or more and are mainly in the eastern third of the county.

Cynthiana soil makes up about 65 percent of this complex. Typically, the surface layer is dark brown silty clay about 5 inches thick. The subsoil, to a depth of 18 inches, is dark yellowish brown silty clay, flaggy silty clay, and clay. Hard limestone bedrock is at a depth of about 18 inches.

Cynthiana soil has very low available water capacity and moderately slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Soil reaction ranges from slighty acid to mildly alkaline throughout the profile. Depth to bedrock ranges from 10 to 20 inches. The shrink-swell potential is moderate in the clayey subsoil.

Faywood soil makes up about 20 percent of the complex. Typically, the surface layer is brown silty clay loam about 3 inches thick. The upper part of the subsoil, to a depth of 15 inches, is strong brown clay, and the lower part, to a depth of 26 inches, is light olive brown clay. Hard limestone bedrock is at a depth of about 26 inches.

Faywood soil has moderate available water capacity and moderately slow or slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Soil reaction ranges from neutral to strongly acid throughout. The root zone is moderately deep. Depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included in this complex in mapping are small areas of Beasley, Eden, Fairmount, and Lowell soils and small areas of soils 5 to 10 inches deep over bedrock. Also included are small areas of soils that are yellowish red in the upper part of the subsoil.

These soils are not suited to cultivated crops because of steep slopes, shallowness to bedrock, and rock outcrop. They are generally in unimproved pasture (fig. 9) and low quality woodland. The hazard of erosion is very severe.

These very rocky soils are poorly suited to hay because of the difficulty of mowing and renovation. These soils are better suited to permanent pasture than to hay because rock outcrop interferes less with grazing than with mowing. In seasons that have adequate rainfall, moderate amounts of pasture can be produced if well managed. Dense-rooted grasses, such as tall fescue, are most commonly used because of their ability to hold the soil and withstand droughtiness. The chief management needs are proper seeding rates and mixtures, use of fertilizer, control of weeds, and control of grazing. Overgrazing reduces the stand of grasses, increases the risk of erosion, and increases the need for frequent renovation.

This Cynthiana soil has moderate potential productivity for woodland, and this Faywood soil has moderately high potential productivity for woodland. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are the main management concerns. Trees suited to Cynthiana soil are Virginia pine and white ash. Trees suited to Faywood soil are white oak, eastern white pine, and white ash.

These soils are poorly suited to urban uses because of steep slopes, moderately slow to slow permeability, common flagstones and rock outcrop, and shallow depth to bedrock.

These soils are in capability subclass VIs. Cynthiana soil is in woodland suitability group 4x, and Faywood soil is in woodland suitability group 3x.

Du—Dumps. This miscellaneous map unit is made up of five separate dump areas. These areas are the limestone dump area east of Maysville; the limestone, sand, and gravel dump area east of Maysville; the scrubber residue waste material dump area south of Old

Figure 9.—Unimproved pasture on Cynthiana-Faywood complex, very rocky, 12 to 30 percent slopes, eroded.

Charleston Bottoms; the inactive sanitary landfill in Maysville; and the active landfill southeast of Maysville. Total acreage of this map unit is about 170 acres.

The limestone dump area is about 5 miles east of Maysville near the Ohio River. This area is stockpiled limestone and agricultural lime that is a by-product of the lime mined for scrubbers. It is not supporting vegetation. This area is about 68 acres.

The limestone, sand, and gravel dump area is on the east side of Maysville adjacent to the Ohio River. This is a storage area of limestone, sand, and gravel. It is not supporting vegetation. This area is about 21 acres.

The scrubber residue waste material dump area is south of the Spurlock Station at Old Charleston Bottoms and is about 5 miles northwest of Maysville. The scrubber residue waste material is disposed of in an operation similar to that of an area-type sanitary landfill. This area is about 31 acres.

The inactive sanitary landfill area is on the east side of Maysville, adjacent to the Ohio River. This area is about 30 acres.

The active sanitary landfill area is about 7 miles southeast of Maysville. This area is about 20 acres.

This map unit is in capability subclass VIIIs. It is not assigned to a woodland suitability group.

EdD2—Eden silt loam, 6 to 20 percent slopes, eroded. This moderately deep, well drained, sloping to moderately steep soil is on long, narrow ridges and upper hillsides, mainly in the extreme western part of the county. Limestone, siltstone, and shale fragments range from 0 to 25 percent in the surface layer. Individual areas are from 5 to 100 acres or more.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil, to a depth of about 24 inches, is light olive brown, channery and flaggy silty clay loam and silty clay that has 20 to 30 percent coarse fragments. The substratum to a depth of about 40 inches is interbedded limestone, shale, and siltstone.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Soil reaction ranges from very strongly acid to mildly alkaline in the surface layer and subsoil and is neutral or mildly alkaline in the substratum. The root zone is moderately deep, and depth to paralithic contact is generally about 24 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Faywood, Lowell, Nicholson, and Shelbyville soils.

This soil is mainly used as pasture and hayland. It is poorly suited to cultivated crops because of steep slopes and a severe erosion hazard. If used for cultivated crops, special practices are required to control erosion. These practices include conservation tillage, stripcropping, returning crop residue to the soil, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system.

This soil is suited to most pasture and hay plants commonly grown in the area and produces moderate yields if properly managed. Hay and pasture plants that are suited to the droughty soil and require the least amount of renovation should be selected. Mowing and renovation are somewhat restricted by the moderately steep slopes. Because of slope and the hazard of erosion, ground cover is important for soil protection. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has moderately high potential productivity for woodland. Equipment limitations, the hazard of erosion, seedling mortality, and plant competition are the main management concerns. Trees suited to this soil are white oak, white ash, and eastern white pine.

This soil is poorly suited to most urban uses because of clayey subsoil, depth to rock, and steep slopes. Low strength is a limitation to local roads and streets. The high clay and shale content, low strength, moderate shrink-swell potential, and moderately steep slopes are limitations difficult to overcome. Breaks and slides occur in roads and driveways on this soil. This soil is poorly suited to septic tank absorption fields because of steep slopes, shallow depth to rock, and slow permeability in the clayey subsoil.

This Eden soil is in capability subclass IVe and in woodland suitability group 3c.

EfE2—Eden flaggy silty clay loam, 20 to 40 percent slopes, eroded. This moderately deep, well drained, steep to very steep soil is on hillsides dissected by V-shaped valleys. It is mainly in the western half of the county. Limestone, siltstone, and shale fragments range from 10 to 25 percent in the surface layer. Individual areas are from 5 acres to several hundred acres.

Typically, the surface layer is yellowish brown, flaggy silty clay loam about 7 inches thick. The subsoil, to a depth of about 24 inches, is light olive brown, channery and flaggy clay that has 20 to 30 percent coarse fragments. The substratum to a depth of about 40 inches is interbedded limestone, shale, and siltstone.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. This soil is difficult to till because of common flagstones. Soil reaction ranges from very strongly acid to mildly alkaline in the surface layer and subsoil and is neutral or mildly alkaline in the substratum. The root zone is moderately deep, and depth to paralithic contact is generally about 24 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Cynthiana, Fairmount, Faywood, and Lowell soils. Also included are small areas of soils that have more than 40 percent slopes and a few areas that are generally less than 20 inches to bedrock and have deep gullies. Also included are small areas of soils along the Ohio River that are similar to Eden soil but have a darker surface layer and a thicker solum.

This soil is generally in low quality pasture and woodland (fig. 10). It is not suited to cultivated crops and hay because of steep and very steep slopes, common flagstones, and a severe erosion hazard.

Most of this soil is suited to permanent pasture. Areas of this soil that have slopes steeper than 30 percent are poorly suited to permanent pasture; they are better suited to woodland. Steep slopes and common flagstones limit the use of equipment. Brush and low quality hardwood woodland eventually take over unless the pasture is properly managed. Tall fescue is commonly used on this soil because of its ability to hold the soil and withstand droughtiness. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has moderately high potential productivity for woodland. The hazard of erosion, equipment limitations, seedling mortality, and plant competition are the main management concerns. Trees suited to this soil are white oak, white ash, and eastern white pine.

The soil is poorly suited to most urban uses because of steep and very steep slopes, clayey subsoil, slow permeability, slippage, and shallow depth to bedrock (fig. 11). Low strength is a limitation for local roads and streets. Breaks and slides occur in roads and driveways on this soil.

This Eden soil is in capability subclass VIIe and in woodland suitability group 3c.

EkB—Elk silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on stream terraces along large streams throughout the county and

Figure 10.—Low-quality pasture in an area of Eden flaggy silty clay loam, 20 to 40 percent slopes, eroded. The soil on the ridgetop is Faywood-Lowell silt loams, 6 to 12 percent slopes.

Figure 11.—Irregular slopes caused by slippage on Eden flaggy silty clay loam, 20 to 40 percent slopes, eroded.

on old, high stream terraces on the western end of Jersey Ridge. Individual areas are from 3 to 35 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 20 inches, is strong brown silty clay loam. The lower part, to a depth of 47 inches, is yellowish brown silty clay loam. The substratum to a depth of 70 inches is yellowish brown silty clay loam that has common pale brown mottles.

The available water capacity of this soil is high, and permeability is moderate. Runoff is medium. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction ranges from slightly acid to very strongly acid in the surface layer and subsoil and from slightly acid to strongly acid in the substratum. The root zone is deep.

Included with this soil in mapping are small areas of Boonesboro, Nolin, and Otwell soils. Also included are small areas of soils that have a dark surface layer and clayey subsoil. A few low-lying areas are subject to flooding in winter and early in spring.

This soil is well suited to all cultivated crops commonly grown in the area. Areas of this soil are used extensively for corn, tobacco, small grains, soybeans, hay, and pasture crops. Response of crops to fertilizer and lime is good. The erosion hazard is moderate if this soil is cultivated, and measures for controlling erosion are needed. Some practices that help to slow surface runoff, control erosion, maintain organic matter, and ensure continued high crop yields are conservation tillage, contouring, stripcropping, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system.

This soil is well suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are northern red oak, white ash, shortleaf pine, white oak, eastern white pine, yellow-poplar, black walnut, and sweetgum. Control of plant competition in establishing tree seedlings is the main management concern.

The soil is well suited to most urban uses; however some included low-lying areas are severely limited because of flooding. Low strength is a limitation for local roads and streets.

This Elk soil is in capability subclass IIe and in woodland suitability group 2o.

EkC—Elk silt loam, 6 to 12 percent slopes. This deep, well drained sloping soil is along large streams throughout the county. The mapped areas are generally long and narrow and are adjacent to drainageways and steeper side slopes. Some areas are on old stream terraces at a higher elevation on the western end of Jersey Ridge. Individual areas are from 3 to 30 acres.

Typically, the surface layer is brown silt loam, about 9 inches thick. The upper part of the subsoil, to a depth of 20 inches, is strong brown silty clay loam. The lower part, to a depth of 47 inches, is yellowish brown silty clay loam. The substratum to a depth of 70 inches is yellowish brown silty clay loam that has common pale brown mottles.

The available water capacity of this soil is high, and permeability is moderate. Runoff is rapid. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction ranges from slightly acid to very strongly acid in the surface layer and subsoil and from slightly acid to strongly acid in the substratum. The root zone is deep.

Included with this soil in mapping are small areas of Boonesboro, Nolin, and Otwell soils. Also included are small areas of soils that have a dark surface layer and clayey subsoil.

This soil is suited to all the cultivated crops commonly grown in the area. Most areas of this soil are used for corn, small grains, hay, and pasture. A few areas are used for tobacco. The response of crops to fertilizer and lime is good. If this soil is cultivated, the hazard of erosion is severe, and some measures for controlling erosion and reducing runoff are needed. Some practices that help to slow surface runoff, control erosion, and insure continued high crop yields are conservation tillage, contouring, stripcropping, water disposal systems, returning crop residue, cover crops, grasses and legumes in the cropping system, and fertilizing and liming according to crop needs.

This soil is well suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground coverage should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are northern red oak, white oak, white ash, shortleaf pine, eastern white pine, yellow-poplar, black walnut, and sweetgum. Control of plant competition is the main management concern.

This soil is suited to most urban uses. Low strength is a limitation for local roads and streets. Slope is a limitation for some uses. To control erosion and reduce sedimentation during development of urban sites, bare areas need to be mulched and revegetated and landscaping and septic tank lines need to be on the contour.

This Elk soil is in capability subclass IIIe and in woodland suitability group 2o.

FrF—Fairmount-Rock outcrop complex, 30 to 65 percent slopes. This complex consists of areas of Fairmount soil and Rock outcrop that were so intermingled they could not be separated at the scale selected for mapping. This shallow, well drained, very steep Fairmount soil is generally along bluff areas adjacent to major streams and on very steep hillsides in the northeastern part of the county. Fairmount soil makes up about 73 percent of this complex, Rock outcrop about 11 percent, and other soils about 16 percent. Individual areas of this map unit are 5 to over 200 acres.

Typically, Fairmount soil has a surface layer that is very dark grayish brown flaggy silty clay loam about 13 inches thick. The subsoil, to a depth of 18 inches, is dark grayish brown flaggy clay that has about 30 percent limestone fragments. Limestone bedrock is at a depth of about 18 inches.

The available water capacity of Fairmount soil is low, and permeability is moderately slow or slow. Runoff is rapid. Natural fertility is medium, and organic matter content is high. Tilth is very poor because of common flagstones, shallowness to bedrock, clayey texture, and steepness of slope. Soil reaction ranges from neutral to moderately alkaline. The root zone is shallow. Depth to bedrock ranges from 10 to 20 inches. The shrink-swell potential is moderate in the clayey subsoil.

The Rock outcrop consists of exposures of bare limestone bedrock that are generally 10 to 15 feet wide and 50 to 75 feet long and are about 90 feet apart.

Included in this complex in mapping are small areas of Beasley, Cynthiana, Eden, Faywood, and Lowell soils. Also included are areas of soils that have bedrock at a depth of less than 10 inches and small areas of soils that are 11 to 40 percent Rock outcrop.

This complex is commonly in low quality hardwood; a few areas have marketable timber. This soil is poorly suited to cultivated crops, pasture, and most urban uses.

This complex has moderate potential productivity for woodland because of shallowness to bedrock, steep slopes, droughtiness, and Rock outcrop. The hazard of erosion, equipment limitations, and seedling mortality are the main management concerns. Trees suited to this soil are white oak and Virginia pine.

This complex is poorly suited to most urban uses because of steep slopes, moderately slow to slow permeability, Rock outcrop, and shallowness to bedrock.

This Fairmount soil is in capability subclass VIIe; Rock outcrop is in capability subclass VIIIs. This complex is in woodland suitability group 4d.

FwB—Faywood silt loam, 2 to 6 percent slopes. This moderately deep, well drained, gently sloping soil is on narrow ridges. The mapped areas are generally smooth and convex. A few areas have small sinkholes. Individual areas are from 3 to 55 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 16 inches, is brown silty clay. The lower part, to a depth of 30 inches, is yellowish brown clay. Hard limestone bedrock is at a depth of about 30 inches.

The available water capacity of this soil is moderate, and permeability is moderately slow or slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or cresting. Reaction ranges from neutral to strongly acid in the surface layer and subsoil. The root zone is moderately deep. Depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Beasley, Cynthiana, Eden, Lowell, Nicholson, and Shelbyville soils.

This soil is well suited to all the cultivated crops commonly grown in the area. Areas of this soil are used for corn, tobacco, small grains, soybeans, hay, and pasture. Response of crops to fertilizer and lime is good. If this soil is cultivated, the erosion hazard is moderate, and measures for controlling erosion are needed. Contouring, stripcropping, conservation tillage, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help in controlling erosion and in maintaining organic matter content and soil fertility.

This soil is well suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has moderately high potential productivity for woodland, but few areas are wooded. Equipment limitations and plant competition are the main management concerns. Trees suited to this soil are eastern white pine, white oak, and white ash.

This soil is suited to some urban uses. It is poorly suited to septic tank absorption fields because of depth to bedrock and moderately slow or slow permeability in the clayey subsoil. Depth to bedrock, moderate shrink-swell potential, and clayey texture are limitations for shallow excavations and buildings. Low strength is a limitation for local roads and streets.

This Faywood soil is in capability subclass IIe and in woodland suitability group 3c.

FyC—Faywood-Lowell silt loams, 6 to 12 percent slopes. This map unit consists of moderately deep and deep, well drained, sloping soils on ridgetops. These soils were so intermingled that they could not be separated at the scale selected for mapping. The areas on the ridges are generally convex and have occasional, small sinkholes. Individual areas are from 3 to 200 acres or more.

Faywood soil makes up about 50 percent of this map unit. Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 16 inches, is brown silty clay. The lower part, to a depth of 30 inches, is yellowish brown clay. Hard limestone bedrock is at a depth of about 30 inches.

Faywood soil has moderate available water capacity and moderately slow or slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Soil reaction ranges from neutral to strongly acid throughout the soil. This soil is easy to till and can be worked throughout a moderately wide range of moisture content without danger of clodding or crusting. The root zone is moderately deep. Depth to bedrock ranges from 20 to 40 inches. Shrink-swell potential is moderate in the clayey subsoil.

Lowell soil makes up about 40 percent of this map unit. Typically, the surface layer is brown silt loam about 6 inches thick. The upper part of the subsoil, to a depth of 27 inches, is strong brown silty clay loam and silty clay. The lower part, to a depth of 50 inches, is yellowish brown and light yellowish brown clay. Limestone bedrock is at a depth of about 50 inches.

Lowell soil has high available water capacity and moderately slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. Soil reaction ranges from slightly acid to very strongly acid in the surface layer and in the upper part of the subsoil and from strongly acid to mildly alkaline in the lower part of the subsoil. The shrink-swell potential is moderate in the clayey subsoil.

Included with these soils in mapping are small areas of Beasley, Cynthiana, Eden, Fairmount, Lowell, Nicholson, and Shelbyville soils. Also included are small areas of similar soils that are reddish brown in the upper part of the subsoil. Shallow drainageways and a few severely eroded areas that have shallow gullies and rock outcrop are common in some places. The included soils make up about 10 percent of this map unit.

These soils are suited to most of the cultivated crops commonly grown in the area. In the western part of the county where available cropland is limited, these soils are used for corn, tobacco, soybeans, and small grains. In other parts of the county, they are used mainly for hay and pasture. The response of crops to fertilizer and lime is good. If these soils are cultivated, the hazard of erosion is severe, and some measures for controlling erosion and reducing runoff are needed. Erosion is a serious problem on the small farms where available cropland is limited and corn and tobacco are grown continuously. Some practices that help to slow surface runoff, control erosion, and ensure continued high crop yields are conservation tillage, contouring, water disposal systems, returning crop residue, cover crops, grasses and legumes in the cropping system, and fertilizing and liming according to crop needs.

These soils are well suited to most pasture and hay plants commonly grown in the area and produce high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This Faywood soil has moderately high potential productivity for woodland, and this Lowell soil has high potential productivity for woodland. Equipment limitations and plant competition are the main management concerns. Trees suited to Faywood soil are eastern white pine, Virginia pine, black oak, white oak, and white ash. Trees suited to the Lowell soil are eastern white pine, northern red oak, white ash, and yellow-poplar.

These soils are moderately well suited to most urban uses. They are poorly suited to septic tank absorption fields because of depth to bedrock and moderately slow or slow permeability in the clayey subsoil. Depth to bedrock, moderate shrink-swell potential, slope, and clayey texture are limitations for some uses. Low strength is a limitation for local roads and streets.

These soils are in capability subclass IIIe. Faywood soil is in woodland suitability group 3c, and Lowell soil is in woodland suitability group 2c.

LoB—Lowell silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on narrow to broad ridges. The areas are generally smooth and convex. A few areas have small sinkholes. Individual areas are from 3 to 500 acres or more.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 23 inches, is brown and strong brown silty clay loam. The lower part, to a depth of 54 inches, is yellowish brown clay. The substratum to a depth of 62 inches is mottled yellowish brown, light brownish gray, and dark brown silty clay.

The available water capacity of this soil is high, and permeability is moderately slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction ranges from slightly acid to very strongly acid in the surface layer and the upper part of the subsoil and from strongly acid to mildly alkaline in the lower part of the subsoil. The root zone is deep. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Beasley, Cynthiana, Eden, Faywood, Nicholson, and Shelbyville soils.

This soil is well suited to all the cultivated crops commonly grown in the area. Areas of this soil are used extensively for corn, tobacco, small grains, soybeans, hay, and pasture. Response of crops to fertilizer and lime is good. If this soil is cultivated, the erosion hazard is moderate, and measures for controlling erosion are needed. Contouring, stripcropping, conservation tillage, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help in controlling erosion and in maintaining organic matter and soil fertility.

This soil is well suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are eastern white pine, northern red oak, yellow-poplar, and white ash. Plant competition is the main management concern.

This soil is suited to urban uses, but it is severely limited for some uses because of the moderate shrink-swell potential, clayey subsoil, and moderate depth to bedrock. Low strength is a limitation for local roads and streets. This soil is poorly suited to septic tank absorption fields because of moderately slow permeability in the clayey subsoil.

This Lowell soil is in capability subclass IIe and in woodland suitability group 2c.

LoC—Lowell silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is on narrow to broad ridgetops and on side slopes. A few areas have small sinkholes. Individual areas are from 3 acres to several hundred acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of

23 inches, is brown and strong brown silty clay loam. The lower part, to a depth of 54 inches, is yellowish brown clay. The substratum is mottled yellowish brown, light brownish gray, and dark brown silty clay to a depth of 62 inches.

The available water capacity of this soil is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a fairly wide range of moisture content without danger of clodding or crusting. Reaction ranges from slightly acid to very strongly acid in the surface and in the upper part of the subsoil and from strongly acid to mildly alkaline in the lower part of the subsoil. The root zone is deep. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Beasley, Cynthiana, Eden, Faywood, Nicholson, and Shelbyville soils. Also included are small areas of soils that are reddish brown in the upper part of the subsoil.

This soil is suited to all the cultivated crops commonly grown in the area. Most areas of this soil are used for corn, tobacco, small grains, soybeans, hay, and pasture. The response of crops to fertilizer and lime is good. If this soil is cultivated the hazard of erosion is severe, and some measures for controlling erosion and reducing runoff are needed. Erosion is a serious problem on the small farms where the available cropland is limited and corn and tobacco are grown continuously. Some practices that help to slow surface runoff, reduce erosion, and ensure continued high crop yields are conservation tillage, contouring, stripcropping, water disposal systems, returning crop residue, cover crops, use of grasses and legumes in the cropping system, and fertilizing and liming according to crop needs.

This soil is well suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetaton are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are eastern white pine, northern red oak, white ash, and yellow-poplar. Plant competition is the main management concern.

This soil is moderately well suited to most urban uses. The moderate shrink-swell potential, clayey subsoil, moderate depth to bedrock, and slope limit its use for most development. Low strength is a limitation for local roads and streets. It is poorly suited to septic tank absorption fields because of moderately slow permeability in the clayey subsoil.

This soil is in capability subclass IIIe and in woodland suitability group 2c.

LoD—Lowell silt loam, 12 to 20 percent slopes. This deep, well drained, moderately steep soil is on narrow, convex ridgetops and upper parts of hillsides. Individual areas are generally long and narrow and range from 3 to 200 acres.

Typically, the surface layer is yellowish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 15 inches, is strong brown silty clay loam. The lower part, to a depth of 35 inches, is yellowish brown and brownish yellow silty clay and clay. The substratum to a depth of about 48 inches is mottled yellowish brown, light brownish gray, and dark brown clay that is about 20 percent fragments of weathered soft siltstone and shale.

The available water capacity of this soil is high, and permeability is moderately slow. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction ranges from slightly acid to very strongly acid in the surface layer and upper part of the subsoil and from strongly acid to mildly alkaline in the lower part of the subsoil. The root zone is deep. The shrink-swell potential is moderate in the clayey subsoil.

Included with this soil in mapping are small areas of Eden, Faywood, Nicholson, and Shelbyville soils. Also included are small areas of soils similar to Lowell soil except that they have thin layers of soft siltstone scattered throughout the subsoil.

Areas of this soil are used mainly for pasture and hayland and, to a limited extent, corn and small grains. Although this soil is suited to occasional cultivation, it is better suited to pasture and hay. If this soil is cultivated, the hazard of erosion is very severe, and some measures for controlling erosion and reducing runoff are needed. Contouring, stripcropping, conservation tillage, water disposal systems, return of crop residue to the soil, cover crops, and grasses and legumes in the cropping system help to control erosion and to maintain organic matter content.

This soil is well suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained through frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are eastern white pine, northern red oak, white ash, and yellow-poplar. Erosion control, equipment limitations, and plant competition are the main management concerns.

This soil is poorly suited to most urban uses because of moderately steep slopes and moderately slow permeability in the clayey subsoil.

This Lowell soil is in capability subclass IVe and in woodland suitability group 2c.

LwD—Lowell-Faywood silt loams, 12 to 20 percent slopes. This map unit consists of deep and moderately deep, well drained, moderately steep soils on hillsides. In some areas, this map unit makes up the entire hillside. These soils were so intermingled they could not be separated at the scale selected for mapping. Individual areas are from 3 to 150 acres or more.

Lowell soil makes up about 50 percent of this complex. Typically, the surface layer is brown silt loam about 10 inches thick. The upper part of the subsoil, to a depth of 22 inches, is dark yellowish brown and strong brown silty clay loam and silty clay. The lower part, to a depth of 49 inches, is yellowish brown clay. Limestone bedrock is at a depth of about 49 inches.

Lowell soils have high available water capacity and moderately slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Soil reaction ranges from slightly acid to very strongly acid in the surface and the upper part of the subsoil and from strongly acid to mildly alkaline in the lower part of the subsoil. The root zone is deep. The shrink-swell potential is moderate in the clayey subsoil.

Faywood soil makes up about 45 percent of this complex. Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 16 inches, is brown silty clay. The lower part, to a depth of 30 inches, is yellowish brown clay. Limestone bedrock is at a depth of about 30 inches.

Faywood soil has moderate available water capacity and moderately slow or slow permeability. Runoff is rapid. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction in the surface layer and subsoil ranges from neutral to strongly acid. The root zone is moderately deep. Depth to bedrock ranges from 20 to 40 inches. The shrink-swell potential is moderate in the clayey subsoil.

Included with these soils in mapping are small areas of Beasley, Cynthiana, Eden, and Fairmount soils. Also included are small areas of eroded soils that have shallow gullies and a few rock outcrops. The included soils make up about 5 percent of this map unit.

Areas of these soils are mainly used as pasture and hayland. They are poorly suited to cultivated crops because of steep slopes. If these soils are cultivated, the hazard of erosion is very severe, and some measures for controlling erosion and reducing runoff are needed. Contouring, stripcropping, conservation tillage, water disposal systems, return of crop residue to the soil, cover crops, and grasses and legumes in the cropping system help to control erosion and to maintain organic matter content.

These soils are well suited to pasture and hay plants commonly grown in the area and produce high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained through frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This Lowell soil has high potential productivity for woodland. This Faywood soil has moderately high potential productivity for woodland. Erosion control, equipment limitations, and plant competition are the main management concerns. Trees suited to the Lowell soil are eastern white pine, northern red oak, white ash, and yellow-poplar. Trees suited to the Faywood soil are eastern white pine, white oak, and white ash.

These soils are poorly suited to most urban uses because of moderately steep slopes, moderate depth to bedrock, and moderately slow or slow permeability in the clayey subsoil.

These soils are in capability subclass IVe. Lowell soil is in woodland suitability group 2c, and Faywood soil is in woodland suitability group 3c.

NcB—Nicholson silt loam, 2 to 6 percent slopes. This deep, moderately well drained, gently sloping soil is on broad uplands. A fragipan is at a depth of about 25 inches. Individual areas are from 3 to 100 acres or more.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil, to a depth of 21 inches, is yellowish brown silt loam and silty clay loam. A brittle and compact fragipan of dark yellowish brown silt loam and silty clay loam that has brown and light brownish gray mottles is between a depth of 21 and 43 inches. The subsoil below the fragipan, to a depth of 64 inches, is yellowish brown clay that has grayish brown mottles. The substratum, to a depth of 73 inches, is mottled grayish brown and light olive brown, channery silty clay. Hard gray limestone is at a depth of 73 inches.

The available water capacity of this soil is moderate, and permeability is slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction ranges from slightly acid to very strongly acid through the fragipan and from strongly acid to mildly alkaline below the fragipan. The root zone and depth to fragipan range from 18 to 30 inches. The seasonal high water table is at a depth of 18 to 30 inches. The shrink-swell potential is moderate below the fragipan.

Included with this soil in mapping are small areas of Beasley, Faywood, Lowell, and Shelbyville soils.

Most areas of this soil are mainly used for hay, pasture, and cultivated crops. It is suited to most cultivated crops grown in the area, and under good management yields are high. It is better suited to cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. The root zone is restricted by a very firm, dense fragipan at a depth of 18 to 30 inches, and during dry seasons plant production is limited. The response of crops to fertilizer and lime is good. If this soil is cultivated, the erosion hazard is moderate, and measures for controlling erosion are needed. Some practices that slow surface runoff, help control erosion, and ensure continued high crop yields are conservation tillage, contouring, stripcropping, cover crops, grasses and legumes in the cropping system, and liming and fertilizing according to crop needs. Crop residue can be kept on or near the surface and incorporated into the plow layer to help maintain good tilth and the supply of organic matter.

This soil is well suited to most pasture and hay plants and produces good yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are sweetgum, yellow-poplar, northern red oak, white oak, eastern white pine, and white ash. The use of equipment can be restricted for short periods during wet seasons. Plant competition is the main management concern.

This soil is suited to most urban uses. Wetness is a limitation for sanitary facilities and building sites. Low strength is a limitation for local roads and streets. Wetness and slow permeability are limitations for septic tank absorption fields.

This Nicholson soil is in capability subclass IIe and in woodland suitability group 2o.

No—Nolin silt loam, occasionally flooded. This deep, well drained, nearly level soil is on flood plains in narrow to moderately wide valleys. Slopes are mostly uniform and are less than 3 percent. Individual areas are from 3 to 100 acres or more.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 16 inches, is dark brown silty clay loam. The lower part, to a depth of 58 inches, is dark brown silt loam that has dark grayish brown and grayish brown coatings and streaks. The substratum to a depth of 72 inches is dark brown silt loam that has grayish brown coatings and streaks.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction in the surface layer and subsoil ranges from medium acid to moderately alkaline. The root zone is deep. This soil is subject to occasional flooding, and the seasonal high water table is 3 to 6 feet deep.

Included with this soil in mapping are small areas of Boonesboro, Chavies, Elk, and Wheeling soils. Also included are small areas that have a darker colored surface layer and heavier textured subsoil, small areas similar to Nolin that have a sandy subsoil, and small areas of soils that are moderately well drained to somewhat poorly drained.

This soil is well suited to most row crops. Corn is the crop most commonly grown. A small acreage is used for hay, pasture, or small grains. The hazard of occasional flooding is most common in winter or early in spring before crops are planted. Tobacco is seldom grown on this soil unless a berm or diversion is installed to prevent flooding from the stream and surrounding hills. Small grains and hay crops are sometimes damaged by flooding. This is a productive soil and can be cropped intensively if properly fertilized and management practices are used to help maintain the organic matter. Conservation tillage, returning crop residue, cover crops, and grasses and legumes in the cropping system help in maintaining desirable soil structure and organic matter.

All of the pasture and hay plants commonly grown in the area are well suited to this soil, although some hay plants are damaged by flooding. The main management needs are maintaining the desired species, controlling weeds, proper stocking, rotation grazing, and fertilizing. Grazing before new seedlings are well established, overgrazing, and grazing when the soil is saturated damages the plants and results in thin cover, which increases the possibility of weed competition and the need for early renovation.

This soil has very high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are sweetgum, yellow-poplar, eastern white pine, northern red oak, black walnut, and white ash. Plant competition is the main management concern.

This soil is poorly suited to most urban uses because of flooding.

This Nolin soil is in capability class IIw and in woodland suitability group 1o.

OtB—Otwell silt loam, 2 to 6 percent slopes. This deep, moderately well drained, gently sloping soil is on stream terraces. Areas of this soil along the Ohio River are long and narrow, and areas along other major streams are generally concave. Individual areas are 3 to 100 acres or more.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of about 20 inches, is brown and yellowish brown silty clay loam. Between a depth of about 20 and 57 inches is a mottled yellowish brown and brown silty clay loam fragipan that is very firm, brittle, and compact. The substratum to a depth of about 94 inches is a mottled dark yellowish brown silty clay loam.

Included with this soil in mapping are small areas of Boonesboro, Chavies, Elk, Nolin, and Wheeling soils. Also included are small areas of a soil that has a fragipan and is somewhat poorly drained. Areas of a soil similar to Otwell soil but having a darker surface layer and not having a fragipan are included.

The available water capacity of this Otwell soil is moderate, and permeability is very slow. Runoff is medium. Natural fertility is medium, and organic matter content is moderate. Tilth is good, but cultivation can be delayed early in spring because of a seasonal high water table. Soil reaction ranges from medium acid to very strongly acid through the fragipan, except in areas that have been limed, and is strongly acid below the fragipan. The root zone is moderately deep and is restricted by a fragipan at a depth between 18 and 30 inches. Late in winter or early in spring the seasonal high water table is at a depth of 24 to 36 inches.

Areas of this soil are used mainly for corn, small grains, hay, and pasture. It is well suited to most cultivated crops commonly grown in the area, and under good management, yields are high. It is suited to cultivated crops that have shallow or moderately deep roots and can tolerate slight wetness. Response of crops to lime and fertilizer is good. If this soil is cultivated, the erosion hazard is moderate, and measures for controlling erosion are needed. Stripcropping, conservation tillage, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help in controlling soil erosion and in maintaining organic matter and soil fertility.

This soil is well suited to most of the pasture and hay plants commonly grown in the area, and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. Shallow or moderately deep-rooted grasses and legumes that can tolerate slight wetness are best suited. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are yellow-poplar, eastern white pine, white oak, white ash, and shortleaf pine. Plant competition is the main management concern.

This soil is suited to most urban uses. Very slow permeability, seasonal wetness, and low strength are limitations for some uses. This soil is poorly suited to septic tank absorption fields because of wetness and very slow permeability.

This Otwell soil is in capability subclass IIe and in woodland suitability group 2o.

Pt—Pits, sand and gravel. This miscellaneous map unit consists of two areas where the soil and underlying material were mined for sand and gravel. The bottoms of the excavated areas are about 25 feet below the original surface. The underlying sand and gravel material now exposed supports plant cover of clovers, grasses, and weeds. The larger of the two areas of this map unit is north of Lee Creek and adjacent to Kentucky Highway 8, south of Dover; the smaller area is adjacent to Lawrence Creek, between Kentucky Highway 8 and Kentucky Highway 1597. Total acreage is 20 acres.

This miscellaneous map unit is in capability subclass VIIs. It is not assigned to a woodland suitability group.

ShB—Shelbyville silt loam, 2 to 6 percent slopes. This deep, well drained, gently sloping soil is on smooth, broad ridges, mostly in the western and central parts of the county. Areas of this soil are commonly oval and range from 3 to 100 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 24 inches, is very dark grayish brown and dark brown silt loam. The next layer, to a depth of 40 inches, is dark brown silty clay loam. The next layer, to a depth of 78 inches, is dark brown, brown, and strong brown silty clay. The lower part of the subsoil to a depth of 90 inches is yellowish brown silty clay loam.

The available water capacity of this soil is high. Permeability is moderate in the surface layer and upper part of the subsoil and moderately slow in the lower part. Runoff is medium. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Reaction ranges from neutral to strongly acid in the upper part of the soil and from very strongly acid to mildly alkaline in the lower part. The shrink-swell potential is moderate in the lower part of the subsoil.

Included with this soil are small areas of Beasley, Faywood, Lowell, and Nicholson soils. Also included are a few areas of Shelbyville soils that have a surface layer 15 inches thick and small areas of similar soils that are yellowish red and clayey.

This soil is well suited to all of the cultivated crops commonly grown in the area. Areas of this soil are used extensively for corn, tobacco, small grains, soybeans, hay, and pasture. Response of crops to fertilizer and lime is good. If this soil is cultivated, the erosion hazard is moderate, and measures for controlling erosion are needed. Contouring, stripcropping, conservation tillage, returning crops residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help in controlling erosion and in maintaining organic matter and soil fertility.

This soil is well suited to pasture and hay plants commonly grown in the area and produces high yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are yellow-poplar, black walnut, white oak, white ash, eastern white pine, shortleaf pine, and northern red oak. Plant competition is the main management concern.

This soil is well suited to most urban uses. Low strength is a moderate limitation for local roads and streets. It is severely limited for septic tank absorption fields because of moderately slow permeability in the clayey part of the subsoil.

This Shelbyville soil is in capability subclass IIe and in woodland suitability group 2o.

WhA—Wheeling silt loam, 0 to 4 percent slopes. This deep, well drained, nearly level to gently sloping soil is on stream terraces along the Ohio River. Mapped areas of this soil are long, narrow to broad, and from 3 to 350 acres. Large areas of this soil are being used for urban and industrial uses.

Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 32 inches, is strong brown silty clay loam. The lower part, to a depth of 52 inches, is strong brown silty clay loam and silt loam. The substratum to a depth of about 82 inches is dark brown fine sandy loam that has thin layers of loamy sand and silty clay loam.

The available water capacity of this soil is high, and permeability is moderate. Runoff is slow. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Soil reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or medium acid in the subsoil and substratum. The root zone is deep. The seasonal high water table is at a depth of more than 5 feet.

Included with this soil in mapping are small areas of Chavies, Nolin, and Otwell soils. Also included are small areas underlain by gravel at a depth of 36 inches or more and small areas of a soil that is more sandy throughout. A few low terraces along Cabin Creek are subject to flooding. A few areas have a darker colored surface layer and heavier textured subsoil.

Areas of this soil are used extensively for corn, tobacco, small grains, soybeans, hay, and pasture. Since this deep, loamy soil has good natural drainage and warms up early in the spring, it is well suited to landscape nursery plants and several specialty vegetable crops. It is well suited to all of the cultivated crops commonly grown in the area, and yields are high under good management. Response of crops to fertilizer and lime is good. This is a productive soil and can be cropped intensively if properly fertilized and practices are used to help maintain the organic matter and soil fertility. Conservation tillage, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help in maintaining desirable soil structure, soil fertility, and the organic matter content.

All of the pasture and hay crops commonly grown in the area are well suited to this soil. The management needs are maintaining the desired species, controlling weeds, proper stocking, rotation grazing, and liming and fertilizing.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are eastern white pine, shortleaf pine, northern red oak, yellow-poplar, white ash, and black walnut. Plant competition is the main management concern.

This soil is well suited to most urban uses. The poor filtering ability of the soil and seepage are limitations for sanitary facilities. A few areas of this soil on low terraces along Cabin Creek are subject to flooding and are poorly suited to most urban uses.

This Wheeling soil is in capability class I and in woodland suitability group 2o.

WhC—Wheeling silt loam, 6 to 12 percent slopes. This deep, well drained, sloping soil is in hummocky areas along the Ohio River and Cabin Creek. Individual areas are from 3 to 15 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 32 inches, is strong brown silty clay loam. The lower part, to a depth of 52 inches, is strong brown silty clay loam and silt loam. The substratum to a depth of about 82 inches is dark brown fine sandy loam that has thin layers of loamy sand and silty clay loam.

The available water capacity of this soil is high, and permeability is moderate. Runoff is rapid. Natural fertility is high, and organic matter content is moderate. This soil is easy to till and can be worked throughout a wide range of moisture content without danger of clodding or crusting. Soil reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or medium acid in the subsoil and substratum. The root zone is deep. The seasonal high water table is at a depth of 5 feet or more.

Included with this soil in mapping are small areas of Chavies and Otwell soils. Also included are small areas of a similar soil underlain by gravel at a depth of 36 inches or more and small areas of a similar soil that is more sandy throughout.

Most areas of this soil are used for hay, pasture, and cultivated crops. Since this deep, loamy soil has good natural drainage and warms up early in the spring, it is well suited to landscape nursery crops and several specialty vegetable crops. It is suited to most cultivated crops grown in the area. The response of crops to fertilizer and lime is good. If this soil is cultivated, some measures for controlling erosion and reducing runoff are needed. Contouring, stripcropping, conservation tillage, returning crop residue, cover crops, fertilizing and liming according to crop needs, and grasses and legumes in the cropping system help to control erosion and to maintain the organic matter content and soil fertility.

This soil is well suited to most pasture and hay plants commonly grown in the area and produces good yields if properly managed. Plants that produce adequate forage and provide satisfactory ground cover should be selected. The desired species can be maintained by frequent pasture renovation. Lime and fertilizer, proper stocking, rotation grazing, and controlling undesirable vegetation are some of the chief management needs.

This soil has high potential productivity for woodland, but few areas are wooded. Trees suited to this soil are eastern white pine, shortleaf pine, northern red oak, yellow-poplar, white ash, and black walnut. Plant competition is the main management concern.

This soil is suited to most urban uses. Slope is a limitation for most uses. The poor filtering ability of the soil and seepage are limitations for sanitary facilities. All development should be on the contour, and bare areas should be mulched and revegetated as soon as possible to control erosion and reduce sedimentation.

This Wheeling soil is in capability subclass IIIe and in woodland suitability group 2o.

Wn—Wheeling-Nolin silt loams. This map unit consists of deep, well drained soils on terraces and flood plains of the Ohio River and the lower part of Cabin Creek. Moderately steep to very steep Wheeling soil is on narrow stream terrace banks and foot slopes, and nearly level Nolin soil is on narrow adjoining flood plains. Slopes range from 25 to 55 percent in Wheeling soil and from 0 to 2 percent in Nolin soil.

The map unit is about 60 percent Wheeling soil, 25 percent Nolin soil, and 15 percent other soils. Wheeling and Nolin soils were so intricately mixed that they could not be separated at the scale selected for mapping. Areas of this map unit are about 170 to 300 feet wide and several hundred feet long. Individual areas are 10 to 90 acres.

Typically, the surface layer of Wheeling soil is brown silt loam about 9 inches thick. The upper part of the subsoil, to a depth of 32 inches, is strong brown silty clay loam. The lower part, to a depth of 52 inches, is strong brown silty clay loam and silt loam. The substratum to a depth of about 82 inches is dark brown fine sandy loam that has thin layers of loamy sand and silty clay loam.

Wheeling soil has high available water capacity and moderate permeability. Runoff is rapid. Natural fertility is high, and organic matter content is moderate. Soil reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or medium acid in the subsoil and substratum.

Typically, the surface layer of Nolin soil is brown and dark grayish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 25 inches, is brown to dark yellowish brown silt loam. The lower part, to a depth of 40 inches, is yellowish brown silt loam that has brownish mottles. The substratum to a depth of 60 inches is mottled brown, gray, and yellowish brown silt loam that has layers of gravelly loam.

Nolin soil has high available water capacity and moderate permeability. Runoff is slow. Natural fertility is high, and organic matter content is moderate. Soil reaction ranges from medium acid to moderately alkaline throughout. This soil is subject to frequent flooding.

Included with these soils in mapping are small areas of Chavies and Otwell soils. Also included are small areas of soils similar to Wheeling soil except that they have more sand or more clay and soils developed from eolian deposits and glacial outwash that are variable in profile development and range from gravelly sandy loam to clay. Areas of soils in similar bottom land positions as Nolin soil but having more sand or more clay than Nolin soil and a few small areas of soils similar to Nolin soil except that they are wetter are also included.

Most areas of this map unit are covered with native hardwoods, softwoods, and brush. A few areas are in unimproved pasture. This map unit is poorly suited to cultivated crops, hay, and urban uses. Steep slopes and frequent flooding are the main limitations.

This Wheeling soil has high potential productivity for woodland, and this Nolin soil has very high potential productivity for woodland. Trees suited to Wheeling soil include eastern white pine, shortleaf pine, northern red oak, yellow-poplar, white ash, and black walnut; trees suited to Nolin soil include sweetgum, yellow-poplar, eastern cottonwood, and green ash. Plant competition, the hazard of erosion, and equipment limitations are the main management concerns.

This Wheeling soil is in capability subclass VIIe, and this Nolin soil is in capability subclass IIIw. Wheeling soil is in woodland suitability group 2r, and Nolin soil is in woodland suitability group 1w.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Mason County are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water control structures.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope ranges mainly from 0 to 6 percent.

About 34,000 acres, or about 22 percent, of Mason County meets the soil requirements for prime farmland. Areas of prime farmland are scattered throughout the county. Most areas are in the northern and central parts of the county, mainly in map units 1 and 2 of the general soil map. The main crops grown on the prime farmland are tobacco, corn, hay, and some wheat and soybeans.

A recent trend in land use in some parts of the county has been the conversion of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, or difficult to cultivate and usually are less productive than prime farmland.

The following map units, or soils, make up prime farmland in Mason County. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 5. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Soils that have limitations, such as a high water table or flooding, may qualify as prime farmland if these limitations are overcome by such measures as drainage or flood control. In the following list, the measures needed to overcome the limitations of a map unit, if any, are shown in parentheses after the map unit name. Onsite evaluation is necessary to determine if the limitations have been overcome by the corrective measures.

BaB	Beasley silt loam, 2 to 6 percent slopes
ChB	Chavies fine sandy loam, 2 to 6 percent slopes
EkB	Elk silt loam, 2 to 6 percent slopes
FwB	Faywood silt loam, 2 to 6 percent slopes
LoB	Lowell silt loam, 2 to 6 percent slopes
NcB	Nicholson silt loam, 2 to 6 percent slopes
No	Nolin silt loam, occasionally flooded
OtB	Otwell silt loam, 2 to 6 percent slopes
ShB	Shelbyville silt loam, 2 to 6 percent slopes
WhA	Wheeling silt loam, 0 to 4 percent slopes

Use and Management of the Soils

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

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

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

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

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

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

Crops, Pasture, and Hayland

William H. Amos, Jr., agronomist, Soil Conservation Service, assisted in writing this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Kentucky Cooperative Extension Service.

In 1981 more than 50,000 acres in Mason County were used for crops *(7)*. This included land that was in tobacco, soybeans, small grains, and all hay crops. The 1981 figure is an increase of more than 13,000 acres of cropland since 1971. The increase is due largely to the expanded acreage of tobacco, corn, and hay crops and to the introduction of soybeans into the county.

The soils in Mason County generally are well suited to row crops. Most of the row crops are grown on uplands because of the limited acreage on bottom land and stream terraces. The broad ridges and more level areas are suitable for grain production. Deep, well drained soils, such as Lowell, Shelbyville, and Wheeling soils, are suited to tobacco and alfalfa. In seasons of normal rainfall, Nicholson soils produce high yields of tobacco. The more sloping Beasley, Eden, Faywood, and Lowell soils are commonly used for hay and pasture. Land in addition to the land currently being cropped can be brought into production. Some land that is idle or in woodland or pasture is potentially good cropland. In addition to the reserve capacity represented by this land, food production could be increased considerably by applying the latest crop production technology to all cropland in Mason County. This soil survey can help facilitate the application of such technology.

Cropland

The management systems needed for cropland are those that protect or improve the soil, reduce erosion to tolerable levels, and minimize water pollution caused by runoff carrying plant nutrients, soil particles, and plant residues.

Soil fertility ranges from medium to high in all of the soils in Mason County. Crops respond to lime or fertilizer, or both. The amounts of lime and fertilizer to be applied should be based on the results of soil tests, on past cropping and management, on the needs of the crop, and on the yield level desired. The Kentucky

Cooperative Extension Service provides assistance in determining the amounts of fertilizer and lime to apply.

Soil tilth and crop residue management are important factors in the germination of seeds, the infiltration of water into the soil, and the maintenance of organic matter content. Most uneroded soils of Mason County have a silt loam surface layer that is medium in organic matter content and has good workability. Some of the eroded soils on sloping land have lost most of this original surface layer and are difficult to till because of the high content of clay in the present surface layer. Conservation tillage helps control erosion and maintain soil structure, reduces soil compaction and the formation of tillage pans, and improves soil aeration, permeability, and tilth.

Soil erosion is the most critical soil-related cropland management problem in Mason County. If soil slope is more than 2 percent, erosion is particularly hazardous. Beasley, Chavies, Elk, Faywood, Lowell, and Wheeling soils, for example, have slopes of 2 to 12 percent. In general, the greater the slope, the greater the hazard and the more difficult it is to control soil erosion.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as part of the subsoil is incorporated into the plow layer. This is especially damaging to soils that have a clayey subsoil, such as Beasley and Lowell soils, and soils that have a layer in or below the subsoil that limits the depth of the root zone. Such restrictive layers could be a fragipan, as in Nicholson soils, or bedrock, as in Eden and Faywood soils. Second, soil erosion on farmland results in sediment entering streams. Polluted streams impair the quality of water for municipal, recreational, and livestock use, and for fish and wildlife.

Erosion can be reduced, however, by certain practices. In general, erosion control practices provide a protective soil cover, reduce water runoff, and increase infiltration. A cropping system that keeps plant cover on the soil for extended periods can hold erosion losses to amounts that will not reduce the productivity capacity. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land, provide nitrogen, and improve tilth for subsequent crops.

Conservation tillage leaves crop residue on the surface and subsequently increases infiltration and reduces the hazards of runoff and erosion. No-tillage corn, which is increasing in acreage, is effective in reducing erosion on sloping land and can be adapted to most soils in the county.

Terraces and diversions reduce the length of the slope and control runoff and erosion. They are practical on deep, well drained soils that have regular slopes. Other soils are less suitable for terraces and diversions because of irregular slopes, a clayey subsoil that would be exposed in terrace channels, or bedrock at a depth of less than 40 inches.

Contouring and contour stripcropping are best adapted to soils that have smooth, uniform slopes. Lowell and Faywood soils are examples.

The trend in Mason County is toward erosion control methods other than terraces and diversions, for example, contour farming, stripcropping, conservation tillage, grassed waterways, use of winter cover crops, and the use of grasses and legumes in the cropping system (fig. 12).

Information on the design of erosion control practices for each kind of soil in Mason County is available at the local office of the Soil Conservation Service.

Field crops suited to the soils and climate of Mason County include many that are not now commonly grown. Corn, tobacco, and soybeans are the most commonly grown row crops. Grain sorghum is occasionally grown with corn for silage. Other crops, including potatoes, sweet peppers, popcorn, sunflowers, peanuts, and similar crops can be grown on a larger scale if the market for them is favorable.

Wheat and barley are the common close-growing crops. Wheat, barley, oats, and rye are usually grown as a winter cover, and a limited acreage is grown for a cash crop. Grass seed can be produced from fescue, red clover, orchardgrass, bromegrass, bluegrass, and timothy if the market for them is favorable.

Specialty crops grown commercially in the county are vegetables, small fruits, tree fruits, and nursery plants. A small acreage, scattered throughout the county, is in strawberries, tomatoes, cucumbers, bush beans, and other vegetables and small fruits. In addition, large areas can be adapted to other specialty crops, such as blueberries, grapes, and many vegetables. Apples are the dominant tree fruit grown in the county. Other tree fruits grown in the county are cherries, pears, and peaches.

Deep soils that have good natural drainage and that warm up early in the spring are especially well suited to many vegetables and small fruits. Chavies, Elk, Lowell, Shelbyville, and Wheeling soils that have slopes of less than 6 percent are in this category. They make up about 21,500 acres in the county. Crops can generally be planted and harvested earlier on these soils than on other soils in the county. Deep, well drained, loamy soils that have slopes of less than 6 percent, such as Chavies, Elk, Shelbyville, and Wheeling soils, are especially well suited to crops such as sweet potatoes, head cabbage, cauliflower, broccoli, muskmelons, peanuts, and watermelons. These soils make up about 5,600 acres in the county.

Most of the well drained soils in the county are suitable for orchard and nursery plants. Soils in low positions where frost is frequent and air drainage is poor generally are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing specialty crops can be obtained from local offices of the

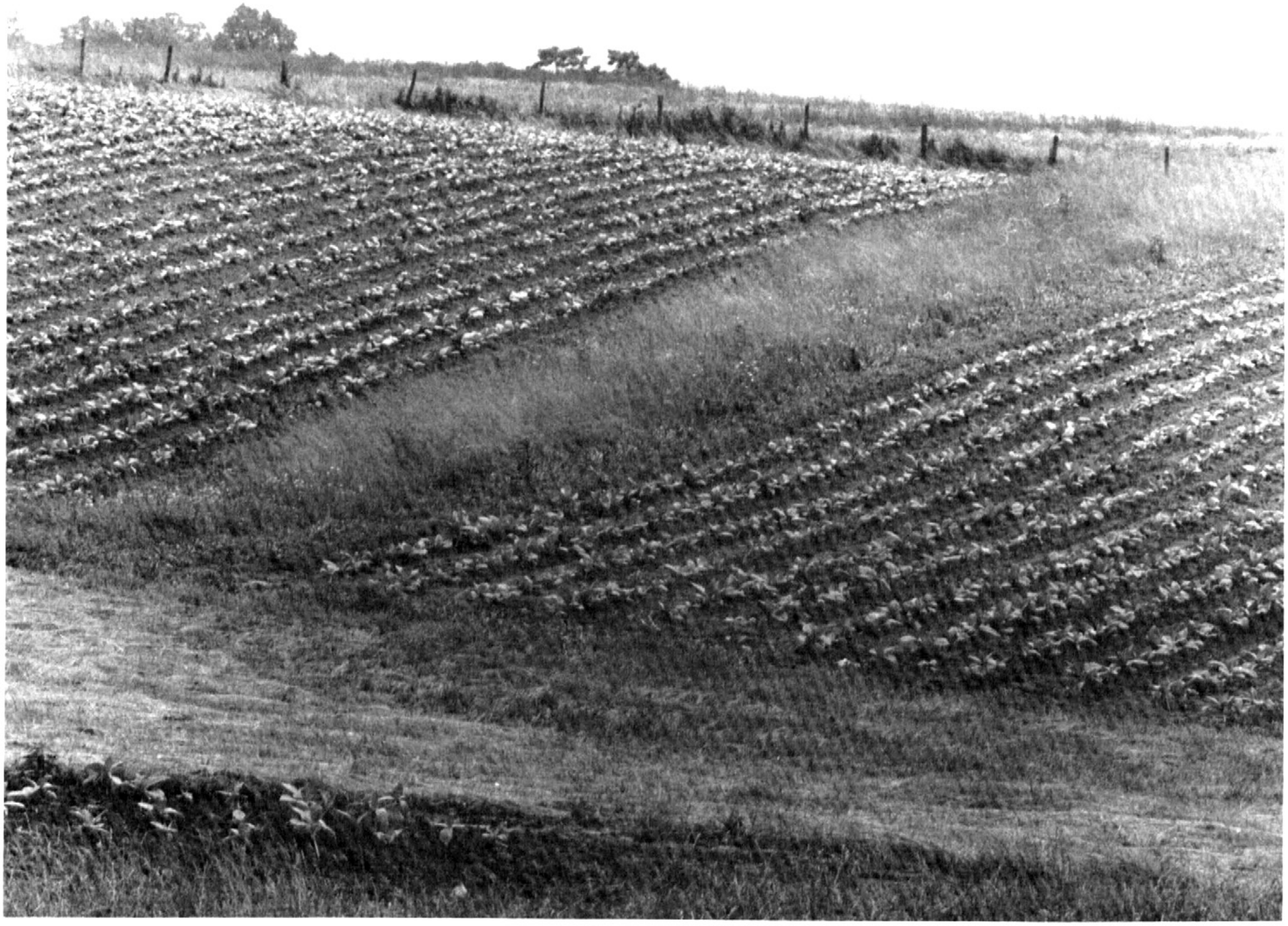


Figure 12.—Grassed waterway and buffer strips in a tobacco field on Lowell silt loam, 2 to 6 percent slopes.

Kentucky Cooperative Extension Service and the Soil Conservation Service.

Pasture and Hayland

In 1981 there were 31,000 beef and dairy cattle in Mason County *(7)*. Most of the hay crops and pastures are produced in a mixture of grasses and legumes. About 90 percent of the hayland is used in a rotation hay and pasture system. Most of the harvested hay is either rolled into large round bales or put up as grass silage (fig. 13).

Because about half of the total farm cash receipts in Mason County is from livestock, it is important that the forage program be of high quality. General principles of management for pasture and hayland are discussed in the following paragraphs.

A successful livestock program is dependent on a forage program that will supply large quantities of homegrown feeds of adequate quality. Such a program can furnish up to 78 percent of the feed for beef and 66 percent for dairy cattle *(4)*.

In Mason County about 58,000 acres is used for hay and pasture. Approximately 19,000 acres needs reestablishment; a sizeable acreage needs improvement, brush control, and protection from overgrazing.

The soils in Mason County vary widely in their capabilities and properties because of differences in depth to bedrock or limiting layers, internal drainage, ability to supply moisture, and many other properties. Grasses and legumes and grass-legume combinations vary widely in their ability to persist and produce on different soils. It is important to match the plants or

Figure 13.—Grass silage harvested in an area of Lowell silt loam, 6 to 12 percent slopes.

mixture of plants to the different soils so that the greatest returns can be realized along with maximum soil and water conservation.

For the best use of level to gently sloping, deep, well drained soils, the highest producing crops, such as corn, alfalfa, or a mixture of alfalfa-orchardgrass or alfalfa-timothy, are planted. Soils that are too steep for crops can be maintained in grasses, such as tall fescue or bluegrass, to minimize soil erosion. Alfalfa can be used with a cool-season grass if the soil is at least 2 feet deep and well drained. On soils less than 2 feet deep or not well drained, clover-grass mixtures or pure grass stands can be used. Legumes can be established in grass-dominant sods through renovation.

Plants need to be suited not only to the soil but also to the intended use. Selected plants provide maximum quality and versatility in the forage program. Legumes generally produce higher quality feed than grasses, resulting in higher animal performance, and should be used to the maximum extent possible. Taller growing legumes, such as alfalfa and red clover, are more versatile than a short legume, such as white clover, which is used primarily for grazing. Grasses, such as orchardgrass, timothy, and tall fescue, are very suitable for hay and silage.

Tall fescue is an important cool-season grass suited to a wide range of soil conditions. It is used for both pasture and hay. Growth that occurs from August to November is commonly permitted to accumulate in the field and is "stockpiled" for deferred grazing late in fall and in winter. Nitrogen fertilizer is one of the important keys for maximum production during the stockpiling period. Desired production levels determine the rate of application.

One of the ways of increasing the yields of pasture and hay fields that have a good stand of grass is by renovation. Renovation is the improvement of pasture and hay fields by partial destruction of the sod, plus liming, fertilizing, and seeding to reestablish desirable forage plants. Adding legumes to these grass fields provides high quality feed. Legumes increase summer production. They take nitrogen from the air. Under Kentucky growing conditions, alfalfa can fix 200-300 pounds of nitrogen per acre every year; red clover, 100-200 pounds; and Ladino clover, 100-150 pounds. An acre of Korean lespedeza, vetch, and other annual forage legumes can fix 75-100 pounds of nitrogen a year *(5)*.

Some important steps in successful renovation and management are:

- Graze or mow close before disking or disturbing the sod.
- Disturb 40 to 60 percent of the grass for sowing clovers and 80 to 100 percent for alfalfa. A disk, field cultivator, or field tiller can be used.
- Take soil tests and apply the needed lime, phosphate, and potash. Do not use nitrogen when adding legumes to old grass fields as it increases grass competition to the legume seedlings.
- Prepare a smooth, firm seedbed and distribute the seed evenly over the area, covering the seed about 1/8 to 1/4 inch deep to assure a good seed-soil contact.
- Seed an adapted variety that has a high percent germination and inoculate with the proper nitrogen-fixing bacteria.
- Seed alfalfa, fescue, bluegrass, timothy, orchardgrass, ryegrass, and small grains for forage late in summer or early in fall. Red clover, white clover, and lespedeza are generally most successfully seeded in the spring.
- Keep renovated fields grazed short until livestock start biting on the young legumes, then remove livestock and allow legumes to become established.
- Control grazing and leave 2 to 3 inches of top growth on established grass-legume mixtures.
- Mow pastures as needed to remove grass seed heads and to control weeds and woody vegetation.
- Topdress annually with phosphate and potash according to soil tests, and add lime to maintain soil pH for the legume that is being grown.
- Check renovated fields for insect damage or disease.

For additional information on pasture and hayland management contact the local office of the Soil Conservation Service or the Kentucky Cooperative Extension 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 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

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

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Kentucky Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management *(12)*. The criteria used in grouping the soils do not include major, and generally expensive, landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

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

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

Class I soils have 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 they 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 miscellaneous areas 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 a 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 very cold or very dry.

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

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units," and in table 6.

Woodland Management and Productivity

Charles A. Forest, forester, Soil Conservation Service, assisted in writing this section.

Mason County is a part of the Western Mesophytic Forest section with such characteristic trees as chinkapin oak, bur oak, white oak, hackberry, sugar maple, ash, black walnut, black cherry, Kentucky coffee tree, American elm, and shagbark and butternut hickories. The commercial woodland acreage totals 26,600 acres, or 17 percent of the land area in Mason County *(8)*. The central mixed-hardwood forest type is most extensive, approximately 7,000 acres. The oak-hickory type makes up 4,000 acres, and the redcedar-hardwood type makes up 4,000 acres. The rest of the acreage includes maple-beech, elm-oak-cottonwood, white oak, oak-pine, and southern pine.

Woodland tracts in the soil survey area are small, private holdings of approximately 24 acres each and are essentially unmanaged. Annual growth averages 22 cubic feet of growing stock and 84 board feet of sawtimber. However, practically all woodland has the potential to produce more than 50 cubic feet of growing stock per acre per year.

With proper management, tree growth, stocking, and tree quality can be improved. This involves removal of low quality trees in fully stocked and understocked stands of all sizes and regeneration of sawtimber stands after harvest. Soil surveys are a useful management tool to identify Kentucky's most productive forest lands, limitations for management, trees to protect, and trees to plant.

At the present time, there is no wood-using industry, such as a sawmill or pallet mill, in the county. However, mills in adjacent counties purchase logs or standing trees from the survey area.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol (woodland suitability) for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in a well-managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, 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 in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

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

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

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

Recreation

In table 9, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

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

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

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

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

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

Wildlife Habitat

William H. Casey, biologist, Soil Conservation Service, assisted in writing this section.

The wildlife of Mason County consists of an estimated 34 species of mammals, 33 species of reptiles and amphibians, and 110 species of breeding birds. Many of the more than 200 other kinds of birds that visit Kentucky each year can be found in the county during certain seasons.

The kinds of wildlife most important are those that furnish recreation in the form of sport hunting or economic gain from commercial trapping. In Mason County, these are cottontail rabbit, gray squirrel, fox squirrel, white-tailed deer, raccoon, red fox, mink, muskrat, bobwhite quail, mourning dove, woodcock, and several species of waterfowl.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

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

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

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

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

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

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

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are Virginia pine and eastern redcedar.

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

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

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

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

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

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

Engineering

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

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

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

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

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

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

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

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

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

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

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

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

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

Sanitary Facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, and soil reactions affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

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

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

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

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

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

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

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

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

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

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

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

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving.

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

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

Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 22.

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

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

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(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 and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

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

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 22.

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

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

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

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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

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

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

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

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

In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

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

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

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

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

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 18 and the results of chemical analysis in table 19. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the Kentucky Agricultural Experiment Station.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods *(14)*.

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).
Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).
Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).
Organic carbon—dichromate, ferric sulfate titration (6A1a).
Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (602), sodium (6P2), potassium (6Q2).
Extractable acidity—barium chloride-triethanolamine I (6H1a).
Cation-exchange capacity—ammonium acetate, pH 7.0 (5A1a).
Cation-exchange capacity—sum of cations (5A3a).
Base saturation—ammonium acetate, pH 7.0 (5C1).
Base saturation—sum of cations, TEA, pH 8.2 (5C3).
Reaction (pH)—1:1 water dilution (8C1a).
Reaction (pH)—potassium chloride (8C1c).
Available phosphorus—procedure (656) Kentucky Agricultural Experiment Station.
Field sampling—site selection (1A1).
Field sampling—soil sampling (1A2).
Laboratory preparation—standard (air dry) material (1B1).
Data sheet symbols (2B).
Exchangeable acidity (H+ A1)—Yuan procedure 67-3.52, Part 2, Methods of Analysis, ASA, 1965.
Calcium carbonate equivalent—Procedure (23b) USDA Handbook 60, USDA Salinity Laboratory, 1954 (6N7).

Mineralogy of Selected Soils

The results of clay mineralogy determinations of several typical pedons are given in tables 20 and 21. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were analyzed by the Soil Conservation Service, Midwest Technical Service Center, Lincoln, Nebraska.

The determinations in table 20 were made by the optical count method on very fine sand of the Lowell soil and coarse silt of the Nolin soil. The determinations in table 21 were on clay particles. All soils that were sampled were determined to have mixed mineralogy. The methods used in obtaining the data are indicated in the list that follows. The codes in parenthesis refer to published methods *(14)*.

Optical analysis (7B1).
Potassium (6Q3a).
Iron (6C7a).
X-ray diffraction (7A2i).
Differential thermal analysis (7A3).
Total analysis of clay (7C3).

Engineering Index Test Data

Table 22 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by the Soil Mechanics Lab, South National Technical Center, Fort Worth, Texas.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) *(1)* or the American Society for Testing and Materials (ASTM) *(2)*.

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(13)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 23 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisol that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

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

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

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (11)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (13)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Beasley Series

The Beasley series consists of deep, well drained soils that have moderately slow permeability. They formed in residuum of interbedded soft limestone and calcareous shales and siltstones. Beasley soils are on ridgetops and hillsides in the eastern part of the county. Slope ranges from 2 to 30 percent.

Beasley soils are associated with Faywood, Lowell, Nicholson, and Shelbyville soils on upper hillsides and ridgetops and with Cynthiana and Fairmount soils on lower, steeper hillsides. Cynthiana, Fairmount, and Faywood soils are not as deep to bedrock. Shelbyville soils are deeper and have a loess mantle. Lowell soils have a thicker solum and are underlain by hard bedrock. Nicholson soils have less clay in the upper part of the solum and have a fragipan.

Typical pedon of Beasley silt loam, 6 to 12 percent slopes, eroded; 0.2 mile east of Owl Hollow Road, 0.5 mile northeast of Kentucky Highway 10, about 7 miles east of Maysville:

Ap—0 to 6 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

B1—6 to 11 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium angular blocky structure; friable; common medium roots; very strongly acid; clear wavy boundary.

B2t—11 to 31 inches; strong brown (7.5YR 5/8) clay; few fine distinct pale brown (10YR 6/3) and light yellowish brown (2.5Y 6/4) mottles; weak medium angular blocky structure; firm, very sticky and very plastic; common fine roots; few discontinuous clay films; very strongly acid; gradual wavy boundary.

B3—31 to 40 inches; light olive brown (2.5Y 5/4) clay; few fine distinct light brownish gray (2.5Y 6/2) mottles; massive with some weak medium subangular blocky structure; very firm, sticky and plastic; few fine roots; few thick discontinuous yellowish brown (10YR 5/6) clay films; dark root stains and few black concretionary stains; neutral; abrupt smooth boundary.

Cr—40 to 46 inches; greenish gray (5GY 6/1) soft interbedded platy shale, siltstone, and limestone; coarse-grained brownish siltstone and limestone in lower part.

Thickness of the solum ranges from 20 to 40 inches; depth to soft calcareous rock is 40 to 60 inches. Coarse fragments of chert, soft limestone, shale, or siltstone range from 0 to 10 percent in the solum and from 0 to 30 percent in the C horizon. Reaction ranges from very strongly acid to neutral in the solum.

The Ap horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 to 4. Texture is silt loam or silty clay.

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6.

The B2t and B3 horizons have hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 8. Most pedons have few to many mottles in shades of red, brown, or yellow, and in shades of gray in the lower part of the B horizon.

The C horizon, if present, has matrix colors and mottles in shades of gray, olive, and brown. Texture is silty clay or clay.

Boonesboro Series

The Boonesboro series consists of moderately deep, well drained soils that have a moderately permeable A horizon and a rapidly permeable B horizon. They formed in alluvium over limestone bedrock. Mapped areas are generally long and narrow and are near stream channels that frequently overflow. Slope ranges from 0 to 3 percent.

Boonesboro soils are associated with Nolin soils on flood plains and Elk soils on nearby terraces. Nolin soils are more than 40 inches deep to bedrock and have less than 5 percent coarse fragments in the solum. Elk soils have an argillic horizon and are deeper to bedrock.

Typical pedon of Boonesboro silt loam, frequently flooded; 528 yards southeast of farmhouse along Mill Creek, 0.6 mile east of the intersection of Middle Trace Road and Cliff Pike Road, about 9 miles south of Maysville:

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam; moderate fine granular structure; friable; common small roots; few black concretions; neutral; gradual smooth boundary.

A1—8 to 19 inches; dark brown (10YR 3/3) silty clay loam; moderate medium granular structure; friable; common small roots; common black concretions; neutral; clear smooth boundary.

B—19 to 34 inches; brown (10YR 4/3) very gravelly silty clay loam; weak fine granular structure; very friable; few fine roots; common black concretions; 50 percent gravel; neutral; abrupt smooth boundary.

R—34 inches; gray limestone.

Thickness of the solum and depth to bedrock range from 20 to 40 inches. Reaction ranges from slightly acid to mildy alkaline throughout. Limestone, chert, and siltstone fragments range from 0 to 20 percent in the A horizon and from 15 to 75 percent in the B horizon.

The Ap and A1 horizons have hue of 10YR, value of 3, and chroma of 2 or 3. The combined thickness ranges from 12 to 24 inches. The texture of the Ap horizon is silt loam and the A1 horizon is silty clay loam and their gravelly or flaggy analogs.

The B horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 2 to 4. Texture is gravelly, very gravelly, cherty, channery, or flaggy analogs of silt loam, silty clay loam, loam, or clay loam.

Chavies Series

The Chavies series consists of deep, well drained soils that have moderately rapid permeability. They formed in alluvium of mixed origin, mainly from eolian deposits and glacial outwash. Chavies soils are on terraces along the Ohio River. Slope ranges from 2 to 12 percent.

Chavies soils are associated with Otwell and Wheeling soils on surrounding terraces and with Nolin soils on nearby flood plains. Otwell soils are not as well drained and have a fragipan. Nolin soils are more silty and do not have an argillic horizon. Wheeling soils are fine-loamy.

Typical pedon of Chavies fine sandy loam, 2 to 6 percent slopes; about 4 miles west of Maysville, 310 yards northeast of the intersection of Kentucky Highway 1597 and Kentucky Highway 8, about 130 yards north of Kentucky Highway 8:

Ap—0 to 12 inches; brown (7.5YR 4/4) fine sandy loam; weak fine granular structure; very friable; few fine roots; few mica flakes; neutral; clear smooth boundary.

B21t—12 to 29 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; few brown (7.5YR 4/4) coatings on ped faces; friable; few fine roots; few thin discontinuous clay films; few mica flakes; slightly acid; gradual wavy boundary.

B22t—29 to 43 inches; strong brown (7.5YR 5/6) fine sandy loam; few fine distinct pale brown (10YR 6/3) mottles and common fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; few thin discontinuous clay films; few mica flakes; slightly acid; gradual smooth boundary.

C—43 to 70 inches; variegated yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) fine sandy loam that has thin layers of silty clay loam; structureless; friable; few mica flakes; strongly acid.

Thickness of the solum ranges from 30 to 50 inches. Depth to bedrock is more than 60 inches. Reaction ranges from neutral to very strongly acid in the solum and from medium acid to very strongly acid in the C horizon.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The B horizon has hue of 10YR or 7.5YR, value of 4 to 5, and chroma of 4 or 6. Texture is loam or fine sandy loam.

The C horizon has colors like the B horizon. Texture is fine sandy loam, loam, loamy sand, sandy loam, and their gravelly analogs. Some pedons are stratified.

Cynthiana Series

The Cynthiana series consists of shallow, well drained soils that have moderately slow permeability. They formed in residuum weathered from limestone. Cynthiana soils are on hillsides in the eastern part of the county. Slope ranges from 6 to 30 percent.

Cynthiana soils are associated with Beasley, Faywood, and Lowell soils on upper hillsides and with Fairmount soils on lower, steeper hillsides. Beasley and Lowell soils are more than 40 inches to bedrock. Faywood soils are 20 to 40 inches to bedrock. Fairmount soils have a mollic epipedon.

Typical pedon of Cynthiana silty clay in an area of Cynthiana-Faywood complex, very rocky, 12 to 30 percent slopes, eroded; about 500 feet north of Half Hill Road, 390 feet north of old farmhouse, 0.9 mile west of the junction of Half Hill Road and Kentucky Highway 1449 at Orangeburg:

Ap—0 to 5 inches; dark brown (10YR 4/3) silty clay; weak medium and fine subangular blocky structure; firm; many fine roots; 5 to 10 percent limestone channers and flagstones 2 to 15 inches across; slightly acid; clear smooth boundary.

B21t—5 to 10 inches; dark yellowish brown (10YR 4/4) silty clay; moderate medium and fine subangular blocky structure; firm; common fine roots; few thin patchy dark brown (10YR 4/3) clay films; 10 percent limestone channers and flagstones 2 to 15 inches across; neutral; clear smooth boundary.

B22t—10 to 16 inches; dark yellowish brown (10YR 4/4) flaggy silty clay; few fine distinct brown (10YR 5/3) mottles; moderate medium and fine subangular blocky structure; firm; few fine roots; common thin continuous dark brown (10YR 4/3) clay films; 20 percent limestone channers and flagstones 2 to 15 inches across; neutral; clear smooth boundary.

B23t—16 to 18 inches; dark yellowish brown (10YR 4/4) channery clay; 30 percent variegation of pale olive (5Y 6/4); weak coarse and medium subangular blocky structure; firm; few fine roots; common thin patchy dark brown (10YR 4/3) clay films; 15 percent limestone channers and flagstones 2 to 15 inches across; mildly alkaline.

R—18 inches; limestone bedrock.

Thickness of the solum and depth to bedrock range from 10 to 20 inches. Reaction ranges from slightly acid to mildly alkaline throughout. Thin, flat, limestone and shale fragments from 2 to 15 inches across range from 0 to 15 percent in the A horizon and from 5 to 35 percent in the B horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4, and chroma of 2 to 4. Texture is silty clay loam or silty clay.

The B horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay or clay and their flaggy or channery analogs.

Eden Series

The Eden series consists of moderately deep, well drained soils that are slowly permeable. They formed in residuum of interbedded soft, calcareous shale and siltstone and thin layers of limestone. Eden soils are on hillsides and narrow ridgetops in the western part of the county. Slope ranges from 6 to 40 percent.

Eden soils are associated with Faywood, Lowell, Nicholson, and Shelbyville soils on upper hillsides and ridgetops. They are also associated with Fairmount soils on hillsides. Faywood soils are moderately deep to hard bedrock. Nicholson soils have a fragipan. Lowell and Shelbyville soils are deeper to bedrock. Fairmount soils are on very steep slopes above Eden soils, have a mollic epipedon, and are less than 20 inches deep to bedrock.

Typical pedon of Eden silt loam, 6 to 20 percent slopes, eroded; about 360 feet southeast of a barn, 310 feet southwest of North Fork Licking River, 0.4 mile northeast of the bridge on U.S. Highway 62 at Murphysville, about 7 miles southwest of Maysville:

Ap—0 to 7 inches; brown (10YR 5/3) silt loam; moderate fine and medium granular structure; friable; many fine roots; 5 percent soft siltstone fragments 1/2 inch to 4 inches in length; very strongly acid; abrupt smooth boundary.

B21t—7 to 16 inches; light olive brown (2.5Y 5/4) channery silty clay loam; moderate coarse and medium angular blocky structure; very firm; common fine roots; few fine pores; continuous brown clay films; 2-inch streak of dark yellowish brown in middle of horizon; 20 percent soft thin flat siltstone fragments 2 to 6 inches in length; strongly acid; clear smooth boundary.

B22t—16 to 24 inches; light olive brown (2.5Y 5/4) flaggy silty clay; moderate medium and coarse angular blocky structure; very firm; few fine roots; few fine pores; continuous olive brown clay films; 30 percent soft thin flat siltstone and limestone fragments 3 to 10 inches in length; neutral; abrupt smooth boundary.

Cr—24 to 40 inches; interbedded limestone, shale, and siltstone.

Thickness of the solum ranges from 14 to 35 inches. Paralithic contact ranges from 20 to 40 inches. Coarse fragments of limestone, siltstone, and shale range from 0 to 25 percent in the A horizon and from 10 to 35 percent in the B horizon. Reaction ranges from very strongly acid to mildly alkaline in the solum and is neutral or mildly alkaline in the C horizon, if present.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture is silt loam or flaggy silty clay loam.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture is silty clay loam or silty clay in the upper part and silty clay or clay in the lower part. Most pedons are channery or flaggy. The lower part of the Bt horizon is mottled in shades of brown, gray, and olive in some pedons.

Eden silt loam, 6 to 20 percent slopes, eroded, contains more silt and less clay in the upper part of the B horizon than is allowed for the series. It is considered a taxadjunct to the Eden series. Use, behavior, and management are the same as for the Eden series, however.

Elk Series

The Elk series consists of deep, well drained soils that have moderate permeability. They formed in mixed alluvium from soils developed in residuum of limestone, siltstone, shale, and loess. Elk soils are on terraces along large streams throughout the county and to a lesser extent on old stream terraces at a higher elevation on the western end of Jersey Ridge. Slope ranges from 2 to 12 percent.

Elk soils are associated with Boonesboro and Nolin soils on nearby flood plains and with Otwell soils on surrounding terraces. Boonesboro and Nolin soils do not have an argillic horizon. Otwell soils have a fragipan.

Typical pedon of Elk silt loam, 2 to 6 percent slopes; 132 yards south of North Fork Licking River, 88 yards west of old farmhouse, about 1.7 miles north of the intersection of Bear Wallow Road and Polecat Road, about 1.6 miles southeast of the intersection of Polecat Road and Kentucky Highway 1234, about 2 miles south of Orangeburg:

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

B1—9 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

B21t—20 to 35 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin patchy clay films; medium acid; clear smooth boundary.

B22t—35 to 47 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint pale brown mottles; moderate medium subangular blocky structure; firm; few fine roots; thick continuous clay films; few small black concretions; very strongly acid; clear smooth boundary.

C—47 to 70 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct pale brown (10YR 6/3) mottles; massive; firm; common black and brown concretionary stains on ped faces; few small black concretions in upper part and common medium black concretions in lower part; strongly acid.

Thickness of the solum ranges from 36 to 54 inches. Depth to bedrock ranges from 60 to 100 inches or more. Reaction ranges from slightly acid to very strongly acid in the solum and from slightly acid to strongly acid in the C horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is silt loam or silty clay loam.

The C horizon has the same color range as described for the B horizon. It ranges from silt loam through silty clay loam that has 0 to 35 percent gravel. Some pedons have a C horizon that is stratified fine sandy loam, loam, clay loam, or silty clay.

Fairmount Series

The Fairmount series consists of shallow, well drained soils that have slow or moderately slow permeability. They formed in limestone residuum interbedded with thin layers of calcareous shales. Fairmount soils are on very steep hillsides and bluff areas throughout the county. Slope ranges from 30 to 65 percent.

Fairmount soils are associated with Cynthiana, Eden, Faywood, Lowell, and Beasley soils. None of the associated soils have a mollic epipedon. Eden, Faywood, Lowell, and Beasley soils are deeper to hard bedrock.

Typical pedon of Fairmount flaggy silty clay loam; about 0.7 mile east of the intersection of Middle Trace Road and Cliff Pike Road, 2 miles east of U.S. Highway 68, about 8 miles south of Maysville:

A1—0 to 13 inches; very dark grayish brown (10YR 3/2) flaggy silty clay loam; weak medium granular and moderate medium subangular blocky structure; friable; common medium and fine roots; 15 percent thin flat limestone fragments 4 to 10 inches long; neutral, abrupt smooth boundary.

B2—13 to 18 inches; dark grayish brown (10YR 4/2) flaggy clay; very dark grayish brown (10YR 3/2) silt coatings on ped faces; moderate medium subangular blocky structure; firm; common fine roots; 30 percent thin flat limestone fragments 4 to 10 inches long; neutral.

R—18 inches; hard gray limestone.

Thickness of the solum and depth to bedrock range from 10 to 20 inches. Reaction ranges from neutral to moderately alkaline throughout. Thin, flat, limestone fragments from 3 to 20 inches across range from 5 to 30 percent throughout the solum.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. Texture is flaggy silty clay loam.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Texture is silty clay or clay and their flaggy analogs.

The R horizon is thin layers of hard limestone or limestone interbedded with thin calcareous shale.

Faywood Series

The Faywood series consists of moderately deep, well drained soils that have moderately slow or slow permeability. They formed in clayey limestone residuum. Faywood soils are on ridgetops and hillsides throughout the county. Slope ranges from 2 to 30 percent.

Faywood soils are associated with Beasley, Lowell, Nicholson, and Shelbyville soils on upper hillsides and ridgetops and with Cynthiana, Eden, and Fairmount soils on lower, steeper hillsides. Beasley and Eden soils are underlain by interbedded, soft limestone, shale, and siltstone. Cynthiana and Fairmount soils are less than 20 inches to hard bedrock. Lowell, Nicholson, and Shelbyville soils are deeper to bedrock.

Typical pedon of Faywood silt loam, 2 to 6 percent slopes; 440 yards east of Middle Trace Road which is 0.7 mile south of the junction of Middle Trace Road and Cliff Pike Road, 2 miles east of U.S. Highway 68, about 8 miles south of Maysville:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine granular and weak medium subangular blocky structure; very friable; common medium roots; slightly acid; clear smooth boundary.

B21t—9 to 16 inches; brown (7.5YR 5/4) silty clay; moderate medium subangular blocky structure; firm, sticky; common fine roots; common clay films; neutral; clear smooth boundary.

B22t—16 to 30 inches; yellowish brown (10YR 5/6) clay; moderate medium subangular blocky structure; firm, sticky; few fine roots; common clay films; few black and brown concretions; neutral.

R—30 inches; hard limestone.

Thickness of the solum and depth to bedrock is 20 to 40 inches. Reaction ranges from strongly acid to neutral throughout. Limestone and shale fragments range from 0 to 10 percent throughout the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Texture is silt loam or silty clay loam.

The B2t horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 4 to 6. The lower part is commonly mottled in shades of brown or olive, and a few pedons have mottles of 2 chroma below the upper 10 inches of the argillic horizon. Texture is silty clay loam, silty clay, and clay.

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 ridgetops and hillsides throughout the county. Slope ranges from 2 to 20 percent.

Lowell soils are associated with Beasley, Faywood, Nicholson, and Shelbyville soils on nearby ridgetops and upper side slopes and with Cynthiana and Eden soils on lower hillsides. Beasley soils have a thinner solum, and Faywood, Cynthiana, and Eden soils are not as deep to bedrock. Nicholson soils have a fragipan, and Shelbyville soils are deeper to the clayey horizon and bedrock.

Typical pedon of Lowell silt loam, 2 to 6 percent slopes; about 625 feet south of Kentucky Highway 324, 0.4 mile southeast of the junction of Kentucky Highway 324 and Kentucky Highway 161, 0.7 mile southeast of the junction of Kentucky Highway 324 and U.S. Highway 68 at Mays Lick, 9 miles south of Maysville:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure parting to moderate fine and medium granular structure; very friable; common small roots; few fine pores; nearly continuous dark brown coatings; medium acid; abrupt smooth boundary.

B1—8 to 12 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; few fine pores; discontinuous dark brown coatings; few discontinuous clay films; few small black concretions; medium acid; clear smooth boundary.

B21t—12 to 23 inches; strong brown (7.5YR 4/6) silty clay loam; moderate coarse subangular blocky structure parting to weak fine angular blocky; firm; common fine roots; few fine pores; nearly continuous brown clay films; few small black concretions; common black coatings and stains; medium acid; gradual smooth boundary.

B22t—23 to 29 inches; yellowish brown (10YR 5/6) clay; moderate coarse subangular blocky structure parting to weak fine angular blocky structure; firm; few fine roots, few fine pores; nearly continuous clay films; common black concretions, coatings, and stains; medium acid; gradual smooth boundary.

B23t—29 to 37 inches; yellowish brown (10YR 5/6) clay; few fine faint pale brown mottles; moderate coarse subangular blocky structure parting to weak fine angular blocky; firm; few fine roots; few fine pores; nearly continuous clay films; few black concretions; common black coatings and stains; strongly acid; gradual wavy boundary.

B24t—37 to 54 inches; yellowish brown (10YR 5/6) clay; many medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure parting to weak fine angular blocky; firm; many black concretions; stains and soft nodules; common discontinuous clay films; one large slickenside about 8 inches in length; strongly acid; gradual smooth boundary.

C—54 to 62 inches; mottled yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and dark brown (10YR 3/3) silty clay; massive very firm; four pressure faces; common black stains and soft nodules; neutral.

Thickness of the solum ranges from 40 to 60 inches, and depth to limestone or interbedded limestone, shale, and siltstone ranges from 40 to 80 inches or more. Reaction ranges from very strongly acid to slightly acid in the upper part of the solum and from strongly acid to mildly alkaline in the lower part. Limestone and shale fragments range from 0 to 5 percent in the upper part of the solum and from 0 to 15 percent in the lower part.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6.

The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture is silty clay loam or silty clay.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Some pedons have mottles in shades of brown, red, and yellow in the lower part. Texture is silty clay loam or silty clay in the upper part and silty clay or clay in the lower part.

The B3 horizon, when present, has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Mottles are in shades of brown, gray, yellow, or olive. Texture is silty clay or clay.

The C horizon has color and texture similar to those of the B3 horizon. The lower part is a mixture of massive clay and interbedded limestone and shale.

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 interbedded limestone, siltstone, and shale. Nicholson soils are on broad ridgetops mainly in the western part of the county. They have a water table at a depth of 1.5 to 2.5 feet late in winter and early in spring. Slope ranges from 2 to 6 percent.

Nicholson soils are associated with Beasley, Faywood, Lowell, and Shelbyville soils on nearby ridgetops and upper hillsides and with Eden soils on lower, steeper hillsides. Eden and Faywood soils have bedrock at less than 40 inches. Beasley, Lowell, and Shelbyville soils are well drained and do not have a fragipan.

Typical pedon of Nicholson silt loam, 2 to 6 percent slopes; about 360 feet west of a barn, 900 feet south of a covered bridge, 1.2 miles northeast of the junction of Valley Pike Road and Kentucky Highway 435, 2.5 miles northeast of Fernleaf:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak fine and medium granular structure; very friable; common fine roots; few fine pores; continuous dark brown coatings; slightly acid; abrupt smooth boundary.

B1—9 to 14 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; common fine roots; few fine pores; continuous brown coatings; strongly acid; clear smooth boundary.

B21t—14 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; moderate coarse subangular blocky structure parting to weak fine angular blocky; friable; few fine roots; few fine pores; continuous dark yellowish brown silt coats on large peds; common discontinuous strong brown clay films on small peds; strongly acid; clear wavy boundary.

Bx1—21 to 27 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and light yellowish brown (10YR 6/4) mottles; moderate very coarse prismatic structure parting to weak medium angular blocky; very firm, brittle and compact; few fine roots between prisms; pale brown and light brownish gray silt coatings 1/8 to 1/4 inch thick between prisms; common clay films on small peds; few small black concretions and coatings; strongly acid; gradual smooth boundary.

Bx2—27 to 37 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak medium angular blocky; very firm, brittle and compact; light brownish gray clay films between prisms 1/8 to 1 inch thick; few discontinuous clay films on small peds; few small black concretions and coatings; very strongly acid; clear wavy boundary.

Bx3—37 to 43 inches; like above except silty clay loam, many black coatings, stains, and soft nodules; strongly acid; clear smooth boundary.

B22t—43 to 64 inches; yellowish brown (10YR 5/6) clay; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure parting to weak medium angular blocky; firm; many clay films; common slickensides; common black films, stains, and soft nodules; medium acid; clear smooth boundary.

IIC—64 to 73 inches; mottled grayish brown (10YR 5/2) and light olive brown (2.5Y 5/4) channery silty clay; massive; very firm; 25 percent thin flat limestone fragments 1 to 4 inches in length; mildly alkaline; abrupt smooth boundary.

R—73 inches; gray limestone.

Thickness of the solum ranges from 40 to 80 inches, and depth to limestone or interbedded limestone, shale, and siltstone is more than 60 inches. Depth to the fragipan is 18 to 30 inches. Soil reaction ranges from very strongly acid to slightly acid through the fragipan and from strongly acid to mildly alkaline below the fragipan.

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

The B1 and B2 horizons have hue of 10YR, value of 4 or 5, and chroma of 4 to 6. Some pedons have few to common pale brown and strong brown mottles. Texture ranges from silt loam to silty clay loam.

The Bx horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 3 to 6. Mottles are few to common and have chroma of 2 or less. Texture is silt loam or silty clay loam.

The IIB horizon is mottled and has hue of 7.5YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay or clay.

The IIC horizon has the same color and texture range as the IIB horizon. Coarse fragments range from 0 to 30 percent.

Nolin Series

The Nolin series consists of deep, well drained soils that are moderately permeable. They formed in alluvium derived from limestone, siltstone, shale, and loess. Nolin soils are on nearly level flood plains throughout the county. Slope ranges from 0 to 3 percent.

Nolin soils are associated with Boonesboro soils on flood plains and with Elk, Chavies, Otwell, and Wheeling soils on surrounding terraces. Boonesboro soils are moderately deep and are gravelly. Elk, Chavies, Otwell, and Wheeling soils have an argillic horizon.

Typical pedon of Nolin silt loam, occasionally flooded; about 104 feet southwest of North Fork Licking River, 340 feet north of a barn, 0.4 mile northeast of the bridge on U.S. Highway 62 at Murphysville, 7 miles southwest of Maysville:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, moderate medium and fine subangular blocky structure parting to weak fine granular; friable; many fine roots; neutral; clear smooth boundary.

B1—8 to 16 inches; dark brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure parting to weak fine granular structure; friable; common fine roots; neutral; gradual smooth boundary.

B21—16 to 26 inches; dark brown (10YR 4/3) silt loam; weak medium and coarse subangular blocky structure; friable; few fine roots; few dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; gradual smooth boundary.

B22—26 to 46 inches; dark brown (10YR 4/3) silt loam; weak medium and coarse subangular blocky structure; friable; few fine roots; common thin discontinuous grayish brown coatings and streaks; neutral; gradual smooth boundary.

B3—46 to 58 inches; dark brown (10YR 4/3) silt loam; weak coarse subangular blocky structure; common thin discontinuous grayish brown coatings and streaks; neutral; gradual smooth boundary.

C1—58 to 72 inches; dark brown (10YR 4/3) silt loam; crushed; dark brown (10YR 3/3) uncrushed; weak coarse subangular blocky structure; common thin discontinuous grayish brown coatings and streaks; neutral.

Thickness of the solum is 40 inches or more. Depth to bedrock is more than 60 inches. Reaction ranges from medium acid to moderately alkaline throughout. Coarse fragments, mostly pebbles, range from 0 to 5 percent in the solum and from 0 to 10 percent below.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Texture is silt loam and silty clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Mottles are in shades of brown and gray. Texture is silty clay loam, silt loam, loam, or fine sandy loam, or it is stratified.

Otwell Series

The Otwell series consists of deep, moderately well drained soils that have very slow permeability. They formed mainly in mixed alluvium on terraces along large streams. Slopes are generally concave and range from 2 to 6 percent. Otwell soils have a fragipan.

Otwell soils are associated with Boonesboro and Nolin soils on nearby flood plains and with Elk, Chavies, and Wheeling soils on surrounding terraces. Elk, Chavies, and Wheeling soils are well drained and do not have a fragipan. Boonesboro and Nolin soils do not have a fragipan or an argillic horizon.

Typical pedon of Otwell silt loam, 2 to 6 percent slopes; about 5 miles northwest of Maysville in Charleston Bottoms, 250 feet northeast of the C&O Railroad, 1,000 feet southeast of a power line, 1,450 feet southwest of the Ohio River:

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine and very fine roots; many very fine mica flakes; some partial mixing with the B21t; slightly acid; clear smooth boundary.

B21t—9 to 13 inches; brown (7.5YR 5/4) silty clay loam; few fine faint pale brown and strong brown mottles; moderate medium subangular blocky structure; friable; common fine roots; many very fine mica flakes; medium acid; clear wavy boundary.

B22t—13 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; few medium faint light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many very fine mica flakes; few black and brown concretions; strongly acid; abrupt smooth boundary.

Bx1—20 to 25 inches; light yellowish brown (10YR 6/4) and brownish yellow (10YR 6/6) silty clay loam; weak medium prismatic structure parting to weak coarse subangular blocky structure; firm; few fine roots between peds; very strongly acid; gradual smooth boundary.

Bx2—25 to 32 inches; brown (7.5YR 5/4) silty clay loam; common medium distinct gray (10YR 6/1), reddish yellow (7.5YR 6/6), and pale brown (10YR 6/3) mottles; moderate coarse prismatic structure; very firm, brittle; many very fine mica flakes; common black manganese stains; very strongly acid; clear wavy boundary.

Bx3—32 to 57 inches; yellowish brown (10YR 5/4) and dark brown (7.5YR 4/4) silty clay loam; common medium strong brown (7.5YR 5/8), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/6) mottles; strong very coarse prismatic structure; very firm, brittle and compact; many very fine mica flakes; common black and brown concretions; few pale brown (10YR 6/3) streaks between peds; very strongly acid; gradual wavy boundary.

C—57 to 94 inches; dark yellowish brown (10YR 4/4) silty clay loam; few faint pale brown mottles; weak medium platy structure; friable; few black manganese stains; many very fine mica flakes; strongly acid.

Thickness of the solum ranges from 40 to 80 inches. Depth to bedrock ranges from 50 to 120 inches or more and is generally more than 90 inches. Depth to the fragipan is 18 to 30 inches. Soil reaction ranges from medium acid to very strongly acid through the fragipan unless the surface area has been limed. It is strongly acid to medium acid below the fragipan.

The Ap horizon is 8 to 10 inches thick. It has hue of 10YR, value of 4, and chroma of 3 or 4.

The B2 horizon is 10 to 20 inches thick. It has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 6. Some pedons have a few pale brown to strong brown mottles in the B2 horizon. Texture is silt loam or silty clay loam.

The Bx horizon is 15 to 40 inches thick. It has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8. Mottles range from few to many and have chroma of 2 or less. Texture is silt loam or silty clay loam.

Some pedons have a B3 horizon up to 20 inches thick that has color and texture similar to the Bx horizon.

The C horizon is similar in color and texture to the Bx horizon. Some pedons are stratified or gravelly.

Shelbyville Series

The Shelbyville series consists of deep, well drained soils that have moderate permeability. They formed in a loess mantle and the underlying residuum from limestone. Shelbyville soils are mostly on broad ridgetops in the western half of the county. Slope ranges from 2 to 6 percent.

Shelbyville soils are associated with Beasley, Faywood, Lowell, and Nicholson soils on surrounding ridgetops and upper hillsides and with Eden soils on lower, steeper hillsides. Eden and Faywood soils are less than 40 inches to rock. Lowell and Beasley soils are more clayey in the upper part of the B horizon. Nicholson soils have a fragipan.

Typical pedon of Shelbyville silt loam, 2 to 6 percent slopes; about 830 feet north of a barn, 0.2 mile southwest of Valley Pike Road, 2 miles north of the junction of Valley Pike Road and Kentucky Highway 435, 2.7 miles northeast of Fernleaf, about 6 miles west of Maysville:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure parting to weak fine granular; friable; many fine roots; strongly acid; clear smooth boundary.

A&B—9 to 15 inches; very dark grayish brown (10YR 3/2) and dark brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure parting to weak fine granular; friable; common fine roots; common black concretions about 1/8 inch in diameter; medium acid; gradual smooth boundary.

B21t—15 to 24 inches; dark brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; few thin patchy strong brown (7.5YR 4/6) clay films on faces of peds; common black concretions about 1/8 inch in diameter; medium acid; gradual smooth boundary.

B22t—24 to 33 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; few fine roots; common thin patchy strong brown (7.5YR 4/6) clay films on faces of peds; many black concretions about 1/8 inch in diameter; slightly acid; gradual smooth boundary.

B23t—33 to 40 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; friable; common thin continuous strong brown (7.5YR 4/6) clay films on faces of peds; many black concretions about 1/8 inch in diameter; slightly acid; clear smooth boundary.

IIB24t—40 to 47 inches; dark brown (7.5YR 4/4) silty clay; moderate medium and fine subangular blocky structure; friable; common thin continuous strong brown (7.5YR 4/6) clay films on faces of peds; many black concretions 2 millimeters in diameter; slightly acid; clear smooth boundary.

IIB25t—47 to 54 inches; brown (7.5YR 5/4) silty clay; moderate medium and fine subangular and angular blocky structure; firm; common thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; common black concretions 1/4 inch or less in diameter; strongly acid; gradual smooth boundary.

IIB26t—54 to 62 inches; brown (7.5YR 5/4) silty clay; moderate medium and fine subangular and angular blocky structure; firm; common distinct continuous brown (7.5YR 4/4) clay films on faces of peds; many black concretions 1/4 inch or less in diameter; very strongly acid; gradual smooth boundary.

IIB27t—62 to 78 inches; strong brown (7.5YR 5/6) silty clay; moderate medium and fine subangular and angular blocky structure; firm; common distinct continuous brown (7.5YR 5/4) clay films on faces of peds; many black concretions 1/4 inch or less in diameter; 15 percent soft yellowish brown (10YR 5/6) siltstone fragments; very strongly acid; clear smooth boundary.

IIB28t—78 to 90 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and pale brown (10YR 6/3) mottles; weak medium subangular blocky structure with relict shale structure; firm; few distinct patchy brown (7.5YR 5/4) clay films; few black concretions 1/8 inch in diameter; very strongly acid.

Thickness of the solum is more than 50 inches, and depth to bedrock is more than 60 inches. Mica flakes are common in the solum of some pedons. Reaction ranges from strongly acid to neutral in the upper part of the soil and from very strongly acid to mildly alkaline in the lower part.

The Ap horizon has hue of 10YR or 7.5YR, value of less than 4, and chroma of 2 to 4.

The B1 and B2t horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture is silt loam or silty clay loam.

The IIB horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. Some pedons are mottled in shades of brown, gray, or olive. Texture is silty clay or clay.

Some pedons have a IIC horizon that has matrix colors and mottles in shades of brown, gray, or olive. It is silty clay or clay.

Shelbyville soils in this survey, below a depth of about 54 inches, have a slightly lower pH and a base saturation that is less than 35 percent by sum of cations. Because these values are outside the range of the official series, these soils are considered to be taxadjuncts to the Shelbyville series. The use, management, and behavior of these soils are the same as for the Shelbyville series, however.

Wheeling Series

The Wheeling series consists of deep, well drained soils that have moderate permeability. They formed in loamy material underlain by sand or sand and gravel. Wheeling soils are on the Ohio River terraces. Slope ranges from 0 to 55 percent.

Wheeling soils are associated with Nolin soils on nearby flood plains and with Chavies and Otwell soils on surrounding terraces. Nolin soils do not have an argillic horizon. Chavies soils have less than 18 percent clay. Otwell soils are not as well drained and have a fragipan.

Typical pedon of Wheeling silt loam, 0 to 4 percent slopes; about 10 miles northwest of Maysville, about 528 yards northeast of the intersection of Kentucky Highway 1235 and Kentucky Highway 8, about 265 yards north of Kentucky Highway 8 in Dover:

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

B21t—9 to 20 inches; strong brown (7.5YR 5/6) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; thick discontinuous clay films; few mica flakes; medium acid; gradual wavy boundary.

B22t—20 to 32 inches; strong brown (7.5YR 5/6) silty clay loam; few fine distinct yellowish red (5YR 5/8) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; weak discontinuous clay films; few mica flakes; few black concretions; strongly acid; gradual wavy boundary.

B3—32 to 52 inches; strong brown (7.5YR 5/6) silty clay loam and silt loam; few fine faint pale brown mottles; weak moderate subangular blocky structure; firm; few very thin discontinuous clay films; few mica flakes; strongly acid; gradual wavy boundary.

IIC—52 to 82 inches; dark brown (7.5YR 4/4) fine sandy loam that has thin layers of loamy sand and silty clay loam; few fine distinct pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; structureless; loose; few black stains; strongly acid.

Thickness of the solum ranges from 40 to 60 inches. Depth to bedrock is more than 6 feet. Reaction ranges from slightly acid to strongly acid in the surface layer and is strongly acid or medium acid in the subsoil and substratum. Mica flakes are common throughout most pedons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture ranges from silty clay loam to fine sandy loam.

The C horizon is stratified and ranges from dominantly fine sandy loam to dominantly gravel.

Formation of the Soils

This section discusses the factors of soil formation, relates them to the soils of the survey area, and describes the processes of soil formation.

Factors of Soil Formation

Soil is a natural, three dimensional body on the earth's surface that supports plants and has properties resulting from the interaction of climate and living matter on earthy parent material, as conditioned by relief over time.

The interaction of five main factors results in differences among soils. These factors are the physical and chemical compositon of the parent material; the climate during and after the accumulation of the parent material; the kinds of plants and animals living in the soil; the relief or topography of the land and its effect on drainage; and the length of time the soil forming factors have been in progress. In the following paragraphs the factors of soil formation are discussed as they relate to the soils of Mason County.

Climate

Climate affects the physical, chemical, and biological relationships in soils. It influences the kind and number of plants and animals, the weathering and decomposition of rocks and minerals, the amount of soil erosion, and the rate of soil formation.

The climate of Mason County is humid and temperate. The average annual precipitation is 44 inches, and the mean annual air temperature is 53 degrees F. The soils are seldom completely dry and are frozen for short periods of time; therefore, they are subject to leaching and weathering throughout the year. The soluble bases have been largely leached out of the surface layer and upper part of the subsoil, and clay minerals have moved from the surface layer into the subsoil. As a result, most of the soils have a leached, acid surface layer and a subsoil that is finer textured than the surface layer. Examples are Lowell and Shelbyville soils.

Plant and Animal Life

Plants affect soil formation mainly by adding organic matter. Animals, bacteria, and fungi contribute to soil formation by converting the remains of plants to organic matter and plant nutrients. The organic matter imparts a dark color to the soil material, and the humus, or decomposed organic matter, aids in the formation of soil structure.

Most of the soils in Mason County formed under hardwood forests. These soils are characterized by a thin, dark surface layer, and a brighter-colored subsoil. Soils that have a thick, dark surface layer, such as Fairmount and Shelbyville soils, probably formed under canebrakes or grass, or both. Soils that formed under hardwood forest have less organic matter in the surface layer than those that formed under grass.

Man has greatly altered the surface layer and the soil environment by clearing the forests and plowing the soil. Man has mixed the soil layers, moved soil from place to place, added fertilizer and lime, and introduced new plants. In places, accelerated erosion has removed most of the original surface layer and exposed the less productive subsoil.

Parent Material

Parent material is the unconsolidated mass from which soils form. It is produced by the weathering or decomposition of rock and minerals. It influences the mineral and chemical composition of the soil and, to a large extent, the rate at which soil formation takes place. In Mason County, soils formed in stream alluvium, glacial outwash, lacustrine deposits, high level fluvial deposits, loess, and residual materials. Nolin soils formed in recent stream alluvium on flood plains; Wheeling, Elk, and Chavies soils formed in glacial outwash and eolian and fluvial deposits on terraces. Nicholson and Shelbyville soils formed partly in loess and partly in the underlying clayey residuum from limestone. This loess mantle ranges from 2 to 4 feet thick and covers most of the broad ridges on uplands where these soils formed.

Most of the surface rock formations in Mason County consist of interbedded limestone, calcareous shale, and siltstone of Ordovician age *(10)*. Lowell, Shelbyville, Faywood, and Cynthiana soils formed dominantly in the residuum of limestone that has thin layers of calcareous shale. Eden soils formed in residuum of mainly calcareous shale that has thin layers of limestone. Beasley soils formed in residuum from rocks of the Silurian age, which consist of dolomitic limestone and clay shale. These rocks of Silurian age are in a small area in the eastern part of Mason County.

Relief

The relief of the landscape influences soil formation primarily through its effect on drainage and erosion. Differences in landscape position also influence variations in exposure to sun, wind, air drainage, soil temperature, and plant cover.

In areas of steep soils, a considerable amount of water is lost through runoff, and only a small amount of water enters the soil. As a result, erosion removes the soil almost as rapidly as it forms. Such soils in Mason County are the steep, shallow Cynthiana soils and the very steep Fairmount soils. Eden and Beasley soils are also on steep hillsides and are eroded or severely eroded where cleared.

In areas of gently sloping soils, enough water moves downward to cause leaching and a pronounced accumulation of clay in the subsoil. These soils are generally deep and have well defined layers or profiles. In some places the soil shows some evidence of wetness, such as mottling in the subsoil. A fragipan that restricts water and air movement may be present, such as in Nicholson soils.

Time

A long period of time is required for distinct soil profiles to develop. The length of time required depends mainly on the kind and nature of the parent material and the topography. Plant and animal life and climate have comparatively less influence on the rate of soil development. With the exception of soils formed in recent alluvium, enough time has elapsed for the soils in Mason County to express the interaction of the factors of soil formation.

Soils that formed in recent sediment have weak horizon development. The surface layer of these soils may show a slight increase in the organic matter content, and the subsoil may have weak structure. Soils of this type, such as Nolin and Boonesboro soils, are said to be young or immature.

After a long time, if there are no further additions of sediment, distinct horizons develop in these soils. The weathering process causes some of the fine material in the surface layer to move into the subsoil and may cause the structure and color of the subsoil to change. Elk soils are examples of the result of this maturing process.

A soil is generally said to be mature when it has been in place and subject to the influence of plant and animal life and climate long enough to acquire distinct profile characteristics. Examples of mature soils in Mason County are Lowell and Nicholson soils.

Processes of Soil Formation

The formation of a succession of layers, or horizons, in soil is the result of one or more of the following processes: accumulation of organic matter; leaching of carbonates and other soluble minerals; chemical weathering (chiefly by hydrolysis) of primary minerals into silicate clay minerals; translocation of the silicate clays, and probably some silt-sized particles, from one horizon to another; and reduction and transfer of iron.

Several of these processes have been active in the formation of most soils in Mason County. The interaction of the first four processes is reflected in the strongly expressed horizons of Shelbyville soils. All five processes have probably been active in the formation of the moderately well drained Nicholson and Otwell soils.

Some organic matter has accumulated in all the soils of Mason County to form the surface layer or A1 horizon. Most of the soils contain moderate amounts of organic matter in the surface layer. If tilled, the A1 horizon will become part of the Ap horizon.

Most of the soils in Mason County are acid in the upper layer although they formed in non-acid materials. The carbonates and other soluble materials have been partially leached into the lower layers or out of the soil profile. Beasley and Lowell soils are examples of soils in which this process occurs.

The translocation of clay minerals is an important process in the horizon development of many soils in the county. As clay minerals are removed from the A horizon, they accumulate as clay films on ped faces, in pores, and in root channels in the B horizon.

A fragipan has formed in the B horizon of some of the moderately well drained soils on uplands and terraces. The fragipan is a dense, compact layer that is hard or very hard when dry, brittle when moist, and tends to rupture suddenly, rather than deform slowly, when lateral pressure is applied. It generally is mottled, slowly or very slowly permeable to water, and has few to many bleached fracture planes that form polygons.

The reduction and transfer of iron has occured in all soils that do not have good natural drainage. This process is known as gleying, and gleyed soils are identified by gray color and mottles. Part of the iron may be reoxidized and segregated, forming the yellowish brown, strong brown, and other brightly-colored mottles in an essentially gray matrix in the subsoil. Nodules or concretions of iron or manganese are commonly formed under these conditions.

As silicate clay forms from primary minerals, some iron is commonly freed as hydrated oxide. These oxides are more or less red. Even if present in small amounts, they give a brownish color to the soil material. They are largely responsible for the strong brown, yellowish brown, or reddish brown colors that dominate the subsoils of many soils in Mason County.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A form of noninversion tillage that retains protective amounts of residue mulch on the surface throughout the year. These include no-tillage, strip tillage, stubble mulching, and other types of noninversion tillage.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

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.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

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 they are wet 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 commonly 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.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay are in the soil. The soil is not a source of gravel or sand for construction purposes.

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.

Fine textured soil. Sandy clay, silty clay, and clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments that are 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Lithic contact. A boundary between soil and continous, coherent underlying material. The underlying material must be sufficiently coherent to make hand-digging with a spade impractical and have a hardness of 3 or more (Mohs scale).

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine 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 simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Paralithic contact. A (lithic-like) contact is a boundary between soil and continuous, coherent underlying material. The mineral material below the contact has a hardness of less than 3 (Mohs scale) and can be dug with difficulty with a spade.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of the 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

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). There is a shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called 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 (in tables). The movement of water through the soil adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

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 the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slippage (in tables). The soil mass is susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced by atmospheric agents in rocks or other deposits at or near the earth's surface. These changes result in disintegration and decomposition of the material.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-79 at Maysville, Kentucky]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	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*	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----	40.4	20.8	30.6	69	-7	8	3.58	2.12	4.89	8	4.2
February---	43.5	21.9	32.7	72	-3	13	3.09	1.40	4.53	7	3.5
March------	53.2	30.2	41.7	82	12	37	4.47	2.29	6.36	9	1.6
April------	65.8	40.1	53.0	86	23	134	3.97	2.15	5.56	9	.0
May--------	75.1	48.9	62.0	91	31	381	4.19	2.37	5.80	9	.0
June-------	82.8	58.2	70.5	95	43	615	3.61	2.48	4.65	8	.0
July-------	86.3	62.4	74.4	97	49	756	4.47	2.71	6.04	8	.0
August-----	85.1	61.4	73.3	96	48	722	4.11	2.56	5.49	7	.0
September--	79.7	54.7	67.2	94	38	516	3.27	1.64	4.68	6	.0
October----	68.3	42.5	55.4	87	24	205	2.47	1.19	3.57	5	.0
November---	55.0	32.8	43.9	79	13	20	3.34	2.02	4.51	7	.8
December---	44.3	24.7	34.5	71	1	14	3.55	1.85	5.03	8	1.3
Yearly:											
Average--	65.0	41.6	53.3	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-8	---	---	---	---	---	---
Total----	---	---	---	---	---	3,421	44.12	38.06	49.95	91	11.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 °F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-79
at Maysville, Kentucky]

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 11	April 22	May 14
2 years in 10 later than--	April 6	April 17	May 8
5 years in 10 later than--	March 27	April 8	April 25
First freezing temperature in fall:			
1 year in 10 earlier than--	October 23	October 19	October 10
2 years in 10 earlier than--	October 29	October 22	October 14
5 years in 10 earlier than--	November 10	October 30	October 23

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-79
at Maysville, Kentucky]

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	207	186	158
8 years in 10	214	192	165
5 years in 10	227	204	179
2 years in 10	240	215	194
1 year in 10	247	221	201

TABLE 4.--GEOLOGIC SYSTEMS, FORMATIONS, AND MEMBERS

System*	Formation	Member	Thickness	Predominant soils
			Ft	
Quaternary--------	---	---	Up to 130	Wheeling Nolin Otwell
Silurian----------	Crab Orchard and Brassfield Dolomite	---	50	Beasley
Ordovician--------	Drakes	Preachersville	20-30	Beasley
	Bull Fork	---	70-205	Cynthiana Faywood Lowell
	Grant Lake	---	80-115	Lowell Faywood Nicholson Shelbyville
	Fairview	---	70-110	Eden Fairmount Lowell
	Kope	---	60-295	Eden Lowell
	Clays Ferry	---	105	Eden

* Listed according to age and sequence laid down. The Quaternary System is the youngest; the Clays Ferry Formation of the Ordovician System is the oldest.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
BaB	Beasley silt loam, 2 to 6 percent slopes	490	0.3
BaC2	Beasley silt loam, 6 to 12 percent slopes, eroded	1,770	1.1
BeE3	Beasley silty clay, 12 to 30 percent slopes, severely eroded	2,620	1.7
Bo	Boonesboro silt loam, frequently flooded	630	0.4
ChB	Chavies fine sandy loam, 2 to 6 percent slopes	200	0.1
ChC	Chavies fine sandy loam, 6 to 12 percent slopes	180	0.1
CnC2	Cynthiana-Faywood silty clay loams, 6 to 12 percent slopes, eroded	3,150	2.0
CyE2	Cynthiana-Faywood complex, very rocky, 12 to 30 percent slopes, eroded	13,600	8.6
Du	Dumps	170	0.1
EdD2	Eden silt loam, 6 to 20 percent slopes, eroded	3,950	2.5
EfE2	Eden flaggy silty clay loam, 20 to 40 percent slopes, eroded	30,200	19.2
EkB	Elk silt loam, 2 to 6 percent slopes	450	0.3
EkC	Elk silt loam, 6 to 12 percent slopes	390	0.3
FrF	Fairmount-Rock outcrop complex, 30 to 65 percent slopes	6,510	4.1
FwB	Faywood silt loam, 2 to 6 percent slopes	870	0.6
FyC	Faywood-Lowell silt loams, 6 to 12 percent slopes	9,170	5.8
LoB	Lowell silt loam, 2 to 6 percent slopes	16,970	10.8
LoC	Lowell silt loam, 6 to 12 percent slopes	27,607	17.5
LoD	Lowell silt loam, 12 to 20 percent slopes	9,750	6.2
LwD	Lowell-Faywood silt loams, 12 to 20 percent slopes	7,660	4.9
NcB	Nicholson silt loam, 2 to 6 percent slopes	6,610	4.2
No	Nolin silt loam, occasionally flooded	4,550	2.9
OtB	Otwell silt loam, 2 to 6 percent slopes	470	0.3
Pt	Pits, sand and gravel	20	*
ShB	Shelbyville silt loam, 2 to 6 percent slopes	3,830	2.4
WhA	Wheeling silt loam, 0 to 4 percent slopes	1,340	0.8
WhC	Wheeling silt loam, 6 to 12 percent slopes	90	*
Wn	Wheeling-Nolin silt loams	980	0.6
	Water	3,456	2.2
	Total	157,683	100.0

* Less than 0.1 percent.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Land capability	Corn	Wheat	Soybeans	Tobacco	Grass-legume hay	Pasture
		Bu	Bu	Bu	Lbs	Tons	AUM*
BaB------------- Beasley	IIe	105	40	30	2,700	4.5	8.0
BaC2------------ Beasley	IIIe	90	35	25	2,400	4.0	8.0
BeE3------------ Beasley	VIe	---	---	---	---	---	3.5
Bo-------------- Boonesboro	IIIw	100	---	40	---	3.5	7.0
ChB------------- Chavies	IIe	115	45	40	2,400	4.0	7.0
ChC------------- Chavies	IIIe	100	40	35	2,200	3.5	7.0
CnC2------------ Cynthiana- Faywood	IVe	65	20	---	---	2.5	4.6
CyE2------------ Cynthiana- Faywood	VIs	---	---	---	---	---	3.5
Du-------------- Dumps	VIIIs	---	---	---	---	---	---
EdD2------------ Eden	IVe	70	---	---	---	3.0	5.0
EfE2------------ Eden	VIIe	---	---	---	---	---	3.5
EkB------------- Elk	IIe	125	55	45	3,400	4.5	9.0
EkC------------- Elk	IIIe	110	55	35	3,000	4.5	8.0
FrF:							
Fairmount------	VIIe	---	---	---	---	---	---
Rock outcrop---	VIIIs	---	---	---	---	---	---
FwB------------- Faywood	IIe	95	30	30	2,600	4.0	7.0
FyC------------- Faywood-Lowell	IIIe	90	30	28	2,400	3.8	6.9
LoB------------- Lowell	IIe	120	45	35	3,200	4.5	8.5
LoC------------- Lowell	IIIe	110	40	30	2,800	4.5	8.5

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Wheat	Soybeans	Tobacco	Grass-legume hay	Pasture
		Bu	Bu	Bu	Lbs	Tons	AUM*
LoD------------- Lowell	IVe	85	30	---	2,300	3.5	7.0
LwD------------- Lowell-Faywood	IVe	70	25	---	2,000	3.0	6.0
NcB------------- Nicholson	IIe	130	50	40	3,100	4.5	8.5
No-------------- Nolin	IIw	140	45	45	3,200	4.5	9.0
OtB------------- Otwell	IIe	120	45	40	2,900	4.2	8.5
Pt-------------- Pits	VIIs	---	---	---	---	---	---
ShB------------- Shelbyville	IIe	140	55	45	3,400	4.5	9.0
WhA------------- Wheeling	I	130	45	40	3,400	4.5	9.0
WhC------------- Wheeling	IIIe	120	40	35	3,200	4.0	8.0
Wn:							
Wheeling-------	VIIe	---	---	---	---	---	6.0
Nolin----------	IIIw	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	1,340	---	---	---
II	34,440	29,890	4,550	---
III	40,082	39,207	875	---
IV	24,510	24,510	---	---
V	---	---	---	---
VI	16,220	2,620	---	13,600
VII	36,749	36,729	---	20
VIII	886	---	---	886

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
BaB, BaC2---------- Beasley	3c	Slight	Slight	Slight	Moderate	Yellow-poplar-------	80	White oak, white ash.
						Eastern redcedar----	40	
						Chinkapin oak-------	---	
						White ash-----------	63	
						White oak-----------	67	
						Black locust--------	---	
BeE3--------------- Beasley	4c	Moderate	Moderate	Moderate	Slight	Eastern redcedar----	35	White oak, Virginia pine, eastern redcedar, white ash.
						Chinkapin oak-------	---	
						Hickory-------------	---	
						White ash-----------	---	
						Black locust--------	---	
Bo----------------- Boonesboro	1o	Slight	Slight	Slight	Severe	Northern red oak----	85	Eastern cottonwood, sweetgum, yellow-poplar, white ash.
ChB, ChC----------- Chavies	2o	Slight	Slight	Slight	Moderate	Northern red oak----	80	Eastern white pine, yellow-poplar, black walnut, white oak, northern red oak, shortleaf pine, white ash.
						Yellow-poplar-------	97	
						Black walnut--------	---	
						Black cherry--------	---	
						Sugar maple---------	---	
						White oak-----------	---	
CnC2:								
Cynthiana---------	4d	Slight	Moderate	Moderate	Slight	White ash-----------	78	White ash, Virginia pine.
						Eastern redcedar----	42	
						Black walnut--------	71	
						Chinkapin oak-------	---	
						Black locust--------	---	
Faywood-----------	3c	Slight	Moderate	Moderate	Moderate	Northern red oak----	70	White oak, eastern white pine, white ash.
						White oak-----------	60	
						Hickory-------------	---	
						Sugar maple---------	---	
						Black cherry--------	---	
						Eastern redcedar----	---	
CyE2:								
Cynthiana---------	4x	Severe	Moderate	Moderate	Slight	Black locust--------	---	White ash, Virginia pine.
						Eastern redcedar----	42	
						Black walnut--------	71	
						Hackberry-----------	---	
						Chinkapin oak-------	---	
Faywood-----------	3x	Severe	Moderate	Moderate	Moderate	Northern red oak----	70	White oak, eastern white pine, white ash.
						White oak-----------	60	
						Hickory-------------	---	
						Chinkapin oak-------	---	
						Sugar maple---------	---	
						Black locust--------	---	
						Eastern redcedar----	---	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordi-nation symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Plant competi-tion	Common trees	Site index	
EdD2 Eden	3c	Moderate	Moderate	Moderate	Moderate	Black oak White oak Scarlet oak Black walnut Eastern redcedar Black cherry Hickory	73 63 70 --- 40 --- ---	White oak, white ash, eastern white pine.
EfE2 Eden	3c	Severe	Moderate	Moderate	Moderate	Black oak White oak Scarlet oak Black walnut Eastern redcedar Black cherry Hickory	73 63 70 --- 40 --- ---	White oak, white ash, eastern white pine.
EkB, EkC Elk	2o	Slight	Slight	Slight	Moderate	Northern red oak Yellow-poplar Hackberry White oak Red maple	80 90 --- --- ---	Eastern white pine, northern red oak, yellow-poplar, black walnut, white ash, sweetgum, white oak, shortleaf pine.
FrF: Fairmount	4d	Severe	Severe	Severe	Slight	Eastern redcedar Scarlet oak Chinkapin oak White ash Northern red oak Yellow buckeye Black oak	41 60 56 71 66 --- 65	White oak, Virginia pine.
Rock outcrop.								
FwB Faywood	3c	Slight	Moderate	Slight	Moderate	Northern red oak White oak White ash Sugar maple Black cherry Eastern redcedar	70 60 --- --- --- ---	White oak, eastern white pine, white ash.
FyC: Faywood	3c	Slight	Moderate	Slight	Moderate	Northern red oak White oak Black cherry Sugar maple Black locust Eastern redcedar	70 60 --- --- --- ---	White oak, eastern white pine, white ash.
Lowell	2c	Slight	Slight	Slight	Moderate	Northern red oak Black walnut American elm White ash Black locust Bur oak	70 --- --- 75 78 ---	White ash, eastern white pine, northern red oak.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
LoB, LoC: Lowell	2c	Slight	Slight	Slight	Moderate	Northern red oak	70	White ash, eastern white pine, northern red oak, yellow-poplar.
						Black walnut	---	
						White ash	75	
						American Elm	---	
						Black locust	78	
						Bur oak	---	
LoD: Lowell	2c	Moderate	Moderate	Slight	Moderate	Northern red oak	70	White ash, eastern white pine, northern red oak, yellow-poplar.
						Black walnut	---	
						White ash	75	
						American elm	---	
						Black locust	78	
						Bur oak	---	
LwD:								
Lowell	2c	Moderate	Moderate	Slight	Moderate	Northern red oak	70	White ash, eastern white pine, northern red oak, yellow-poplar.
						Black walnut	---	
						White ash	75	
						American Elm	---	
						Black locust	78	
						Bur oak	---	
Faywood	3c	Moderate	Moderate	Slight	Moderate	Northern red oak	70	White oak, eastern white pine, white ash.
						White oak	60	
						Bur oak	---	
						Black cherry	---	
						Sugar maple	---	
						Black locust	---	
						Eastern redcedar	---	
NcB: Nicholson	2o	Slight	Slight	Slight	Moderate	Northern red oak	80	Yellow-poplar, white oak, sweetgum, white ash, eastern white pine, sweetgum, northern red oak.
						Black oak	76	
						White oak	72	
						Sugar maple	---	
						Black locust	---	
						Black gum	---	
						Black walnut	---	
No: Nolin	1o	Slight	Slight	Slight	Severe	White ash	---	Sweetgum, yellow-poplar, northern red oak, white ash, black walnut, eastern white pine.
						Sweetgum	92	
						Yellow-poplar	107	
						American sycamore	---	
						River birch	---	
						White ash	---	
OtB: Otwell	2o	Slight	Slight	Slight	Moderate	White oak	69	Eastern white pine, yellow-poplar, white ash, white oak, shortleaf pine.
						Yellow-poplar	---	
						Sugar maple	---	
						Southern red oak	---	
						Black oak	---	
ShB: Shelbyville	2o	Slight	Slight	Slight	Moderate	Northern red oak	80	Eastern white pine, shortleaf pine, white oak, yellow-poplar, black walnut, white ash, northern red oak.
						Black oak	---	
						White oak	---	
						Black walnut	---	
						Hickory	---	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
WhA, WhC----------- Wheeling	2o	Slight	Slight	Slight	Moderate	Northern red oak---- Yellow-poplar-------	80 90	Eastern white pine, yellow-poplar, black walnut, white ash, northern red oak, shortleaf pine.
Wn:								
Wheeling----------	2r	Severe	Severe	Slight	Moderate	Northern red oak---- Yellow-poplar------- American sycamore--- Black cherry--------	80 90 --- ---	Eastern white pine, shortleaf pine, yellow-poplar, black walnut, white ash, northern red oak.
Nolin-------------	1w	Slight	Moderate	Slight	Severe	Sweetgum------------ Yellow poplar------- Red maple----------- American sycamore--- White ash-----------	92 --- --- --- ---	Sweetgum, yellow-poplar, eastern cottonwood, green ash.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BaB: Beasley	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly, slope.	Slight	Slight.
BaC2: Beasley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
BeE3: Beasley	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: too clayey.	Severe: slope, too clayey.
Bo: Boonesboro	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
ChB: Chavies	Slight	Slight	Moderate: slope.	Slight	Slight.
ChC: Chavies	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CnC2:					
Cynthiana	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Severe: erodes easily.	Severe: thin layer.
Faywood	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
CyE2:					
Cynthiana	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock, too clayey.	Severe: slope, small stones, depth to rock.	Severe: erodes easily, slope, too clayey.	Severe: slope, thin layer, too clayey.
Faywood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Du. Dumps					
EdD2: Eden	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Severe: slope.
EfE2: Eden	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.
EkB: Elk	Slight	Slight	Moderate: slope.	Slight	Slight.
EkC: Elk	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
FrF:					
Fairmount	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: large stones, slope, depth to rock.	Severe: erodes easily, slope.	Severe: slope, thin layer.
Rock outcrop.					
FwB Faywood	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: depth to rock, slope, percs slowly.	Slight	Moderate: thin layer.
FyC:					
Faywood	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Lowell	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
LoB Lowell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
LoC Lowell	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
LoD Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
LwD:					
Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Faywood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
NcB Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
No Nolin	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
OtB Otwell	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
Pt. Pits					
ShB Shelbyville	Slight	Slight	Moderate: slope.	Slight	Slight.
WhA Wheeling	Slight	Slight	Slight	Slight	Slight.
WhC Wheeling	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Wn:					
Wheeling-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nolin----------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	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
BaB: Beasley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BaC2: Beasley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BeE3: Beasley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Bo: Boonesboro	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ChB: Chavies	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
ChC: Chavies	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CnC2:										
Cynthiana	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Faywood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CyE2:										
Cynthiana	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Faywood	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Du. Dumps										
EdD2: Eden	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
EfE2: Eden	Very poor.	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
EkB: Elk	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EkC: Elk	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FrF:										
Fairmount	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
FwB: Faywood	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	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
FyC:										
Faywood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Lowell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LoB Lowell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LoC Lowell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LoD Lowell	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LwD:										
Lowell	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Faywood	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
NcB Nicholson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
No Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OtB Otwell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pt. Pits										
ShB Shelbyville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhA Wheeling	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhC Wheeling	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wn:										
Wheeling	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Nolin	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Fair	Very poor.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BaB: Beasley	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
BaC2: Beasley	Moderate: slope, too clayey.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
BeE3: Beasley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope, too clayey.
Bo: Boonesboro	Severe: depth to rock.	Severe: flooding.	Severe: flooding, depth to rock.	Severe: flooding.	Severe: flooding.	Severe: flooding.
ChB: Chavies	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
ChC: Chavies	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
CnC2:						
Cynthiana	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, low strength.	Severe: thin layer.
Faywood	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
CyE2:						
Cynthiana	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer, too clayey.
Faywood	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Du. Dumps						
EdD2: Eden	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Severe: slope.
EfE2: Eden	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: low strength, slope, slippage.	Severe: slope, slippage.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
EkB: Elk	Slight	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
EkC: Elk	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
FrF:						
Fairmount	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.						
FwB: Faywood	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: low strength.	Moderate: thin layer.
FyC:						
Faywood	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
Lowell	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
LoB: Lowell	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
LoC: Lowell	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
LoD: Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
LwD:						
Lowell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Faywood	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
NcB: Nicholson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Moderate: wetness.
No: Nolin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
OtB--------------- Otwell	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
Pt. Pits						
ShB--------------- Shelbyville	Moderate: too clayey.	Slight---------	Slight---------	Moderate: slope.	Severe: low strength.	Slight.
WhA--------------- Wheeling	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: low strength.	Slight.
WhC--------------- Wheeling	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope.	Moderate: slope.
Wn: Wheeling---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nolin------------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BaB----------------- Beasley	Severe: percs slowly.	Moderate: slope, depth to rock.	Severe: too clayey, depth to rock.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
BaC2---------------- Beasley	Severe: percs slowly.	Severe: slope.	Severe: too clayey, depth to rock.	Moderate: slope, depth to rock.	Poor: too clayey, hard to pack.
BeE3---------------- Beasley	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey, depth to rock.	Severe: slope.	Poor: slope, too clayey, hard to pack.
Bo------------------ Boonesboro	Severe: flooding, depth to rock, poor filter.	Severe: seepage, depth to rock, flooding.	Severe: flooding, depth to rock, seepage.	Severe: flooding, depth to rock, seepage.	Poor: area reclaim, thin layer.
ChB----------------- Chavies	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
ChC----------------- Chavies	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
CnC2:					
Cynthiana----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Faywood------------	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
CyE2:					
Cynthiana----------	Severe: depth to rock, slope, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Faywood------------	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Du. Dumps					
EdD2, EfE2---------- Eden	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey, slope.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EkB----------------- Elk	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
EkC----------------- Elk	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
FrF:					
Fairmount----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
FwB----------------- Faywood	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
FyC:					
Faywood------------	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Lowell-------------	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
LoB----------------- Lowell	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
LoC----------------- Lowell	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
LoD----------------- Lowell	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
LwD:					
Lowell-------------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Faywood------------	Severe: slope, depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: slope, depth to rock, too clayey.	Severe: slope, depth to rock.	Poor: area reclaim, too clayey, hard to pack.
NcB----------------- Nicholson	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Poor: too clayey, hard to pack.
No------------------ Nolin	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
OtB Otwell	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Pt. Pits					
ShB Shelbyville	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
WhA Wheeling	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Slight	Good.
WhC Wheeling	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair: slope, thin layer.
Wn: Wheeling	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
Nolin	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
BaB, BaC2: Beasley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BeE3: Beasley	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Bo: Boonesboro	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
ChB: Chavies	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
ChC: Chavies	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
CnC2:				
Cynthiana	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, too clayey.
Faywood	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CyE2:				
Cynthiana	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Faywood	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Du. Dumps				
EdD2: Eden	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.
EfE2: Eden	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones.
EkB: Elk	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
EkC: Elk	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
FrF:				
Fairmount	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, large stones.
Rock outcrop.				
FwB: Faywood	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FyC:				
Faywood	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Lowell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LoB, LoC: Lowell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LoD: Lowell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
LwD:				
Lowell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
Faywood	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
NcB: Nicholson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
No: Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
OtB: Otwell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pt. Pits				
ShB: Shelbyville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
WhA: Wheeling	Fair: low strength.	Probable	Probable	Fair: small stones.
WhC: Wheeling	Fair: low strength.	Probable	Probable	Fair: small stones, slope.
Wn:				
Wheeling	Poor: slope.	Probable	Probable	Poor: slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Wn:				
Nolin-----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
BaB: Beasley	Moderate: depth to rock.	Moderate: thin layer.	Deep to water	Erodes easily	Erodes easily.
BaC2: Beasley	Moderate: depth to rock.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
BeE3: Beasley	Severe: slope.	Moderate: thin layer.	Deep to water	Slope	Slope.
Bo: Boonesboro	Severe: seepage.	Severe: thin layer.	Deep to water	Depth to rock, erodes easily.	Depth to rock, erodes easily.
ChB: Chavies	Severe: seepage.	Severe: piping, seepage.	Deep to water	Favorable	Favorable.
ChC: Chavies	Severe: seepage.	Severe: piping, seepage.	Deep to water	Slope	Slope.
CnC2:					
Cynthiana	Severe: depth to rock.	Severe: hard to pack, thin layer.	Deep to water	Slope, large stones, depth to rock, erodes easily.	Large stones, slope, erodes easily, depth to rock.
Faywood	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
CyE2:					
Cynthiana	Severe: depth to rock, slope.	Severe: hard to pack, thin layer.	Deep to water	Slope, large stones, depth to rock, erodes easily.	Large stones, slope, erodes easily, depth to rock.
Faywood	Severe: slope.	Severe: thin layer, hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Du. Dumps					
EdD2: Eden	Severe: slope.	Severe: hard to pack, thin layer.	Deep to water	Slope, percs slowly, large stones, depth to rock, erodes easily.	Large stones, slope, erodes easily, depth to rock.
EfE2: Eden	Severe: slope.	Severe: hard to pack, thin layer.	Deep to water	Slope, large stones, depth to rock, percs slowly.	Large stones, slope, depth to rock.
EkB: Elk	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
EkC----------------- Elk	Moderate: seepage.	Severe: piping.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
FrF: Fairmount--------	Severe: depth to rock, slope.	Severe: thin layer, large stones.	Deep to water----	Slope, large stones, depth to rock, erodes easily.	Large stones, slope, erodes easily, depth to rock.
Rock outcrop.					
FwB----------------- Faywood	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Deep to water----	Depth to rock, erodes easily, percs slowly.	Erodes easily, depth to rock, percs slowly.
FyC: Faywood----------	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Lowell-----------	Moderate: depth to rock.	Moderate: thin layer.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
LoB----------------- Lowell	Moderate: depth to rock.	Moderate: thin layer.	Deep to water----	Erodes easily----	Erodes easily.
LoC, LoD---------- Lowell	Moderate: depth to rock.	Moderate: thin layer.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
LwD: Lowell-----------	Moderate: depth to rock.	Moderate: thin layer.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
Faywood----------	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Deep to water----	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
NcB----------------- Nicholson	Slight------------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Erodes easily, wetness, rooting depth, percs slowly.	Erodes easily, rooting depth, percs slowly.
No----------------- Nolin	Severe: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
OtB----------------- Otwell	Slight------------	Moderate: wetness.	Percs slowly, slope.	Erodes easily, rooting depth, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.
Pt. Pits					
ShB----------------- Shelbyville	Moderate: seepage.	Slight------------	Deep to water----	Favorable--------	Favorable.
WhA----------------- Wheeling	Severe: seepage.	Severe: piping.	Deep to water----	Favorable--------	Favorable.
WhC----------------- Wheeling	Severe: seepage.	Severe: piping.	Deep to water----	Slope------------	Slope.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Wn:					
Wheeling	Severe: slope, seepage.	Severe: piping.	Deep to water	Slope	Slope.
Nolin	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils may have unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BaB, BaC2-------- Beasley	0-6	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	85-100	80-100	75-100	25-35	4-10
	6-40	Silty clay loam, silty clay, clay.	CH, CL	A-7	0-5	90-100	85-100	85-100	75-100	45-70	20-40
	40-46	Weathered bedrock	---	---	---	---	---	---	---	---	---
BeE3------------- Beasley	0-7	Silty clay-------	CL	A-6, A-7	0-5	90-100	85-100	80-100	75-100	34-42	5-22
	7-25	Silty clay, clay	CH, CL	A-7	0-5	90-100	85-100	85-100	75-100	45-70	0-40
	25-45	Silty clay, clay.	CL, CH	A-7	0-10	70-100	55-100	50-100	50-95	40-65	5-35
	45-50	Weathered bedrock	---	---	---	---	---	---	---	---	---
Bo--------------- Boonesboro	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	90-100	85-100	80-100	70-95	25-35	4-11
	8-34	Gravelly silt loam, flaggy loam, very gravelly silty clay loam.	GM, GC, CL, CL-ML	A-2, A-4, A-6, A-7	0-20	50-75	40-70	35-65	25-60	25-42	4-20
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ChB, ChC--------- Chavies	0-12	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4	0	85-100	75-100	40-90	40-75	<25	NP-5
	12-43	Fine sandy loam, loam.	SM, ML	A-4	0	85-100	75-100	65-100	45-85	<35	NP-8
	43-70	Fine sandy loam, gravelly fine sandy loam, loam.	SM, ML, CL-ML, SM-SC	A-4, A-2, A-1-B	0-5	70-100	60-95	40-85	20-75	<25	NP-5
CnC2: Cynthiana--------	0-5	Silty clay loam	ML, CL, CL-ML	A-4, A-6, A-7	0-15	70-100	65-100	60-100	55-100	25-42	4-20
	5-18	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
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Faywood----------	0-3	Silty clay loam	CL	A-6, A-7	0-15	100	95-100	90-100	85-100	34-42	15-22
	3-26	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CyE2: Cynthiana--------	0-5	Silty clay-------	MH, CH, CL	A-7	0-15	70-100	65-100	60-100	55-100	45-75	20-45
	5-18	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
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	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	
CyE2:											
Faywood---------	0-3	Silty clay loam	CL	A-6, A-7	0-15	100	95-100	90-100	85-100	34-42	15-22
	3-26	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Du. Dumps											
EdD2------------ Eden	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0-10	85-100	80-100	75-100	75-100	23-32	7-12
	7-24	Flaggy silty clay, flaggy clay, silty clay loam.	CH, CL, ML	A-7	10-35	75-100	55-100	50-100	50-100	45-75	15-45
	24-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
EfE2------------ Eden	0-7	Flaggy silty clay loam.	ML, CL, MH, CH	A-7, A-6	10-25	75-95	70-95	70-95	65-100	35-65	12-35
	7-24	Flaggy silty clay, flaggy clay, silty clay loam.	MH, CH, CL	A-7	10-35	75-100	55-100	50-100	50-100	45-75	20-45
	24-40	Weathered bedrock	---	---	---	---	---	---	---	---	---
EkB, EkC--------- Elk	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	70-95	25-35	3-10
	9-47	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
	47-70	Silty clay loam, silt loam.	ML, CL, CL-ML, SM-SC	A-4, A-6	0	75-100	55-100	45-100	40-95	25-40	5-15
FrF:											
Fairmount-------	0-13	Flaggy silty clay loam.	CL	A-6, A-7	5-50	80-100	70-100	65-100	60-95	35-45	15-22
	13-18	Flaggy silty clay loam, flaggy clay, flaggy silty clay.	CH, CL	A-7, A-6	5-50	80-100	70-100	65-100	60-100	40-70	20-40
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
FwB------------- Faywood	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0-15	100	95-100	90-100	85-100	25-35	4-10
	9-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FyC:											
Faywood---------	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0-15	100	95-100	90-100	85-100	25-35	4-10
	9-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	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	
FyC:											
Lowell----------	0-6	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	6-27	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	14-32
	27-50	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LoB, LoC--------- Lowell	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	8-23	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	14-32
	23-62	Clay, silty clay.	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
LoD-------------- Lowell	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	8-15	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	14-32
	15-48	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
LwD:											
Lowell----------	0-10	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-100	22-32	4-10
	10-22	Silty clay, clay, silty clay loam.	CL, CH, MH	A-7, A-6	0	100	95-100	90-100	85-100	35-65	14-32
	22-49	Clay, silty clay	CH, MH, CL	A-7	0-20	95-100	90-100	85-100	75-100	45-75	20-40
	49	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Faywood---------	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0-15	100	95-100	90-100	85-100	25-35	4-10
	9-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-15	90-100	90-100	85-100	75-100	42-70	20-45
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
NcB-------------- Nicholson	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	9-21	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	85-100	85-100	80-100	25-45	5-20
	21-43	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-100	25-45	5-20
	43-73	Silty clay, clay, channery silty clay.	CH, CL	A-6, A-7	0-10	80-100	70-100	60-100	55-100	34-70	16-40
No--------------- Nolin	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	8-46	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
	46-72	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, SM	A-4, A-6	0-10	90-100	80-100	60-95	35-95	<30	NP-15

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	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	
OtB-------------- Otwell	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	9-20	Silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	20-57	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	35-50	20-30
	57-94	Stratified silt loam to silty clay loam.	CL	A-6, A-7	0	80-100	75-100	75-100	60-95	35-50	15-25
Pt. Pits											
ShB-------------- Shelbyville	0-9	Silt loam--------	ML, CL	A-4, A-6	0	100	95-100	90-100	85-100	25-40	3-15
	9-40	Silty clay loam, silt loam.	CL	A-6, A-4, A-7	0	100	95-100	90-100	85-100	30-45	10-25
	40-90	Silty clay, clay	CH, CL	A-7	0-10	80-100	80-100	70-100	65-100	45-75	18-45
WhA, WhC--------- Wheeling	0-9	Silt loam--------	ML, CL, SM, SC	A-4	0	90-100	90-100	85-100	45-90	15-35	NP-10
	9-52	Silty clay loam, loam, gravelly sandy loam.	ML, CL, SM, SC	A-4, A-6	0-5	90-100	70-100	65-100	45-80	20-40	2-20
	52-82	Stratified very fine sand to very gravelly sand.	GM, SM, GP, GW	A-1, A-2, A-3, A-4	10-20	35-90	20-75	10-65	5-45	<20	NP-10
Wn: Wheeling--------	0-9	Silt loam--------	ML, CL, SM, SC	A-4	0	90-100	90-100	85-100	45-90	15-35	NP-10
	9-52	Silty clay loam, loam, gravelly sandy loam.	ML, CL, SM, SC	A-4, A-6	0-5	90-100	70-100	65-100	45-80	20-40	2-20
	52-82	Stratified very fine sand to very gravelly sand.	GM, SM	A-1, A-2, A-3, A-4	10-20	35-90	20-75	10-65	5-45	<20	NP-10
Nolin-----------	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	8-40	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
	40-60	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, GM	A-4, A-6	0-10	50-100	50-100	40-95	35-95	<30	NP-15

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
BaB, BaC2-------- Beasley	0-6	12-27	1.20-1.40	0.6-2.0	0.18-0.23	4.5-7.3	Low----------	0.43	3	.5-4
	6-40	40-60	1.30-1.55	0.2-0.6	0.12-0.18	4.5-7.3	Moderate-----	0.28		
	40-46	---	---	---	---	---	-------------	----		
BeE3------------- Beasley	0-7	40-60	1.20-1.40	0.6-2.0	0.14-0.23	4.5-7.3	Low----------	0.32	3	.5-2
	7-25	40-60	1.30-1.55	0.2-0.6	0.12-0.18	4.5-7.3	Moderate-----	0.28		
	25-45	40-60	1.50-1.70	0.2-0.6	0.10-0.16	6.6-8.4	Moderate-----	0.28		
	45-50	---	---	---	---	---	-------------	----		
Bo--------------- Boonesboro	0-8	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-7.8	Low----------	0.37	3	3-5
	8-34	15-35	1.20-1.40	6.0-20	0.06-0.12	6.1-7.8	Low----------	0.17		
	34	---	---	---	---	---	-------------	----		
ChB, ChC--------- Chavies	0-12	7-18	1.20-1.40	2.0-6.0	0.11-0.18	4.5-7.3	Low----------	0.24	4	.5-4
	12-43	7-18	1.20-1.40	2.0-6.0	0.11-0.20	4.5-7.3	Low----------	0.24		
	43-70	7-18	1.30-1.50	2.0-6.0	0.08-0.18	4.5-6.0	Low----------	0.24		
CnC2:										
Cynthiana-------	0-5	27-40	1.20-1.40	0.6-2.0	0.15-0.20	6.1-7.8	Moderate-----	0.37	2	1-4
	5-18	40-60	1.35-1.60	0.2-0.6	0.08-0.15	6.1-7.8	Moderate-----	0.28		
	18	---	---	---	---	---	-------------	----		
Faywood---------	0-3	27-40	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	3	1-4
	3-26	35-60	1.35-1.45	0.06-0.6	0.12-0.17	5.1-7.3	Moderate-----	0.28		
	26	---	---	---	---	---	-------------	----		
CyE2:										
Cynthiana-------	0-5	40-60	1.35-1.60	0.2-0.6	0.08-0.15	6.1-7.8	Moderate-----	0.37	1	0-4
	5-18	40-60	1.35-1.60	0.2-0.6	0.08-0.15	6.1-7.8	Moderate-----	0.28		
	18	---	---	---	---	---	-------------	----		
Faywood---------	0-3	27-40	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	3	1-4
	3-26	35-60	1.35-1.45	0.06-0.6	0.12-0.17	5.1-7.3	Moderate-----	0.28		
	26	---	---	---	---	---	-------------	----		
Du. Dumps										
EdD2------------- Eden	0-7	18-27	1.25-1.40	0.06-0.6	0.22-0.24	4.5-7.8	Moderate-----	0.43	3	.5-3
	7-24	35-60	1.45-1.65	0.06-0.2	0.08-0.13	4.5-7.8	Moderate-----	0.28		
	24-40	---	---	---	---	---	-------------	0.17		
EfE2------------- Eden	0-7	27-40	1.45-1.65	0.06-0.6	0.11-0.17	4.5-7.8	Moderate-----	0.17	3	.5-3
	7-24	40-60	1.45-1.65	0.06-0.2	0.08-0.13	4.5-7.8	Moderate-----	0.28		
	24-40	---	---	---	---	---	-------------	----		
EkB, EkC--------- Elk	0-9	12-27	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low----------	0.37	5	.5-3
	9-47	18-34	1.20-1.50	0.6-2.0	0.18-0.22	4.5-6.5	Low----------	0.28		
	47-70	15-40	1.20-1.50	0.6-2.0	0.14-0.20	5.1-6.5	Low----------	0.28		
FrF:										
Fairmount-------	0-13	27-40	1.20-1.40	0.06-0.6	0.12-0.20	6.6-8.4	Moderate-----	0.37	2	3-7
	13-18	40-60	1.40-1.60	0.06-0.6	0.10-0.18	6.6-8.4	Moderate-----	0.37		
	18	---	---	---	---	---	-------------	----		
Rock outcrop.										

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
FwB------------- Faywood	0-9	15-27	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	3	1-4
	9-30	35-60	1.35-1.45	0.06-0.6	0.12-0.17	5.1-7.3	Moderate-----	0.28		
	30	---	---	---	---	---	-------------	----		
FyC:										
Faywood---------	0-9	15-27	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	3	1-4
	9-30	35-60	1.35-1.45	0.06-0.6	0.12-0.17	5.1-7.3	Moderate-----	0.28		
	30	---	---	---	---	---	-------------	----		
Lowell----------	0-6	12-27	1.20-1.40	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3	1-4
	6-27	27-60	1.30-1.60	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-----	0.28		
	27-50	40-60	1.50-1.70	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-----	0.28		
	50	---	---	---	---	---	-------------	----		
LoB, LoC--------- Lowell	0-8	12-27	1.20-1.40	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3	1-4
	8-23	27-60	1.30-1.60	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-----	0.28		
	23-62	40-60	1.50-1.70	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-----	0.28		
LoD-------------- Lowell	0-8	12-27	1.20-1.40	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3	1-4
	8-15	27-60	1.30-1.60	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-----	0.28		
	15-48	40-60	1.50-1.70	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-----	0.28		
	48	---	---	---	---	---	-------------	----		
LwD:										
Lowell----------	0-10	12-27	1.20-1.40	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.37	3	1-4
	10-22	27-60	1.30-1.60	0.2-2.0	0.13-0.19	4.5-6.5	Moderate-----	0.28		
	22-49	40-60	1.50-1.70	0.2-0.6	0.12-0.17	5.1-7.8	Moderate-----	0.28		
	49	---	---	---	---	---	-------------	----		
Faywood---------	0-9	12-27	1.30-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	3	1-4
	9-30	35-60	1.35-1.45	0.06-0.6	0.12-0.17	5.1-7.3	Moderate-----	0.28		
	30	---	---	---	---	---	-------------	----		
NcB-------------- Nicholson	0-9	12-27	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low----------	0.43	3	2-4
	9-21	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Low----------	0.43		
	21-43	18-35	1.50-1.70	0.06-0.2	0.07-0.12	4.5-6.5	Low----------	0.43		
	43-73	40-60	1.40-1.60	0.06-0.6	0.07-0.12	5.1-7.8	Moderate-----	0.37		
No--------------- Nolin	0-8	12-27	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43	5	2-5
	8-46	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43		
	46-72	10-30	1.30-1.55	0.6-6.0	0.10-0.23	5.6-8.4	Low----------	0.43		
OtB-------------- Otwell	0-9	12-27	1.25-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	.5-3
	9-20	22-35	1.30-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.43		
	20-57	18-30	1.60-1.80	<0.06	0.06-0.08	4.5-6.0	Low----------	0.43		
	57-94	20-30	1.55-1.65	0.06-0.2	0.19-0.21	5.1-6.0	Moderate-----	0.43		
Pt. Pits										
ShB-------------- Shelbyville	0-9	12-27	1.30-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low----------	0.32	4	2-5
	9-40	18-40	1.30-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37		
	40-90	40-60	1.35-1.50	0.2-0.6	0.12-0.18	4.5-7.8	Moderate-----	0.28		
WhA, WhC--------- Wheeling	0-9	12-27	1.20-1.40	0.6-6.0	0.12-0.18	5.1-6.5	Low----------	0.32	4	1-3
	9-52	18-30	1.30-1.50	0.6-2.0	0.08-0.16	5.1-6.0	Low----------	0.32		
	52-82	8-15	1.30-1.50	6.0-20	0.04-0.08	5.1-6.0	Low----------	0.20		
Wn:										
Wheeling--------	0-9	12-27	1.20-1.40	0.6-6.0	0.12-0.18	5.1-6.5	Low----------	0.32	4	1-3
	9-52	18-30	1.30-1.50	0.6-2.0	0.08-0.16	5.1-6.0	Low----------	0.32		
	52-82	8-15	1.30-1.50	6.0-20	0.04-0.08	5.1-6.0	Low----------	0.20		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cc	In/hr	In/in	pH				Pct
Wn:										
Nolin-----------	0-8	12-27	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43	5	2-5
	8-40	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43		
	40-60	10-30	1.30-1.55	0.6-6.0	0.10-0.23	5.6-8.4	Low-----------	0.43		

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
BaB, BaC2, BeE3--- Beasley	C	None------	---	---	>6.0	---	---	40-60	Soft	Moderate	Moderate.
Bo---------------- Boonesboro	B	Frequent--	Brief-----	Jan-Apr	>6.0	---	---	20-40	Hard	Low-----	Low.
ChB, ChC---------- Chavies	B	None------	---	---	>6.0	---	---	>60	---	Low-----	Moderate.
CnC2, CyE2:											
Cynthiana--------	D	None------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
Faywood----------	C	None------	---	---	>6.0	---	---	20-40	Hard	High----	Moderate.
Du. Dumps											
EdD2, EfE2-------- Eden	C	None------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
EkB, EkC---------- Elk	B	None------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
FrF:											
Fairmount--------	D	None------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
Rock outcrop.											
FwB--------------- Faywood	C	None------	---	---	>6.0	---	---	20-40	Hard	High----	Moderate.
FyC:											
Faywood----------	C	None------	---	---	>6.0	---	---	20-40	Hard	High----	Moderate.
Lowell-----------	C	None------	---	---	>6.0	---	---	>40	Hard	High----	Moderate.
LoB, LoC, LoD----- Lowell	C	None------	---	---	>6.0	---	---	>40	Hard	High----	Moderate.
LwD:											
Lowell-----------	C	None------	---	---	>6.0	---	---	>40	Hard	High----	Moderate.
Faywood----------	C	None------	---	---	>6.0	---	---	20-40	Hard	High----	Moderate.
NcB--------------- Nicholson	C	None------	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	High----	Moderate.
No---------------- Nolin	B	Occasional	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	Low-----	Moderate.
OtB--------------- Otwell	C	None------	---	---	2.0-3.0	Perched	Jan-Apr	>60	---	Moderate	High.
Pt. Pits											
ShB--------------- Shelbyville	B	None------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
WhA, WhC---------- Wheeling	B	None------	---	---	>6.0	---	---	>60	---	Low-----	Moderate.
Wn:											
Wheeling---------	B	None------	---	---	>6.0	---	---	>60	---	Low-----	Moderate.
Nolin------------	B	Frequent--	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	Low-----	Moderate.

TABLE 18.--PHYSICAL ANALYSES OF SELECTED SOILS

[The soils are the typical pedon for the soil series in this survey area. For the location of the pedons see the section, "Soil Series and Their Morphology"]

Soil name, report number, horizon, and depth in inches	Total			Size class and particle diameter (mm)							
	Sand (2-0.05)	Silt (0.05-0.002)	Int. IV Clay (< 0.002)	Sand: Very coarse (2.1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1-0.002)	Textural class*
	Pct <2 mm										
Cynthiana silty clay: (80KY-161-6)											
Ap -- 0- 5	3.5	52.2	44.3	0.2	0.3	0.4	1.0	1.6	1.9	53.8	Sic
B21t -- 5-10	2.8	47.6	49.6	0.2	0.3	0.3	0.9	1.1	1.7	48.7	Sic
B22t -- 10-16	2.2	40.9	56.9	TR	0.2	0.2	0.8	1.0	1.2	41.9	Sic
B23t -- 16-18	3.3	36.6	60.1	0.1	0.1	0.2	1.1	1.8	1.5	38.4	C
Eden silt loam: (80KY-161-4)											
Ap -- 0- 7	5.8	69.6	24.6	0.1	0.3	0.4	1.2	3.8	2.0	73.4	Sil
B21t -- 7-16	3.5	58.9	37.6	---	0.2	0.2	0.8	2.3	1.2	61.2	Sicl
B22t -- 16-24	2.0	55.0	43.0	---	0.1	0.1	0.5	1.3	0.7	56.3	Sic
Lowell silt loam: (80KY-161-5)											
Ap -- 0- 8	6.5	68.5	25.0	0.5	2.1	1.5	1.4	1.0	5.5	69.5	Sil
B1 -- 8-12	7.0	65.7	27.3	0.7	2.5	1.4	1.4	1.0	6.0	66.7	Sicl
B21t -- 12-23	10.2	57.3	32.5	0.8	3.4	2.0	2.2	1.8	8.4	59.1	Sicl
B22t -- 23-29	9.5	36.5	54.0	0.3	1.9	1.6	3.0	2.7	6.8	39.2	C
B23t -- 29-37	6.8	35.0	58.2	0.1	1.0	1.0	2.1	2.6	4.2	37.6	C
B24t -- 37-54	6.5	37.8	55.7	0.1	0.5	0.6	2.1	3.2	3.3	41.0	C
C -- 54-62	4.5	45.3	50.2	0.1	0.5	0.5	1.5	1.9	2.6	47.2	Sic
Nicholson silt loam: (80KY-161-2)											
Ap -- 0- 9	2.9	76.0	21.1	0.1	0.8	0.7	0.7	0.6	2.3	76.6	Sil
B1 -- 9-14	1.9	70.9	27.2	TR	0.5	0.5	0.5	0.4	1.5	71.3	Sicl
B21t -- 14-21	2.9	68.5	28.6	0.1	0.7	0.6	0.8	0.7	2.2	69.2	Sicl
Bx1 -- 21-27	6.2	68.7	25.1	0.4	1.9	1.4	1.4	1.1	5.1	69.8	Sil
Bx2 -- 27-37	10.1	67.3	22.6	0.7	3.4	2.3	2.2	1.5	8.6	68.8	Sil
Bx3 -- 37-43	10.7	57.4	31.9	1.2	3.7	2.0	2.2	1.6	9.1	59.0	Sicl
IIB22t-- 43-64	4.7	38.0	57.3	0.3	1.3	0.8	1.2	1.1	3.6	39.1	C
IIC -- 64-73	6.8	51.8	41.4	1.1	1.5	0.9	1.8	1.5	5.3	53.3	Sic

See footnotes at end of table.

TABLE 18.--PHYSICAL ANALYSES OF SELECTED SOILS--Continued

Soil name, report number, horizon, and depth in inches	Total			Size class and particle diameter (mm)							
	Sand (2-0.05)	Silt (0.05-0.002)	Int. IV Clay (< 0.002)	Sand: Very coarse (2.1)	Sand: Coarse (1-0.5)	Sand: Medium (0.5-0.25)	Sand: Fine (0.25-0.1)	Sand: Very fine (0.1-0.05)	Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1-0.002)	Textural class*
	Pct <2 mm										
Nolin silt loam: (80KY-161-3)											
Ap -- 0- 8	0.8	72.4	26.8	---	TR	TR	---	0.8	TR	73.2	Sil
B1 -- 8-16	1.4	71.2	27.4	---	TR	---	---	1.4	TR	72.6	Sicl
B21 -- 16-26	1.6	72.4	26.0	---	TR	0.1	0.2	1.3	0.3	73.7	Sil
B22 -- 26-46	4.1	73.3	22.6	TR	0.3	0.4	0.9	2.5	1.6	75.8	Sil
B3 -- 46-58	2.1	72.7	25.2	TR	0.1	0.2	0.4	1.4	0.7	74.1	Sil
C1 -- 58-72	2.3	70.9	26.8	TR	TR	TR	0.2	2.1	0.2	73.0	Sil
Shelbyville silt loam: 1/ (80KY-161-1)											
Ap -- 0- 5	4.6	76.5	18.9	0.3	1.6	1.0	0.8	0.9	3.7	77.4	Sil
Ap -- 5- 9	4.9	73.4	21.7	0.3	1.8	1.1	0.8	0.9	4.0	74.3	Sil
A&B -- 9-15	6.6	67.0	26.4	0.6	2.5	1.4	1.1	1.0	5.6	68.0	Sil
B21t -- 15-24	8.2	65.3	26.5	0.7	3.2	1.7	1.4	1.2	7.0	66.5	Sil
B22t -- 24-33	12.2	57.0	30.8	2.0	4.7	2.0	1.8	1.7	10.5	58.7	Sicl
B23t -- 33-40	9.0	54.7	36.3	0.8	3.3	1.8	1.5	1.6	7.4	56.3	Sicl
IIB24t-- 40-47	7.0	47.0	46.0	0.4	2.4	1.4	1.4	1.4	5.6	48.4	Sic
IIB25t-- 47-54	4.4	48.0	47.6	0.2	1.0	0.6	1.0	1.6	2.8	49.6	Sic
IIB26t-- 54-62	2.3	40.2	57.5	TR	0.2	0.2	0.5	1.4	0.9	41.6	Sic
IIB27t-- 62-78	9.5	42.5	48.0	TR	0.5	0.7	1.3	7.0	2.5	49.5	Sic
IIB28t-- 78-90	2.4	59.6	38.0	---	TR	TR	0.4	2.0	0.4	61.6	Sicl

1/ The Ap horizon of Shelbyville silt loam was subdivided for sampling.

* Coarse fragment determinations were not made on these soils; therefore, the soils that are flaggy or channery do not show these textural modifiers.

TABLE 19.--CHEMICAL ANALYSES OF SELECTED SOILS

[A dash indicates the element was not detected. An asterick indicates the determination was not made. TR means trace. The soils are the typical pedon for the soil series in this survey area. For the location of the pedons see the section, "Soil Series and Their Morphology"]

Soil name, report number, horizon, and depth in inches	Reaction			Extractable cations					Cation exchange capacity		Ex-tract-able acid-ity	Hydro-gen and alumi-mum	Base saturation		Or-gan-ic mat-ter	Cal-cium car-bonate equiv-alent	Phos-pho-rus-	Potas-sium
	SMP BUFFER	H_2O (1:1)	KCl 1N (1:1)	Ca	Mg	K	Na	Total	Ammonium acetate	Sum of cat-ions			Ammonium acetate	Sum of cat-ions				
	pH	pH	pH	-----Milliequivalents per 100 grams of soil--------									Pct	Pct	Pct	Pct	Ppm	Ppm
Cynthiana silty clay: (80KY-161-6)																		
Ap -- 0- 5	6.6	6.2	5.4	15.9	1.5	0.8	0.1	18.3	24.4	33.6	15.3	0.1	75	54	*	0.2	72.0	229
B21t -- 5-10	*	7.0	6.0	19.5	0.9	0.3	0.1	20.8	23.9	33.5	12.7	0.1	87	62	*	0.5	43.0	135
B22t -- 10-16	*	7.0	6.0	21.9	0.7	0.4	0.1	23.1	27.0	33.4	10.3	0.1	86	69	*	0.4	30.5	157
B23t -- 16-18	*	7.6	6.5	24.1	0.5	0.3	0.1	25.0	26.4	33.7	8.7	0.1	95	74	*	0.5	13.5	134
Eden silt loam: (80KY-161-4)																		
Ap -- 0- 7	6.2	5.0	4.0	5.9	0.9	0.5	0.1	7.4	13.7	23.5	16.1	0.6	54	32	2.7	0.5	31.5	150
B21t -- 7-16	6.4	5.3	3.7	11.1	1.2	0.3	0.1	12.7	17.1	26.7	14.0	0.4	74	48	0.5	0.3	51.5	124
B22t -- 16-24	*	7.3	6.3	14.3	0.7	0.2	TR	15.2	18.1	22.4	7.2	0.2	84	68	0.4	1.3	5.5	94
Lowell silt loam: (80KY-161-5)																		
Ap -- 0- 8	6.5	6.0	5.1	6.6	1.4	0.4	0.1	8.5	13.0	22.2	13.7	0.1	65	38	2.5	0.2	93.5	112
B1 -- 8-12	6.5	5.9	4.7	6.5	1.1	0.2	0.1	7.9	12.7	21.5	13.6	0.2	62	37	1.0	0.1	48.0	78
B21t -- 12-23	6.5	6.0	4.8	8.9	1.8	0.2	0.1	11.0	15.7	25.6	14.7	0.2	70	43	0.5	0.4	43.5	86
B22t -- 23-29	6.2	5.6	4.3	16.9	1.4	0.3	0.2	18.8	28.4	38.0	19.3	0.3	66	50	0.3	0.8	86.0	132
B23t -- 29-37	5.4	5.3	3.6	13.8	1.1	0.2	0.2	15.3	28.9	43.0	27.8	6.6	53	36	0.4	0.2	265.0	98
B24t -- 37-54	5.9	5.3	3.9	21.2	1.2	0.3	0.1	22.8	31.5	44.3	21.5	0.7	72	52	0.3	0.2	137.0	143
C -- 54-62	*	7.1	5.9	19.3	0.9	0.2	0.2	20.6	27.1	28.9	8.3	0.1	76	71	0.4	0.9	27.0	105
Nicholson silt loam: (80KY-161-2)																		
Ap -- 0- 9	6.8	6.5	5.7	8.7	0.5	0.2	0.2	9.6	12.7	19.5	9.9	0.1	76	49	2.3	0.3	14.0	72
B1 -- 9-14	6.5	5.3	4.0	6.4	0.8	0.2	0.1	7.5	13.1	18.6	11.1	0.1	57	40	0.7	0.2	3.0	77
B21t -- 14-21	6.4	5.2	3.9	6.8	1.0	0.2	0.1	8.1	14.0	23.1	15.0	0.2	58	35	0.5	0.2	3.0	88
Bx1 -- 21-27	6.2	5.1	3.7	5.2	1.0	0.2	0.1	6.5	13.4	20.5	14.0	0.4	49	32	0.3	0.3	3.0	76
Bx2 -- 27-37	6.0	5.0	3.6	4.5	0.9	0.2	0.1	5.7	13.5	20.8	15.1	0.6	42	27	0.2	0.2	3.0	73
Bx3 -- 37-43	5.9	5.2	3.6	6.7	1.1	0.2	0.1	8.1	18.1	24.4	16.3	0.5	45	33	0.2	0.2	4.5	82
IIB22t -- 43-64	6.4	5.6	4.0	19.1	2.2	0.3	0.2	21.8	32.2	34.7	12.9	0.4	68	63	0.2	0.2	26.5	121
IIC -- 64-73	*	7.4	6.5	17.4	1.0	0.2	0.1	18.7	21.3	23.7	5.0	0.1	88	79	0.3	4.9	8.5	95

See footnote at end of table.

TABLE 19.--CHEMICAL ANALYSES OF SELECTED SOILS--Continued

Soil name, report number, horizon, and depth in inches	Reaction			Extractable cations					Cation exchange capacity		Extractable acidity	Hydrogen and aluminum	Base saturation		Organic matter	Calcium carbonate equivalent	Phosphorus	Potassium
	SMP BUFFER	H_2O (1:1)	KCl 1N (1:1)	Ca	Mg	K	Na	Total	Ammonium acetate	Sum of cations			Ammonium acetate	Sum of cations				
	pH	pH	pH	-----Milliequivalents per 100 grams of soil -------									Pct	Pct	Pct	Pct	Ppm	Ppm
Nolin silt loam: (80KY-161-3)																		
Ap -- 0- 8	*	6.9	6.5	16.4	1.6	0.4	0.1	18.5	18.6	26.6	8.1	0.1	99	70	4.4	0.4	72.0	107
B1 -- 8-16	*	7.2	6.6	13.9	1.2	0.3	0.1	15.5	16.0	21.8	6.4	0.1	97	71	3.3	0.5	52.0	86
B21 -- 16-26	*	7.3	6.3	10.3	1.0	0.2	0.1	11.6	14.4	18.5	6.9	---	81	63	2.0	0.2	41.0	80
B22 -- 26-46	*	7.3	6.3	9.8	1.0	0.1	0.1	11.0	14.5	18.8	7.8	---	76	59	1.6	0.2	35.0	74
B3 -- 46-58	*	7.3	6.3	12.1	1.2	0.2	0.1	13.6	15.3	20.4	6.8	---	89	67	1.8	0.1	50.0	72
C1 -- 58-72	*	7.1	6.2	13.8	1.2	0.2	0.1	15.3	17.8	23.3	7.9	0.1	86	66	2.2	0.2	58.5	86
Shelbyville silt loam: 1/ (80KY-161-1)																		
Ap1 -- 0- 5	6.4	5.4	4.5	4.5	0.3	0.6	0.1	5.5	10.4	18.1	12.6	0.2	53	30	2.4	0.2	26.0	200
Ap2 -- 5- 9	6.6	5.7	4.8	5.4	0.4	0.5	0.1	6.4	10.6	17.7	11.3	0.1	60	36	1.7	0.2	14.0	138
A&B -- 9-15	6.7	5.7	4.6	6.3	0.6	0.3	0.1	7.3	12.0	17.9	10.6	0.1	61	41	0.7	0.2	5.5	113
B21t -- 15-24	6.8	5.8	4.8	6.7	0.6	0.2	0.1	7.6	12.3	17.5	9.9	0.1	62	43	0.4	0.4	4.5	80
B22t -- 24-33	6.8	6.2	5.0	7.0	1.1	0.3	0.1	8.5	12.9	19.0	10.6	0.1	66	45	0.2	0.2	6.0	100
B23t -- 33-40	6.8	6.1	5.0	7.3	1.7	0.3	0.1	9.4	13.5	19.5	10.1	0.1	70	48	0.2	0.5	9.5	117
B24t -- 40-47	6.7	6.1	4.9	8.6	2.6	0.4	0.1	11.7	23.7	24.1	12.4	0.1	49	49	0.2	0.2	17.0	144
B25t -- 47-54	6.3	5.5	3.4	7.3	3.0	0.5	0.1	10.9	24.4	27.4	16.5	0.3	45	40	0.3	0.2	14.0	148
B26t -- 54-62	4.9	5.0	3.4	5.5	2.6	0.5	0.1	8.7	27.5	35.8	27.1	1.0	32	24	0.1	0.2	17.5	166
B27t -- 62-78	5.0	5.0	3.4	4.6	2.1	0.5	0.1	7.3	24.6	36.7	29.5	1.6	30	20	0.2	0.1	49.0	150
B28t -- 78-90	5.2	4.9	3.3	5.3	2.0	0.4	0.2	7.9	20.3	30.0	22.1	1.0	39	26	0.2	0.1	177.5	135

1/ The Ap horizon of Shelbyville silt loam was subdivided for sampling.

TABLE 20.--MINERALOGY OF SELECTED SOILS

Soil name, report number, horizon, and depth in inches	Percentage of minerals									
	Resistant			Weatherable						
	Quartz	Opaques	Total resistant	Potassium feldspar	Boitite	Muscovite	Epidote	Tourmaline	Hornblend	Plant opal
Lowell silt loam: (80KY-161-5) B21t -- 12-23	76	1	77	10	8	3	1	TR	TR	---
Nolin silt loam: (80KY-161-3) B22 -- 26-46	74	3	77	18	3	1	TR	TR	1	TR

TABLE 21.--CLAY MINERALOGY OF SELECTED SOILS

Soil name, report number, horizon, and depth in inches	Potassium	Iron	Relative amounts of clay minerals*				Kaolinite
			Vermiculite	Mica	Kaolinite	Montmorillonite	
	Pct	Pct					Pct
Cynthiana silty clay: (80KY-161-6)							
B22t -- 10-16	4.0	6.6	3	3	2	1	15
Eden silt loam: (80KY-161-4)							
B21t -- 7-16	4.5	7.2	2	3	1	1	6
Lowell silt loam: (80KY-161-5)							
B21t -- 12-23	2.0	7.5	2	2	2	1	20
Nicholson silt loam: (80KY-161-2)							
B21t -- 14-21	1.9	8.3	2	2	2	2	26
IIB22t -- 43-46	3.0	7.5	3	3	2	2	17
Shelbyville silt loam: (80KY-161-1)							
B22t -- 24-33	2.2	7.8	2	2	2	1	29

* Relative amounts: 5-dominant, 4-abundant, 3-moderate, 2-small, 1-trace.

TABLE 22.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon and depth in inches	Classification: AASHTO	Classification: Unified	Grain-size distribution: Percentage passing sieve--: 2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	Percentage smaller than--: .02 mm	.005 mm	.002 mm	Liquid limit	Plasticity index	Moisture density: Max-dry density	Moisture density: Optimum Moisture	Specific Gravity
													Pct		Lb/ft3	Pct	Pct
Cynthiana silty clay: 1/ (80KY-161-6)																	
B22t -- 10-16	A-7	CH,MH	100	100	100	100	100	100	98	88	65	60	61	30	95	26	2.75
Eden silt loam: 2/ (80KY-161-4)																	
B21t -- 7-16	A-7	ML	100	97	94	88	55	55	52	40	29	21	45	16	104	20	2.78
Lowell silt loam: 3/ (80KY-161-5)																	
B21t -- 12-23	A-6	CL	100	100	100	100	100	93	90	72	40	27	37	14	106	19	2.74
B24t -- 37-54	A-7-5	CH, MH	100	100	100	100	100	100	98	85	65	60	61	30	93	28	2.76
Nicholson silt loam: 4/ (80KY-161-2)																	
B21t -- 14-21	A-7	CL	100	100	100	100	100	100	100	85	43	31	41	17	99	20	2.72
Bx2 -- 27-37	A-6	CL	100	100	100	100	100	100	100	80	46	27	32	11	109	20	2.73
IIB22t -- 43-64	A-7	CH	100	100	100	100	100	100	98	91	78	60	66	35	94	24	2.78
Nolin silt loam: 5/ (80KY-161-3)																	
B1 -- 8-16	A-7	ML	100	100	100	100	100	100	100	78	40	19	43	15	97	20	2.70
B22 -- 26-46	A-6	CL	100	100	100	100	100	100	100	91	40	26	36	13	105	19	2.71
Shelbyville silt loam: 6/ (80KY-161-1)																	
Ap -- 0- 9	A-4	ML	100	100	100	100	100	100	94	69	27	13	33	9	106	17	2.70
*B23t & IIB24t -- 33-47	A-7	CL	100	100	100	100	100	100	91	72	46	34	42	18	103	21	2.75
*IIB25t & IIb26t -- 47-62	A-7	MH	100	100	100	100	100	100	100	93	72	60	63	31	95	26	2.80

1/ Cynthiana silty clay: 0.9 mile west of the junction of Half Hill Road and Kentucky Highway 1449 at Orangeburg, 500 feet north of Half Hill Road, 390 feet north of the old farmhouse.

2/ Eden silt loam: 0.4 mile northeast of the bridge on U.S. Highway 62 at Murphysville, 310 feet southwest of North Fork Licking River, 360 feet southeast of barn.

3/ Lowell silt loam: 0.7 mile southeast of Mays Lick, 0.4 mile southeast of the junction of Kentucky Highway 324 and Kentucky Highway 161, 625 feet south of Kentucky Highway 324.

4/ Nicholson silt loam: 2.5 miles northeast of Fernleaf, 1.2 miles northeast of the junction of Valley Pike Road and Kentucky Highway 435, 0.3 mile east of Valley Pike, 360 feet west of a barn.

5/ Nolin silt loam: 0.4 mile northeast of the bridge on U.S. Highway 62 at Murphysville, 340 feet north of a barn, about 104 feet southwest of North Fork Licking River.

6/ Shelbyville silt loam: 2.7 miles northeast of Fernleaf, 2 miles north of the junction of Valley Pike Road and Kentucky Highway 435, 0.2 mile southwest of Valley Pike Road, about 830 feet north of a barn.

* The B23t and IIB24t horizons and the IIBA25t and IIB26t horizons were combined for sampling purposes.

TABLE 23.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Beasley	Fine, mixed, mesic Typic Hapludalfs
Boonesboro	Fine-loamy, mixed, mesic Fluventic Hapludolls
Chavies	Coarse-loamy, mixed, mesic Ultic Hapludalfs
Cynthiana	Clayey, mixed, mesic Lithic Hapludalfs
*Eden	Fine, mixed, mesic Typic Hapludalfs
Elk	Fine-silty, mixed, mesic Ultic Hapludalfs
Fairmount	Clayey, mixed, mesic Lithic Hapludolls
Faywood	Fine, mixed, mesic Typic Hapludalfs
Lowell	Fine, mixed, mesic Typic Hapludalfs
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Otwell	Fine-silty, mixed, mesic Typic Fragiudalfs
*Shelbyville	Fine-silty, mixed, mesic Mollic Hapludalfs
Wheeling	Fine-loamy, mixed, mesic Ultic Hapludalfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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