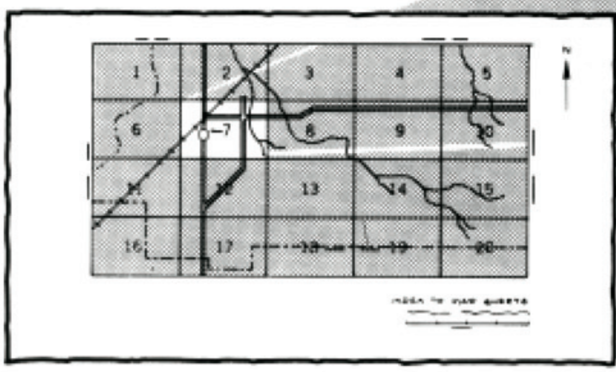
# SOIL SURVEY OF

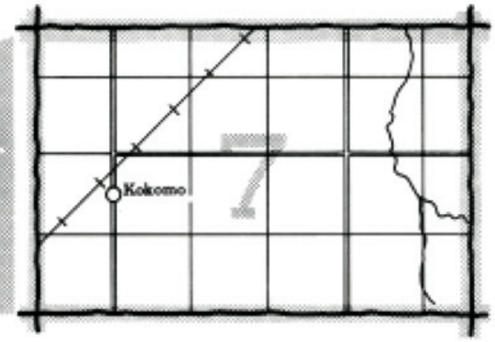
# Hardin and Larue Counties Kentucky

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

# HOW TO USE

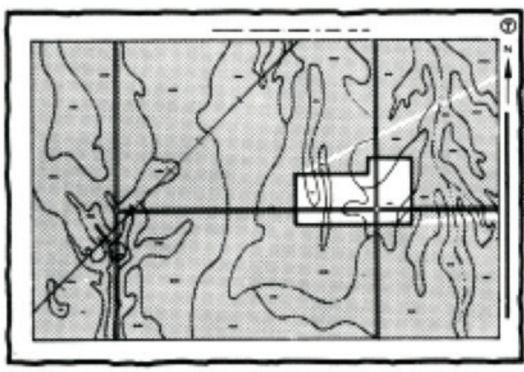
1. Locate your area of interest on the "Index to Map Sheets"

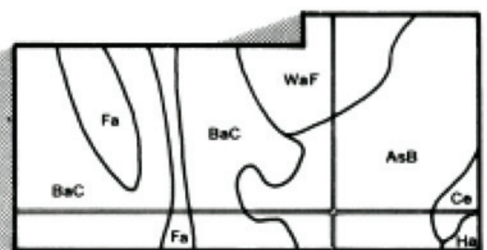


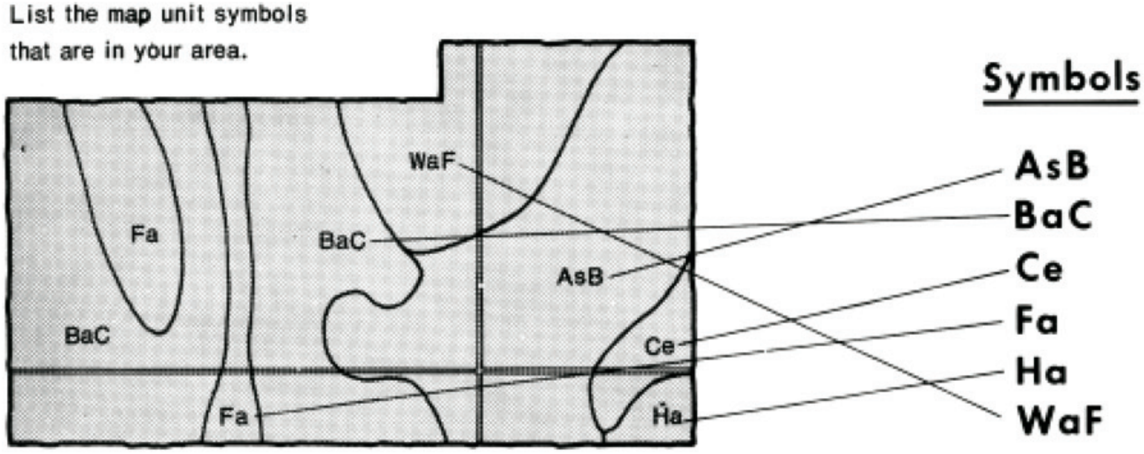

2. Note the number of the map sheet and turn to that sheet.

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



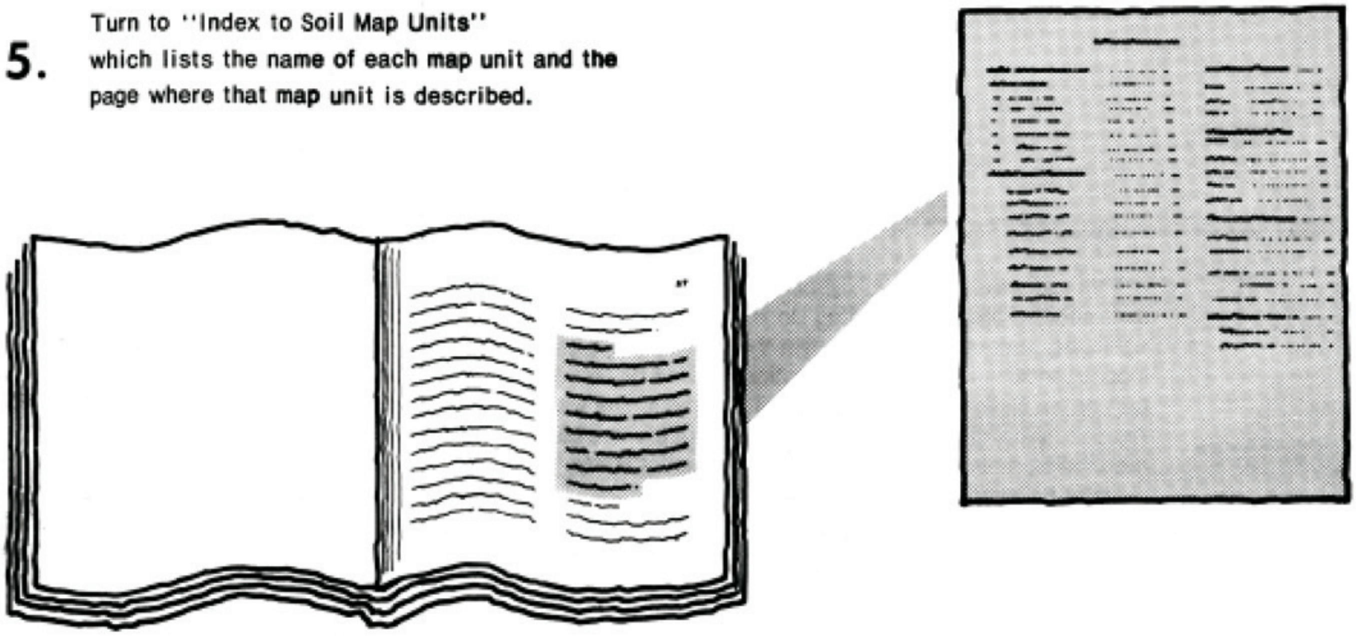



4. List the map unit symbols that are in your area.

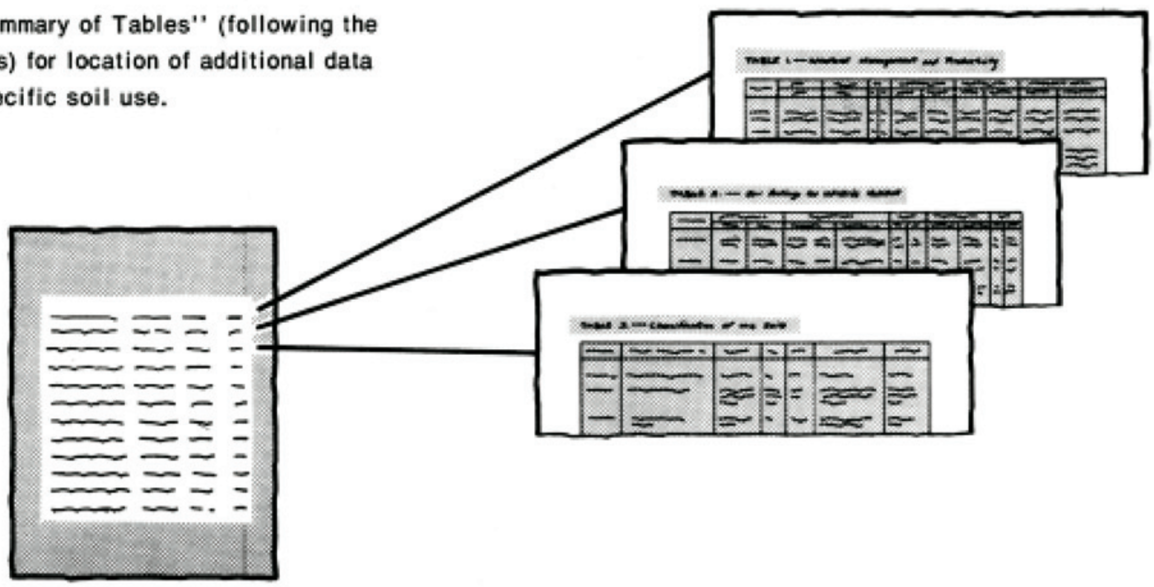


# THIS SOIL SURVEY

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

Major fieldwork for this soil survey was completed in the period 1967-1974. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1974. This survey was made cooperatively by the Soil Conservation Service and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the conservation districts of Hardin and Larue Counties.

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

**Cover: An area of Huntington silt loam in pasture. This soil is best suited to grasses and legumes that can withstand flooding for brief periods.**

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Issued January 1979

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# Foreword

This soil survey contains much information useful in land-planning programs in Hardin and Larue Counties. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

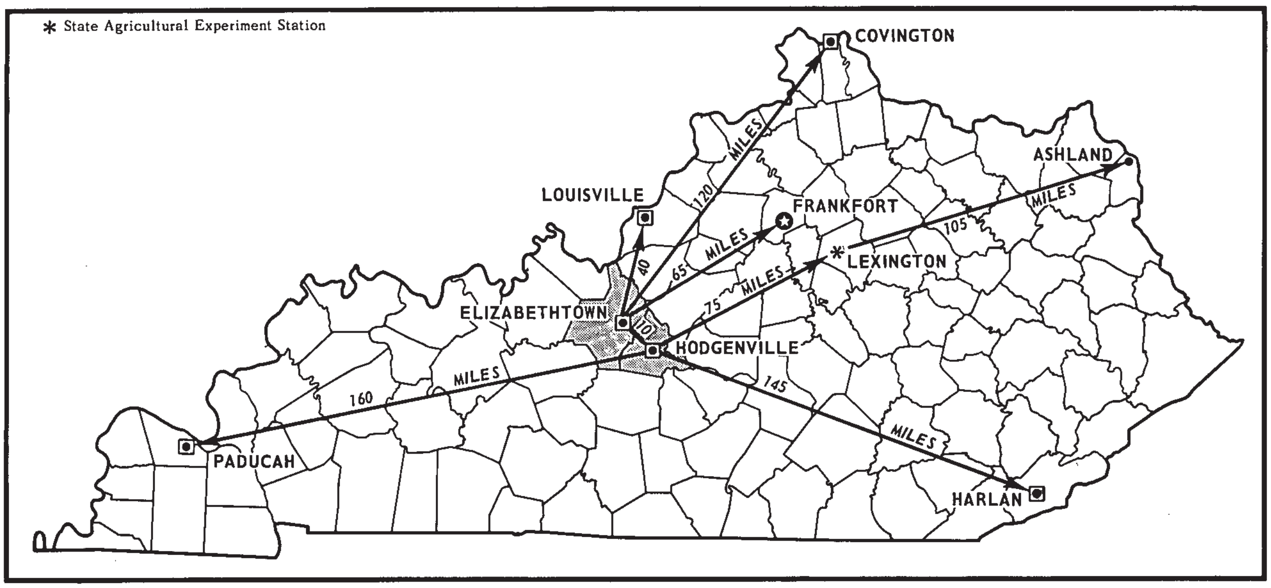
This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to 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 kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Glen E. Murray
State Conservationist
Soil Conservation Service




**Location of Hardin and Larue Counties in Kentucky.**

# SOIL SURVEY OF HARDIN AND LARUE COUNTIES, KENTUCKY

By Fred S. Arms, Michael J. Mitchell, Frank C. Watts, and Byron L. Wilson,
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United States Department of Agriculture, Soil Conservation Service, in
cooperation with the Kentucky Agricultural Experiment Station

## General nature of the area

HARDIN AND LARUE COUNTIES are in the north-central part of Kentucky. The area occupies 560,640 acres or 876 square miles. Hardin County contains 394,265 acres and Larue County 166,375 acres. In 1970 the population of Hardin County was 78,421 and that of Larue County was 10,672, according to the Bureau of Census. Elizabethtown is the county seat of Hardin County, and Hodgenville is the county seat of Larue County.

The western part of the survey area is dissected by streams in many places and is dominantly hilly, although broad nearly level to rolling ridgetops are common. The rest of the survey area is mainly rolling to nearly level limestone uplands that have steep slopes along drainageways. Sinks and depressions are common in most places. Nearly level flood plains and stream terraces are along the northern and eastern boundaries of the area. The elevation ranges from about 382 feet above sea level, which is the normal pool elevation of the Ohio River, to about 1,060 feet in the southeastern part of Larue County.

The climate is temperate and humid. The growing season is favorable for the production of corn, tobacco, and small grains, which are the chief crops. Grasses and legumes are grown for hay and pasture on farms where cattle are raised.

The number and size of industrial developments in the area have increased rapidly in recent years. Numerous small industries are of major importance to the economy.

Historical landmarks attract tourists to the area, and Fort Knox Military Reservation is located in the northern part.

Forest products and limestone are the primary natural resources.

## Climate

In Hardin and Larue Counties, summers are hot in the valleys and slightly cooler in the hills; winters are moderately cold. Rain is fairly heavy throughout the year and heaviest in winter. 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 Leitchfield, Kentucky, for the period 1951 to 1974. Table 2 shows probable dates of the first freezing temperature in fall and the last in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 37 degrees F and the average daily minimum is 27 degrees. The lowest temperature on record, -19 degrees, occurred at Leitchfield on January 24, 1963. In summer, the average temperature is 76 degrees and the average daily maximum is 87 degrees. The highest temperature, 105 degrees, was recorded on July 27, 1952.

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

Of the total annual precipitation, 24 inches, or 51 percent, generally falls during the period April through September, which includes the growing season for most crops. In 2 years in 10, the April-September rainfall is less than 19 inches. The heaviest 1-day rainfall during the period of record was 5.86 inches at Leitchfield on July 22, 1973. Thunderstorms number about 45 each year, 22 of which occur in summer.

The average seasonal snowfall is 13 inches. The greatest depth of the snow cover at any one time during the period of record was 16 inches. On the average, 5 days have at least 1 inch of snow on the ground, but the number of days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night in all seasons, and the average at dawn is about 80 percent. Possible sunshine is 67 percent in summer and 43 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in March.

## Farming

In 1970 64.4 percent of the soils in Hardin County and 82.8 percent in Larue County were in farms. These figures represent a decrease of about 7 percent since 1950. The number of farms in Hardin and Larue Counties in 1970 has decreased since 1945. In the same period the average size of farms in each county increased slightly. In 1969, there were 2,150 farms in Hardin County, and the average size was 118.1 acres. Larue County had 1,220 farms, and the average size was 112.9 acres, according to the Bureau of Census.

The percentage of owner operators, part owner operators, and tenant operators was about the same in Hardin County as in Larue County in 1970. About 81 percent of the farms were operated by full owner, 11 percent by part owners, and 8 percent by tenants, according to the Bureau of Census.

The growing of row crops, hay, and pasture and the raising of livestock are the main farm enterprises. Corn is the principal grain crop. Wheat, oats, barley, and rye are grown for grain and as green manure and cover crops. Oats are also grown for hay. Sorghum and soybeans are grown for some grain and hay on a few farms. Burley tobacco, the main cash crop, is grown on small acreages on most farms. Potatoes, vegetables, sweet corn, berries, grapes, melons, apples, peaches, cherries, pears, and plums account for only a small percentage of the total farm production. Some of these crops are grown on most farms for home use. Honey and molasses are produced for sale on a few farms.

Alfalfa, red clover, Korean lespedeza, orchardgrass, and timothy are the important hay crops. The most common pasture plants are orchardgrass, Kentucky 31 fescue, Kentucky bluegrass, and white clover.

The total acreage of cropland reported in the 1970 census was 167,707 acres in Hardin County and 92,576 acres in Larue County. There was a large decrease in the acreage of land used for corn from 1950 to 1970. In the same period, however, the total production in bushels increased, and there was a large increase in yield per acre. Among the reasons for this increase are the use of better land management practices, an increase in the amount of lime and commercial fertilizers applied, the use of improved corn varieties, and the increased use of chemicals for more effective weed control. Improved production practices have increased in yields of most of the crops commonly grown in the area.

Livestock enterprises account for a high percentage of the farm income in the area. Beef and dairy cattle and hogs are the main livestock, and their numbers increased greatly from 1950 to 1970. The number of cattle and calves reported in the 1970 census was more than double that reported in 1950. The number of sheep declined during the same period, and sheep production is no longer a major livestock enterprise in the area. Commercial production of poultry and eggs is an important enterprise on a few farms, but the number of poultry on farms has declined in recent years. Horses and mules are used very little as work animals. Raising horses is not an enterprise except on a few farms, but horses and ponies are kept on many farms for riding.

The acreage of farm woodland has not changed appreciably since 1950. In 1970, there were 47,538 acres of farm woodland in Hardin County and 25,163 acres in Larue County. These figures represent almost half the total acreage of woodland in each of the two counties. In 1970, there were 100,000 acres of woodland in Hardin County and 55,700 acres in Larue County (*3*). Despite tree planting operations and natural reforestation, the total acreage in woodland has changed little since 1950 because of land clearing operations. The net result has been an increase in the acreage of suitable cropland and the conversion to woodland of some soils having low potential for crop production.

## Topography, drainage, and geology

Hardin and Larue Counties lie chiefly in the Western Pennyroyal physiographic region of Kentucky, which is part of the Mississippian Plateau (*1*). The topography is mostly a dissected plateau, but it varies greatly. Near the eastern boundary of the survey area and in the western part of Hardin County, the streams are deeply entrenched. The topography in these areas is characterized by high ridges and narrow valleys that have steep valley walls. Flood plains of the Ohio, Salt, and Rolling Fork Rivers extend along the northern and eastern boundaries of Hardin County. The Rolling Fork River flood plain also lies along the northeastern boundary of Larue County.

In the remainder of the two-county area the streams are entrenched to a moderate depth and have narrow flood plains. The topography is dominantly undulating to rolling uplands. A large area of intermittent karst topography extends south from Radcliff in northern Hardin County through Franklin Cross Roads, White Mills, and Sonora to the Hart County line. This area of Karst topography also includes the west central and southwestern parts of Larue County. The landscape in these karst areas is dotted with sinklike depressions. Depressions also occur in some other places where the underlying rock is limestone.

The lowest elevation in the survey area is 382 feet above sea level. This is the normal pool elevation of the Ohio River at West Point in Hardin County. The highest elevation, 1,060 feet, is near the Taylor County line in southeastern Larue County. Generally, the elevation on the uplands ranges from about 600 to 900 feet.

Surface drainage is predominant in approximately 65 percent of Hardin and Larue Counties. Subterranean drainage is predominant in areas of karst topography. The eastern part of Larue County and the northern and eastern parts of Hardin County are drained mostly by Salt River and its tributaries. A small area south of West Point in northern Hardin County is drained by the Ohio River. The Vine Grove community is drained by Otter

Creek. Rolling Fork River, which is a major tributary of Salt River, and its tributaries—Cedar Creek, Clear Creek, Youngers Creek, Knob Creek, and Salt Lick Creek—drain most of the eastern parts of Hardin and Larue Counties. Mill Creek, which drains part of Hardin County, empties into Salt River. Larue County and the southern half of Hardin County are drained mostly by the Nolin River and its tributaries, including Valley Creek, East Rhudes Creek, South Fork, North Fork, McDougall Creek, Castleman Creek, Wilkins Creek, Grady Creek, and South Fork Creek. The western part of Hardin County is drained principally by Rough River and its tributaries, which are Meeting Creek and Linders Creek. A small area in southern Larue County is drained by Bacon Creek, Pottinger Creek, and Lynn Camp Creek, which are part of the Green River watershed.

The stream channels of the Rolling Fork and Nolin Rivers are mostly narrow and meandering. These streams overflow frequently in winter and spring, when rainfall is heavy. Water spreads over the flood plain, scouring the surface and depositing silt, sand, gravel, and debris. Occasionally, high floods cause serious damage to property in the Hodgenville and Elizabethtown communities. Water-retention structures and the improved vegetative cover in the Valley Creek watershed can minimize stream overflow and flood damage in the Elizabethtown community.

Karst areas are drained by natural outlets or by connected underground tunnels. The water flows to surface streams at lower elevations. The natural outlets, commonly called sinkholes and depressions, range from about 10 feet to several hundred feet in diameter. When the natural outlets become clogged with crop residue, debris, and sediment that has been deposited by runoff, water stands for considerable periods before it filters down into underground streams. These depressions, consequently, are unsuitable for cultivated crops. If the outlet is sealed tightly, however, a depression that is filled with water can be used as a permanent stockwater pond.

Some small streams that drain up to several hundred acres of land flow into depressions. One example is Lost Branch which is west of Summit in Hardin County. This stream has cut through the sandstone and shale and into the underlying limestone. Another example is Sandy Creek, which drains through a depression near Flint Hill in southwestern Hardin County.

Hardin and Larue Counties are underlain by plane bedded sedimentary rocks of the Mississippian and Devonian Periods, but the rocks are predominantly of Mississippian age, according to the U.S. Geological Survey. New Albany Shale of the Devonian age is exposed on foothills above the Rolling Fork River Valley in eastern Larue County.

Resting upon the New Albany Shale is the Borden Formation of Mississippian age. This formation is from 230 to 370 feet thick, and it is exposed on the steep hillsides in the northern and eastern parts of the area. The Borden Formation has two members. The upper part is the Muldraugh member, which is 70 to 295 feet thick and consists of siltstone, dolomite, and limestone. The lower part is the shale member, which consists of gray, acid clay shale.

Harrodsburg Limestone, which is 20 to 45 feet thick, lies immediately above the Borden Formation and is, in turn, overlain by Salem Limestone, which is about 30 to 180 feet thick. Salem Limestone is exposed on the highest ridges in the eastern half of the area and has some thin strata of calcareous shale and dolomite.

The St. Louis and St. Genevieve Limestones underlie most of the remainder of the area. The St. Louis rests upon the Salem, and the St. Genevieve is immediately above the St. Louis. These strata combined are commonly more than 200 feet. Much of the residual parent materials of the soils in the central and southern part of the area resulted from the weathering of these limestones. Generally more of the St. Louis Limestone underlies the soils on the uplands in the eastern part of the survey area. As distance westward increases, this limestone is less common, and it becomes the dominant underlying limestone near the edge of the Western Coalfield physiographic region.

Karst topography in Hardin and Larue Counties is mainly associated with the St. Louis and St. Genevieve Limestones. Scattered throughout most of the uplands that are underlain by these limestones are localized deposits of sand, sandstone, silt, shale, and limestone. These materials derived from rocks overlying the St. Genevieve. The deposits slumped into sinkholes in the St. Louis and St. Genevieve Limestones during an early cycle of karst erosion. In some places these deposits are as much as 210 feet thick, and in other places they are thinner and are mixed with the residual soil materials.

Rocks overlying the St. Genevieve Limestone are in the western part of Hardin County. Paoli Limestone, 30 to 65 feet thick, immediately overlies St. Genevieve Limestone. Above the Paoli Limestone is 3 to 120 feet of shale, sandstone, and limestone of the Moorestown Formation. In most places, Beaver Bend Limestone, which is 8 to 35 feet thick, overlies the Moorestown. Above this is the Sample Sandstone, which is 15 to 75 feet thick. The Sample Sandstone is overlain by the Reelsville Limestone, which is 5 to about 40 feet thick. Immediately above the Reelsville is 5 to about 30 feet of clay shale, siltstone, and sandstone. Above this is the Galcondian Formation, which has three members. The Beech Creek Limestone, the basal member, has a maximum thickness of about 15 feet. The Big Clifty Sandstone, the thickest member, is 60 to 120 feet thick and underlies the Haney Limestone member, which is 20 to 50 feet thick. The uppermost formation is the Hardinsburg Sandstone. It is 45 feet or more thick and has some interbedded shale. The Hardinsburg Sandstone forms the upper part of the ridges in the extreme western part of Hardin County.

A mantle of wind-deposited silt, or loess, that is up to 5 feet thick covers many of the gently rolling to rolling uplands. This mantle is thickest on ridges above the Ohio River Valley in northern Hardin County. In other parts of Hardin County and in Larue County, the loess is mostly less than 3 feet thick.

## How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots (*5*).

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

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

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

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

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

## General soil map for broad land use planning

The general soil map at the back of this publication shows, in color, the soil associations in the survey area. Each soil association is a unique natural landscape that has a distinct pattern of soils and of relief and drainage. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up an association can occur in other associations but in a different pattern.

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

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

The soil associations in Hardin and Larue Counties are described in the following pages.

### Soil associations of Hardin County

#### 1. Frondorf-Sadler-Ramsey association

*Nearly level to moderately steep, moderately well drained and well drained, deep and moderately deep soils on broad ridgetops and upper side slopes; and shallow, somewhat excessively drained, steep soils on hillsides*

This association consists of nearly level to moderately steep soils on broad ridgetops and upper side slopes, and steep soils on narrow valley walls. Sandstone bedrock forms narrow bands or escarpments on the steep hillsides (fig. 1). Some valleys are about 220 feet deep. The major streams that dissect the association are Rough River, Meeting Creek, Hoover Creek, Linders Creek, and Sutzer Creek. A few small streams empty into sinks and caves in karst valleys. Two separate areas, one large and one very small, make up the association.

This association occupies about 18 percent of Hardin County. About 26 percent of the association is Frondorf and Lenberg soils, 22 percent is Sadler soils, and 8 percent is Ramsey soils. Minor soils make up the rest.

The Frondorf soils, on upper side slopes and narrow ridges, are sloping to moderately steep, well drained, and loamy and are underlain by sandstone and shale at a depth of about 33 inches. The Frondorf soils occur on the landscape in a complex pattern with the Lenberg soils. The Sadler soils, on broad ridgetops, are nearly level to sloping, moderately well drained, and loamy and have a very firm, compact or brittle, slowly permeable layer or fragipan at a depth of about 28 inches. The Ramsey soils, on hillsides, are steep, loamy, and somewhat excessively drained and are underlain by sandstone and siltstone at a depth of about 16 inches.

Minor soils in the association are the Wellston soils on narrow ridges and upper side slopes; Allegheny, Steinsburg, and Caneyville soils on hillsides and foot slopes; and Nolin, Lindside, Newark, and Melvin soils on flood plains.

About two thirds of the association has been cleared of trees and is used for crops. Many of the soils on upper side slopes are idle land that is reverting to hardwood trees through natural revegetation. Several young stands of pine trees are scattered throughout the association. The soils that are farmed are mostly on the broad ridgetops and narrow flood plains. Corn, tobacco, hay, and pasture are the chief crops. Raising of beef cattle is the main livestock enterprise. Most farms are owner operated, and some of the owners are part-time farmers.

This association has potential for more intensive use for forestry, farming, recreation, and urban developments. Potential is good for vegetables, orchards, and vineyards. The erosion hazard is the main limitation to use of the soils for row crops. Ramsey soils are not suited for row crops or pasture because of steep slopes and shallow depth to bedrock. Numerous sites are available for water impoundment structures in the narrow valleys. Many kinds of wild plants and animals are suited to this area because of the varied topography and contrasting soils. The use of the soils for urban developments is limited mainly by the steepness of slopes. Care must be taken in selecting sites for sewage disposal systems.

### 2. Crider-Pembroke-Cumberland association

*Gently sloping to moderately steep, deep, well drained soils on karst uplands*

This association consists of gently sloping to moderately steep soils on karst uplands (fig. 2). Most of the surface runoff collects in small depressions and sinks which dot the landscape and drains into underground streams. Karst valleys and sinking creeks are common. Many of the depressions are ponded for brief periods in rainy seasons, and others are permanently ponded. Surface water is also removed by the Nolin River and other small streams that dissect the association. Depressions are commonly about 40 feet below the highest elevations in this area, and stream channels are somewhat lower. This association is made up of 5 separate areas.

This association occupies about 22 percent of Hardin County. About 33 percent of the association is Crider soils, 18 percent is Pembroke soils, and 17 percent is Cumberland soils. Minor soils make up the rest.

Crider soils, on the smoothest part of the landscape, are deep, well drained, gently sloping to sloping, and loamy. Pembroke soils, on undulating to rolling uplands, are deep, well drained, and gently sloping to sloping. They have a loamy plow layer and upper part of the subsoil. Clayey layers are below a depth of about 40 inches. The Cumberland soils, on side slopes and rims of depressions, are deep, well drained, and sloping to moderately steep. They have a loamy plow layer and a clayey subsoil. Minor soils in the association are the Fredonia, Caneyville, Hagerstown, and Nicholson soils on uplands; the Elk, Otwell, and Ashton soils on stream terraces and in depressions; and the Huntington, Nolin, Lindside, Newark, Melvin, and Dunning soils in depressions and on flood plains.

The farms in this association are commonly owner operated, and some are tenant farms. Corn, tobacco, and small grain are important crops in the association. Clover and tall grasses are grown extensively for pasture and hay. Raising beef cattle and hogs is the main livestock enterprise on most farms. On a few farms, dairying is the chief enterprise. The only remaining woodland consists of small woodlots which are commonly on the steeper slopes.

This association has potential for more intensive use for farming and urban developments. The hazard of erosion is the main limitation for row crops. The limitations are generally slight to moderate for most urban developments.

The cavernous limestone in this association is a source of crushed rock and lime for farm use.

### 3. Caneyville-Hagerstown association

*Moderately deep and deep, well drained, moderately steep to gently sloping soils and Rock outcrop on karst uplands*

This association consists of moderately steep to gently sloping soils and Rock outcrop on hilly karst uplands (fig. 3). Most surface water collects in the sinks and depressions which dot the landscape and drains into underground streams. Karst valleys and sinking creeks are common. Nolin and Rough Rivers also dissect the association. Four separate areas of this association are in Hardin County.

This association occupies about 11 percent of Hardin County. About 35 percent of the association is Caneyville soils and Rock outcrop, and 31 percent is Hagerstown soils. Minor soils make up the rest. The Caneyville soils occur on the landscape in a complex pattern with Rock outcrop. Rock outcrop makes up about 18 percent of the surface.

The Caneyville soils, on hillsides, are well drained and sloping to moderately steep. They have a loamy plow layer and a clayey subsoil that is underlain by limestone at a depth of about 34 inches. The Hagerstown soils, on ridges and side slopes, are deep, well drained, and gently sloping to moderately steep. They have a loamy plow layer and a clayey subsoil.

Minor soils in the association are the Pembroke, Sonora, Riney, Fredonia, Vertrees, Crider, and Nicholson soils on uplands; Ashton, Elk, and Otwell soils on stream terraces; and Nolin, Lindside, Newark, and Melvin soils on flood plains and in depressions.

This association is not used extensively for farming. Small acreages of corn, tobacco, and small grains are scattered throughout the area. Pastureland and idle land are common in some areas. Much of the area is in trees. Some areas that have been cleared are being revegetated naturally. Oak, hickory, redcedar, maple, and yellow-poplar are the dominant trees.

The use of the soils in this association for farming and most urban developments is limited because of the rough topography, presence of rock outcrops, and moderate depth to bedrock. The hazard of erosion also limits the use of the soils for row crops. The association has good potential for woodland, recreation use, orchards, and vineyards. Some scenic homesites are scattered throughout the association.

### 4. Sonora-Gatton-Riney association

*Deep, gently sloping and sloping, well drained and moderately well drained soils on narrow to moderately broad ridges and side slopes; and deep, well drained soils on narrow ridges and hillsides*

This association consists of undulating to rolling and hilly soils on uplands that are dissected by many small streams (fig. 4). The streams are commonly about 60 feet below the ridgetops. Many small streams are nearer the ridgetops, but the major streams are up to 100 feet below the ridges. Seven separate areas make up the association.

The association occupies about 11 percent of Hardin County. About 49 percent of the association is Sonora soils, 13 percent Gatton soils, and 11 percent is Riney soils. Minor soils make up the rest.

The Sonora soils, on ridgetops and upper parts of side slopes, are gently sloping and sloping, deep, loamy, and well drained. Gatton soils are on ridgetops and in undulating areas below Sonora soils. They are gently sloping, moderately well drained, loamy soils that have a firm, compact, and brittle layer or fragipan at a depth of about 22 inches. The Riney soils, on narrow ridges and hillsides, are sloping to steep, deep, well drained, and loamy.

Minor soils in the association are the Waynesboro soils on uplands; Lawrence and Otwell soils on stream terraces; and Nolin, Lindside, Newark, and Melvin soils on flood plains.

The soils in this association are used mainly for farming. Small woodlots are common, and there are a few fairly large tracts of woodland in the association. Idle fields and gullied and severely eroded spots are also common in this area. Most of the farms are owner operated, but some of the operators are part-time farmers. Corn, tobacco, small grain, hay, and pasture are the chief crops. Raising beef cattle and hogs is the main livestock enterprise.

The soils are suited to many kinds of uses. They have potential for intensive use for crop production. Wetness and limited rooting depth in the Gatton soils and the hazard of soil erosion are the main limitations to use of soils for crops. Slow permeability in the fragipan of the Gatton soils and slope are the main limitations to use of the soils for urban and recreational developments. The association has good potential for residential and industrial developments.

### 5. Crider-Vertrees-Nicholson association

*Nearly level to sloping, deep, well drained and moderately well drained soils on broad ridges and side slopes; and deep, well drained, sloping to steep soils on narrow ridges and hillsides*

This association consists of nearly level to rolling, hilly, and steep soils on broad uplands that are dissected in most parts by many small streams (fig. 5). The larger streams are as much as 160 feet below the ridgetops. Some parts of the association are karsts, and drainageways lead through sinks and depressions into underground streams. Karst valleys are common. Some of the depressions are ponded.

The association occupies about 23 percent of Hardin County. About 40 percent of the association is Crider soils, 35 percent is Vertrees soils, and 15 percent is Nicholson soils. Minor soils make up the rest. Two separate areas make up the association.

The Crider soils, on ridges and side slopes, are gently sloping to sloping, deep, and well drained. They have a loamy plow layer; the subsoil is loamy in the upper part and clayey in the lower part. Vertrees soils, on narrow ridges and hillsides, are sloping to steep, deep, and well drained. They have a loamy plow layer and a clayey subsoil. The Nicholson soils, on broad ridgetops, are well drained, nearly level to gently sloping, and loamy and have a firm, compact layer or fragipan at a depth of about 23 inches.

Minor soils in the association are the Waynesboro soils on uplands; Lawrence, Otwell, Elk, and Ashton soils on stream terraces; and Nolin, Lindside, Newark, Melvin, and Dunning soils on flood plains and in depressions.

This association is used extensively for farming. Small woodlots and some large tracts of woodland are scattered throughout the area. Idle fields that are reverting to hardwood trees are common in some parts. There are many small communities and built-up areas along most roads. Elizabethtown, which is the county seat of Hardin County, Radcliff, and Fort Knox are in the association. The farms are commonly owner operated and many of the owners are part-time farmers. Corn, tobacco, and small grains are the main crops. Legumes and tall grasses are grown extensively for hay and pasture. Raising beef cattle and hogs and dairying are important livestock enterprises.

This association is suited to many kinds of uses. It has good potential for more intensive use for crop production.

Potential is good for vegetables, orchards, and vineyards. Wetness and limited depth of root penetration in the Nicholson soils and the hazard of soil erosion are the main soil limitations to use of the soils for crops. Slope and wetness are the main limitations for urban developments. Care must be taken in selecting sites for sewage disposal systems.

The limestone in this associaton is a source of crushed rock and lime for farm use.

### 6. Garmon-Caneyville-Lenberg association

*Very steep to moderately steep, moderately deep, well drained soils on hillsides, narrow ridges, and foot slopes*

This association consists of very steep to moderately steep soils on narrow ridges and valley walls (fig. 6). Narrow valley floors are commonly 400 feet or more below the ridgetops. The association is made up in part by the Muldraugh Escarpment.

The association occupies about 11 percent of Hardin County. About 36 percent of the association is Garmon soils, 15 percent is Caneyville soils, and 7 percent is Lenberg soils. Minor soils make up the rest. The Caneyville soils occur on the landscape in a complex pattern with areas of Rock outcrop. Rock outcrop makes up about 18 percent of the surface area of the Caneyville soils. The Lenberg soils occur in a complex pattern with the Frondorf soils. The Frondorf soils make up about 30 percent of the acreage of Lenberg soils.

Garmon soils are on the hillsides. They are very steep, well drained, loamy soils that are underlain by limestone and shale at a depth of about 20 to 40 inches. The Caneyville soils, which are on the narrow ridges and upper side slopes, are moderately steep to steep and well drained. They have loamy surface and subsurface layers and a clayey subsoil that is underlain by limestone bedrock at a depth of about 20 to 40 inches. The Lenberg soils, which are on foot slopes and low ridges, are moderately steep and well drained. They have loamy surface and subsurface layers and a clayey subsoil which is underlain by soft acid shale at a depth of about 20 to 40 inches.

The minor soils in the association are Hagerstown, Vertrees, Crider, and Nicholson soils on ridges; Wellston soils on foot slopes and low ridges; and Sensabaugh and Nolin soils adjacent to stream channels.

A major part of this association is in hardwood trees. Corn, tobacco, hay, and pasture are grown in relatively small acreages on some of the minor soils in the area. The northern part of the association is in Fort Knox Military Reservation.

The potential of the soils in this association for most purposes is limited because of steep slopes and moderate depth to bedrock. The association has good potential for forestry, wildlife habitat, and some recreation uses. Some of the minor soils are suited to farming if adequate measures are taken to control soil erosion. The soils have some potential for orchards and vineyards. Some scenic and secluded homesites are available for homes. The foot slopes are subject to slides.

### 7. Lawrence-Nolin-Otwell association

*Nearly level and gently sloping, deep, somewhat poorly drained to well drained, alluvial soils on stream terraces and flood plains*

This association consists of moderately broad to narrow areas of nearly level to undulating soils on stream terraces and flood plains along Rolling Fork and Ohio Rivers (fig. 7).

This association occupies about 1 percent of Hardin County. About 28 percent of the association is Lawrence soils, 20 percent Nolin soils, and 16 percent is Otwell soils. Minor soils make up the rest.

The Lawrence soils, on stream terraces, are nearly level, somewhat poorly drained, and loamy and have a firm, compact, slowly permeable layer or fragipan at a depth of about 17 inches. The Nolin soils, on flood plains near the river channels, are nearly level, deep, well drained, and loamy. Otwell soils, on stream terraces, are nearly level to gently sloping, moderately well drained and loamy and have a slowly permeable, firm, compact layer or fragipan at a depth of about 26 inches.

Minor soils in this association are the Newark, Lindside, and Melvin soils on flood plains; and the Elk, Robertsville, and Ashton soils on stream terraces.

Most of the soils in this association are used for farming. There are a few small woodlots, and narrow strips of trees line the streambanks. The farms are commonly operated by the owner. Corn is the chief crop. Tobacco is grown in small plots, and soybeans are an important crop on some farms. Legumes and tall grasses are grown for pasture and hay. Raising beef cattle and hogs is the main livestock enterprise. Most farm homes and a few small communities are on soils near the foot slopes of the adjacent association.

The soils in this association have potential for intensive use for crops. The rivers are a potential source of water for irrigation. The main limitations to use of the soils for crops are flooding and wetness. The limited depth of root penetration in the Lawrence and Otwell soils makes them poorly suited to some of the deep rooted crops.

The hazard of flooding, seasonal high water table, and wetness make the soils in this association poorly suited for most urban development. They are suited for some recreation development.

### 8. McGary-Markland-Nolin association

*Nearly level and sloping, deep, somewhat poorly drained and well drained soils on broad stream terraces and narrow flood plains*

This association consists of soils on broad flats on stream terraces, in narrow strips of rolling topography, and on narrow flood plains. Moderately deep, narrow drainageways dissect the area. The bottoms of drainageways are about 40 feet below the terrace flats.

This association occupies about 3 percent of Hardin County. McGary soils make up about 46 percent of the association, Markland soils make up 30 percent, and Nolin soils make up 15 percent. Minor soils make up the rest.

The McGary soils, on stream terraces, are nearly level, deep, and somewhat poorly drained and have a loamy plow layer and a clayey subsoil. The Markland soils occupy positions below the McGary soils. They are sloping, well drained to moderately well drained soils that have a loamy plow layer and a clayey subsoil. Nolin soils are in narrow strips adjacent to the rivers. They are nearly level, deep, well drained, and loamy.

Minor soils in the association are the Lawrence, Robertsville, and Elk soils on stream terraces; and the Newark, Melvin, and Sensabaugh soils on flood plains.

A small part of this association near Colesburg is in farms. About half of this part is in hardwood trees, and the remainder is used chiefly for pasture and hay. Corn is grown on the flood plains. The remainder of the association is in Fort Knox Military Reservation. In this part about half the acreage is woodland. Oak, hickory, redcedar, ash, and maple are the dominant trees. Many old fields are reverting to hardwood trees. Military developments, fields of tall fescue, weeds, and developments for wildlife habitat are scattered throughout this part of the area.

The use of the soils for farming is limited because of soil wetness, flooding, and the hazard of soil erosion. The association has potential for farming, forestry, and some seasonal recreation uses. The hazard of flooding, wetness, and seasonal high water table make this association poorly suited to most types of urban development.

## Soil associations of Larue County

### 1. Riney-Waynesboro association

*Sloping to steep, deep, well drained soils on narrow ridges and hillsides*

This association consists of soils on narrow, rolling, and winding ridgetops; on steep hillsides; and in deep, narrow valleys. The ridgetops are commonly about 260 feet above the valleys.

This association occupies about 3 percent of Larue County. About 80 percent of the association is Riney soils and 18 percent is Waynesboro soils. Minor soils make up the rest.

The Riney soils, on ridgetops and hillsides, are deep, well drained, and loamy. Waynesboro soils are on hillsides. They are deep, well drained soils that have a loamy plow layer. The subsoil is loamy in the upper part and clayey in the lower part.

Minor soils in the association are the Sonora soils on ridgetops and the Caneyville soils on hillsides.

This association is mostly in forest. Soils on some of the ridgetops are used for corn, tobacco, hay, and pasture. Idle fields reverting to forest are common. Oak, hickory, and yellow-poplar are the dominant trees. The farms are commonly operated by part-time farmers. Absentee ownership of land is common. Houses in the association are on ridges near the main roads.

This association has low potential for row crops because of the rough topography and the hazard of soil erosion. Potential is good for orchards and vineyards. The association is suited for forestry, wildlife habitat, and recreation uses. Steep slopes limit use of the soils for large urban developments. Many scenic and secluded sites are available for homes. In a few spots there are concentrated deposits of rounded quartz pebbles and sand. Gravel from some of these deposits has been used to surface local roads.

### 2. Crider-Pembroke-Cumberland association

*Gently sloping to moderately steep, deep, well drained soils on karst uplands*

This association consists of gently sloping to moderately steep soils on karst uplands (fig. 2). Surface runoff mainly collects in small depressions and sinks, which dot the landscape, and drains into underground streams. Karst valleys and sinking creeks are common. Many of the depressions are ponded for brief periods in rainy seasons, and others are permanently ponded. In some parts of the area, surface water is removed by Nolin River and other small streams that dissect the association. The depressions are commonly about 40 feet below the highest elevations in the area, and with the stream channels are somewhat lower.

This association occupies about 16 percent of Larue County. About 33 percent of the association is Crider soils, 18 percent is Pembroke soils, and 17 percent is Cumberland soils. Minor soils make up the rest.

The Crider soils, on the smoothest part of the landscape, are deep, well drained, gently sloping to sloping, and loamy. The Pembroke soils, on undulating to rolling uplands, are deep, well drained, and gently sloping to sloping. They are loamy in the plow layer and upper part of the subsoil and are clayey below a depth of about 40 inches. The Cumberland soils, on side slopes and rims of depressions, are deep, well drained, and sloping to moderately steep. They have a loamy plow layer and a clayey subsoil.

Minor soils in the association are the Fredonia, Caneyville, Hagerstown, and Nicholson soils on uplands; the Elk, Otwell, and Ashton soils on stream terraces and in depressions; and the Huntington, Nolin, Lindside, Newark, Melvin, and Dunning soils in depressions and on flood plains.

The farms in this association are commonly operated by the owner, and some of these are farmed by tenants. Corn, tobacco, and small grain are important crops in the association. Clover and tall grasses are grown extensively for pasture and hay. Raising beef cattle and hogs is the main livestock enterprise on most farms. On a few farms, dairying is the chief enterprise. The only remaining woodland is in small woodlots which are commonly on the steeper slopes. There are many farm homes and small communities in the association. Hodgenville, the county seat of Larue County, is near the eastern boundary.

This association has potential for intensive use for farming and urban developments. The hazard of erosion is the main limitation to use of the soils for row crops. The limitations are generally slight to moderate for most urban developments.

The cavernous limestone in this association is a source of crushed rock and lime for farm use.

### 3. Caneyville-Hagerstown association

*Moderately deep and deep, well drained, moderately steep to gently sloping soils and Rock outcrop on karst uplands*

This association consists of moderately steep to gently sloping soils and Rock outcrop on hilly karst uplands. Surface water mainly collects in sinks and depressions which dot the landscape, and drains into underground streams. Karst valleys and sinking creeks are common. Nolin and Rough Rivers also dissect the association.

This association occupies about 3 percent of Larue County. About 35 percent of the association is Caneyville soils and Rock outcrop, and 31 percent is Hagerstown soils. Minor soils make up the rest. The Caneyville soils occur on the landscape in a complex pattern with rock outcrops that make up about 18 percent of the surface area.

The Caneyville soils, on hillsides, are well drained and sloping to moderately steep. They have a loamy plow layer and a clayey subsoil that is underlain by limestone at a depth of about 34 inches. The Hagerstown soils, on ridges and side slopes, are deep, well drained, and gently sloping to moderately steep. They have a loamy plow layer and a clayey subsoil.

Minor soils in the association are the Pembroke, Sonora, Riney, Fredonia, Vertrees, Crider, and Nicholson soils on uplands; Ashton, Elk, and Otwell soils on stream terraces; and Nolin, Lindside, Newark, and Melvin soils on flood plains and in depressions.

This association is not used extensively for farming. Small acreages of corn, tobacco, and small grains are scattered throughout the area. Pastureland and idle land are common in some parts. Much of the area is in trees. Some areas that have been cleared are being revegetated naturally. Oak, hickory, redcedar, maple, and yellow-poplar are the dominant trees.

The use of the soils in this association for farming and for most urban development is limited because of the rough topography, extent of rock outcrops, and moderate depth to bedrock. The hazard of erosion also limits the use of the soils for row crops. The association has good potential for forestry, orchards, and vineyards, and recreation use. Some scenic sites for homes are scattered throughout the association.

### 4. Sonora-Gatton-Riney association

*Deep, gently sloping and sloping, well drained and moderately well drained soils on narrow to moderately broad ridges and side slopes; and deep, well drained soils on narrow ridges and hillsides*

This association consists of undulating to rolling and hilly soils on uplands that are dissected by many small streams (fig. 4). The streams are commonly about 60 feet below the ridgetops. Many small streams are nearer the ridgetops, but the major streams are up to 100 feet below the ridges. Two separate areas make up the association.

The association occupies about 18 percent of Larue County. About 49 percent of the association is Sonora soils, 13 percent is Gatton soils, and 11 percent is Riney soils. Minor soils make up the rest.

The Sonora soils, on ridgetops and upper side slopes, are gently sloping and sloping, deep, loamy, and well drained. The Gatton soils are on ridgetops and on undulating positions below Sonora soils. They are gently sloping, moderately well drained, loamy soils that have a firm, compact, brittle layer or fragipan at a depth of about 22 inches. The Riney soils, on narrow ridges and hillsides, are sloping to steep, deep, well drained, and loamy.

Minor soils in the association are the Waynesboro soils on uplands; Lawrence and Otwell soils on stream terraces; and Nolin, Lindside, Newark, and Melvin soils on flood plains.

The soils in this association are used mainly for farming. Small woodlots are common, and there are a few fairly large tracts of woodland in the association. Idle fields and gullied and severely eroded spots are also common in most parts. Most of the farms are owner operated, but some of the owners are part time farmers. Corn, tobacco, small grain, hay, and pasture are the chief crops. Raising beef cattle and hogs is the main livestock enterprise.

The soils are suited to many kinds of uses. They have potential for intensive use for crop production. Wetness and limited depth for root growth in the Gatton soils and the hazard of soil erosion are the main limitations for crops. Steepness of the slopes and slow permeability in the fragipan of the Gatton soils are the main limitations to use of the soils for urban and recreation developments. The association has good potential for residential and industrial developments.

### 5. Crider-Vertrees-Nicholson association

*Nearly level to sloping, deep, well drained and moderately well drained soils on broad ridges and side slopes; and deep, well drained, sloping to steep soils on narrow ridges and hillsides*

This association consists of nearly level to rolling, hilly, and steep soils on broad uplands that are dissected in most parts by many small streams (fig. 5). The larger streams are as much as 160 feet below the ridgetops. Some parts of the association are karst topography, and drainageways lead through sinks and depressions into underground streams. Karst valleys are common. Some of the depressions are ponded.

The association occupies about 35 percent of Larue County. About 40 percent of the association is Crider soils, 35 percent is Vertrees soils, and 15 percent is Nicholson soils. Minor soils make up the rest. Four separate areas make up the association.

The Crider soils, on ridges and side slopes, are gently sloping to sloping, deep, and well drained. They have a loamy plow layer; the subsoil is loamy in the upper part and clayey in the lower part. The Vertrees soils, on narrow ridges and hillsides, are sloping to steep, deep, and well drained. They have a loamy plow layer and a clayey subsoil. The Nicholson soils, on broad ridgetops, are well drained, nearly level to gently sloping, and loamy and have a firm, compact layer or fragipan at a depth of about 23 inches.

Minor soils in the association are the Waynesboro soils on uplands; Lawrence, Otwell, Elk, and Ashton soils on stream terraces; and Nolin, Lindside, Newark, Melvin, and Dunning soils on flood plains and in depressions.

This association is used extensively for farming. Small woodlots and some large tracts of woodland are scattered throughout the area. Idle fields that are reverting to hardwood trees are common in some parts. The farms are commonly owner operated, and many of the owners are part-time farmers. Corn, tobacco, and small grains are the main crops. Legumes and tall grasses are grown extensively for hay and pasture. Raising beef cattle and hogs and dairying are important livestock enterprises.

This association is suited to many kinds of uses. It has good potential for intensive use for crops, including vegetables, orchards, and vineyards. Wetness and limited depth of root penetration in the Nicholson soils and the hazard of soil erosion are the main soil limitations to use of the soils for crops. Steepness of slopes and wetness are the main limitations for urban developments. Care must be taken in selecting sites for sewage disposal systems.

The limestone in this association is a source of crushed rock and lime for farm use.

### 6. Garmon-Caneyville-Lenberg association

*Very steep, steep, and moderately steep, moderately deep, well drained soils on hillsides, narrow ridges, and foot slopes*

This association consists of very steep to moderately steep soils on narrow ridges and valley walls (fig. 6). The narrow valley floors are commonly 400 feet or more below the ridgetops. The association is made up in part by the Muldraugh Escarpment.

The association occupies about 19 percent of Larue County. About 36 percent of the association is Garmon soils, 15 percent is Caneyville soils, and 7 percent is Lenberg soils. Minor soils make up the rest. The Caneyville soils occur on the landscape in a complex pattern with Rock outcrop, which makes up about 18 percent of the surface area. The Lenberg soils occur in a complex with the Frondorf soils, which make up about 30 percent of the surface area.

The Garmon soils are on the hillsides. They are very steep, well drained, loamy soils that are underlain by limestone and shale at a depth of about 20 to 40 inches. The Caneyville soils, which are on the narrow ridges and upper side slopes, are moderately steep to steep and well drained. They have loamy surface and subsurface layers and a clayey subsoil that is underlain by limestone bedrock at a depth 20 to 40 inches. The Lenberg soils, which are on the foot slopes and low ridges, are moderately steep and well drained. They have loamy surface and subsurface layers and a clayey subsoil which is underlain by soft acid shale at a depth of about 20 to 40 inches.

The minor soils in the association are the Hagerstown, Vertrees, Crider, and Nicholson soils on ridges; Wellston soils on foot slopes and low ridges; and Sensabaugh and Nolin soils adjacent to stream channels.

Much of this association is in hardwood trees. Corn, tobacco, hay, and pasture are grown in relatively small acreages on some of the minor soils in the area.

The potential of the soils in this association for most uses is limited because of steep slopes and moderate depth to bedrock. The association has good potential for forestry, wildlife, and some recreation uses. Some of the minor soils are suited to farming if adequate measures are taken to control erosion. Potential is good for orchards and vineyards. Some scenic and secluded sites are available for homes. The foot slopes are subject to slides.

### 7. Lawrence-Nolin-Otwell association

*Nearly level and gently sloping, deep, somewhat poorly drained to well drained, alluvial soils on stream terraces and flood plains*

This association consists of nearly level to undulating soils on moderately broad to narrow stream terraces and flood plains along Rolling Fork River (fig. 7).

This association occupies about 6 percent of Larue County. About 28 percent of the association is Lawrence soils, 20 percent is Nolin soils, and 16 percent is Otwell soils. Minor soils make up the rest.

The Lawrence soils, on stream terraces, are nearly level, somewhat poorly drained, and loamy and have a firm, compact, slowly permeable layer or fragipan at a depth of about 17 inches. The Nolin soils, on flood plains near the river channels, are nearly level, deep, well drained, and loamy. Otwell soils, on stream terraces, are nearly level to gently sloping, moderately well drained, and loamy soils and have a slowly permeable, firm, compact layer or fragipan at a depth of about 26 inches.

Minor soils in this association are the Newark, Lindside, and Melvin soils on flood plains; and the Elk, Robertsville, and Ashton soils on stream terraces.

Most of the soils in this association are used for farming. There are a few small woodlots, and narrow strips of trees line the streambanks. The farms are commonly operated by the owner. Corn is the chief crop. Tobacco is grown in small plots, and soybeans are an important crop on some farms. Legumes and tall grasses are grown for pasture and hay. Raising beef cattle and hogs is the main livestock enterprise. Most farm homes and a few small communities are on soils near the foot slopes of the adjacent association.

The soils in this association have potential for intensive use for crops. The river is a potential source of water for irrigation. The main limitations to use of the soils for crops are flooding and wetness. The limited depth of root penetration in the Lawrence and Otwell soils makes them poorly suited to some of the deep rooted crops.

The hazard of flooding, seasonal high water table, and wetness make the soils in this association poorly suited to most urban developments. They are suited to some recreation developments.

# Soil maps for detailed planning

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

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

The mapping units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have similar profiles make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Sonora series, for example, was named for the town of Sonora in Hardin County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Sonora silt loam, 2 to 6 percent slopes, is one of several phases within the Sonora series.

Some mapping units are made up of two or more dominant kinds of soil. Such mapping units are called soil complexes.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Frondorf-Lenberg silt loams, 6 to 12 percent slopes, is an example.

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

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

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

## Soil descriptions

**AlD—Allegheny-Lenberg-Caneyville complex, 12 to 20 percent slopes.** This complex consists of moderately steep, well drained soils on hillsides, benches, and foot slopes. Slopes are complex. In some areas, drainageways are dismembered and lead into depressions in karst valleys. Areas of these soils are in strips 150 to 400 feet wide and 5 to 140 acres in size. These Allegheny, Lenberg, and Caneyville soils occur together in such an intricate pattern that they were not separated in mapping. The complex is about 40 percent Allegheny loam, 20 percent Lenberg silt loam, 20 percent Caneyville silt loam, and 20 percent other soils.

In a representative profile of the Allegheny soil in this complex, the plow layer is brown loam 6 inches thick. The subsoil, 27 inches thick, is strong brown clay loam to a depth of 24 inches, and from 24 to 33 inches it is strong brown sandy clay loam. The substratum, 17 inches thick, is strong brown sandy loam. Sandstone bedrock is below a depth of 48 inches. In a representative profile of the Lenberg soil, the plow layer is brown silt loam about 6 inches thick. The subsoil, about 20 inches thick, consists of a thin layer of yellowish brown silt loam underlain by yellowish red and brown very firm plastic clay that has gray mottles and has shale fragments in the lower 4 inches. The substratum, about 8 inches thick, is very firm shaly clay mottled in shades of brown and gray. Gray soft acid shale bedrock is below a depth of about 34 inches. In a representative profile of the Caneyville soil, the plow layer is brown silt loam about 6 inches thick. The subsoil, about 25 inches thick, is very firm plastic clay. The upper part is yellowish red, and the lower part is strong brown mottled with red and gray. Hard limestone bedrock is at a depth of about 31 inches.

Included with this complex in mapping and making up about 15 percent of the mapping unit are some soils that are similar to these soils except that they differ in some parts of the profile. One such soil is like the Lenberg soil except that the surface layer is loam and the upper part of the subsoil is sandy clay loam about 10 inches thick, and these horizons have as much as 20 percent sandstone and shale fragments that are about 6 inches long. Another included soil is like the Caneyville soil except that it has a sandy loam surface layer and is sandy clay loam in the upper 10 inches of the subsoil. Also included are some soils similar to the Allegheny soil except that they have as much as 20 percent sandstone and shale fragments throughout the solum, the layers below a depth of 30 inches range from sandy clay loam to sandy loam, and they are commonly underlain by sandstone bedrock. In addition, limestone outcrops cover about 15 percent of the surface in areas of the Caneyville soil, and some severely eroded spots of Lenberg and Caneyville soils are on the upper and middle parts of the slope.

The Lenberg and Caneyville soils are moderate in available water capacity, and they have a moderately deep root zone. Root growth is restricted by the clayey subsoil. The Allegheny soil is high in available water capacity and has a deep root zone. Permeability is moderately slow in Lenberg and Caneyville soils and moderate in Allegheny soils. The content of organic matter in the plow layer of the Caneyville soil is moderate, and in Lenberg and Allegheny soils it is low. Tilth is fair, except in a few severely eroded spots where it is poor. Reaction in the Allegheny and Lenberg soils is strongly acid or very strongly acid in unlimed areas. Reaction in the Caneyville soil ranges from very strongly acid to slightly acid. The clayey subsoil of the Lenberg and Caneyville soils has a moderate shrink-swell potential. Depth to bedrock ranges from 20 to 40 inches in the Lenberg and Caneyville soils and is more than 4 feet in Allegheny soils. Surface runoff is rapid on these soils.

This soil complex is in pasture, brush, and trees. These soils have poor potential for cultivated crops and for many urban uses. They have potential for pasture and trees and for development of habitat for openland or woodland wildlife. The hazard of erosion is very severe if the plant cover is removed.

These soils are not suited for cultivated crops because of the moderately steep slopes and the risk of very severe damage by erosion. Hay crops that leave the soil unprotected after harvest are poorly suited. A permanent vegetative cover is needed to reduce runoff and control erosion.

These soils are suited to pasture. If they are used for pasture, management practices are needed that will slow surface runoff and control erosion. Plants that require the least amount of renovation should be selected for seeding. All equipment operations should be on the contour. Lime and fertilizer need to be applied in sufficient quantities to provide for rapid growth of seedlings and quick establishment of cover. Grazing should be delayed until cover is well established, and overgrazing should be avoided.

Trees are suited to these soils, and some of the acreage is in woods. The hazard of erosion, equipment limitations, and weed competition are the main management concerns. For control of erosion, all logging roads, skid trails, and machine plantings should be on the contour. The use of equipment is restricted by the moderately steep slopes and the clayey spots that are slippery when wet. Shrubbing in cutover areas and weeding in open fields can reduce competition.

The soils in this complex are limited for most urban uses, mainly because of the steepness of the slopes. Shallow excavations are difficult to make because of the underlying shale or sandstone bedrock at a depth of about 20 to 50 inches. Depth of excavation is limited in the Caneyville soil because the underlying limestone bedrock is at a depth of 20 to 40 inches. The moderately slow permeability in the Lenberg and Caneyville soils is a limitation to their use for waste disposal systems. The Lenberg and Allegheny soils are subject to slides. The soils in this complex can be severely damaged by erosion unless they are protected by vegetative cover. If the soils are used as construction sites, development should be on the contour. Removal of vegetative cover should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass VIe; Allegheny part in woodland ordination 2r, and Lenberg and Caneyville parts in woodland ordination 3c.

**As—Ashton silt loam** (0 to 2 percent slopes). This nearly level, well drained soil is in low positions on stream terraces. The areas are oval or in blocks and range from about 3 to 100 acres in size. Most areas of this soil are subject to occasional flooding from November to May.

In a representative profile, the plow layer is dark brown silt loam 10 inches thick. The subsoil, 38 inches thick, is brown to dark yellowish brown silt loam with a few pale brown mottles and concretionary stains in the lower part. The substratum, more than 18 inches thick, is mottled yellowish brown and gray silt loam.

Included with this soil in mapping are Elk and Nolin soils in areas that are less than one acre in size.

Permeability of this soil is moderate, and the soil has a high available water capacity. The root zone is deep. The loamy plow layer has a moderate content of organic matter and has good tilth. Surface runoff is medium, and the seasonal high water table is below a depth of about 4 feet. The shrink-swell potential is low. The soil also has low strength.

This soil is suited to farming and to trees. Most of the acreage is in cultivated crops, hay, and pasture. This soil is limited for urban uses because of flooding.

This soil is suited to most of the crops commonly grown in the area. Winter crops are poorly suited because of flooding during winter and spring. The loamy plow layer has a moderate content of organic matter and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is slight. If this soil is cultivated, management practices are needed that will maintain the supply of organic matter and good tilth. Some practices that are effective are returning crop residue to the soil, planting winter cover crops, using minimum tillage, and including grasses and legumes in the cropping system. Fertilizer should be applied according to crop needs. Some areas need lime but most do not. Ditches are needed in some areas to control runoff and overwash from adjacent soils.

Pasture grasses and legumes that can tolerate flooding for short periods are best suited to this soil. Seedbeds are usually easy to prepare because tilth is good in the loamy plow layer. The chief management needs are proper stocking rates to maintain desired plant species, rotation of pasture, deferred grazing, and restricted grazing when the soil is wet. Severe damage to the plant cover can result if the pasture is grazed before the plants are well established or when the soil is too wet. Sparse cover of pasture plants results in increased weed competition and the need for early renovation. Fertilizer is required for sustained high yields of pasture plants.

This soil is well suited to trees, but most of the acreage is farmed. Plant competition is severe because of the high available moisture supply during the growing season. Seedlings planted in open fields need to be cultivated to control weeds until they are established.

This soil is limited for most urban uses because it is subject to flooding. If this soil is protected from flooding, the seasonal high water table, which is at a depth of about 4 feet, limits its use as a site for dwellings with basements or as a site for area type landfill. The low strength of this soil can result in damage to building foundations and pavements. Capability class I; woodland ordination lo.

**CnD—Caneyville-Rock outcrop complex, 6 to 20 percent slopes.** This complex consists of sloping to moderately steep, moderately deep, well drained soils and limestone outcrops on side slopes and narrow ridgetops and in karst areas. Rock outcrop is spaced one to 200 feet apart and covers 10 to 25 percent of the surface. Slopes are convex in karst areas and on ridges and side slopes. Areas are 5 to 275 acres in size. In the karst areas, drainageways are dismembered and lead through depressions into underground streams. About one-third of the Caneyville soil in this complex is severely eroded and has shallow gullies. In the severely eroded areas the plow layer is mostly clayey subsoil material. This complex is about 65 percent Caneyville soil, 20 percent Rock outcrop, and 15 percent other soils.

In a representative profile of the Caneyville soil, the surface layer is about 5 inches thick. The upper 2 inches is dark grayish brown silt loam, and the lower 3 inches is yellowish brown silt loam. The subsoil, about 29 inches thick, is yellowish red clay in the upper 17 inches and strong brown clay mottled in shades of brown and red in the lower 12 inches. Light gray, hard limestone is at a depth of 34 inches.

Included in mapping are some soils that have a thin, very dark grayish brown, mildly alkaline silt loam surface layer; a grayish brown to brown, mildly alkaline silty clay subsoil; and calcareous shale below a depth of 6 to 15 inches. Also included are some soils similar to the Caneyville soil except that they are underlain by calcareous shale; some soils that have a brown to dark grayish brown surface layer, a reddish clayey subsoil, and limestone bedrock at a depth of 10 to 20 inches; and some soils that have a clayey surface layer and bedrock at a depth of less than 10 inches.

Permeability of the Caneyville soil in this complex is moderately slow. The available water capacity is moderate, and the root zone is moderately deep. Reaction in unlimed areas ranges from medium acid to very strongly acid in the upper part of the profile and from medium acid to slightly acid in horizons immediately above bedrock. Surface runoff is rapid. The plow layer has a moderate to low content of organic matter. Depth to hard limestone bedrock is 20 to 40 inches. The subsoil has a moderate shrink-swell potential.

This complex is in trees, brush, and rough pasture. It is poorly suited to cultivated crops and nearly all urban uses. It has potential for pasture, trees, and openland or woodland wildlife.

The soils in this complex are not suited to cultivated crops because of the many rock outcrops and the risk of very severe damage to the soils by erosion unless they are protected by permanent vegetative cover.

This complex is suited to pasture, but seedbed preparation and weed control are difficult because of the extent of Rock outcrop. There is a high risk of severe damage by erosion unless the soils are kept in thick stands of vegetation. Mixtures of suited grasses and legumes that require the least amount of renovation should be selected for seeding. Fertilizer and lime should be applied in sufficient amounts to provide for rapid growth of seedlings and quick establishment of cover. Grazing should be delayed until cover is well established. Overgrazing should be avoided.

Trees are suited to the soils in this complex, and some of the acreage is in woods. Hazard of erosion is the main concern of management. For control of erosion, all logging roads and skid trails should be on the contour wherever possible. Machine planting is difficult because of the many rock outcrops.

The soils in this complex are poorly suited for nearly all urban uses because of the rock outcrops, depth to bedrock, moderately slow permeability, moderately steep slopes, and moderate shrink-swell potential. The soils are subject to severe damage by erosion unless protected by permanent vegetative cover. If the soils are used as construction sites, development should be on the contour. Removal of vegetative cover should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass VIs; Caneyville part in woodland ordination 3c, Rock outcrop part not placed in a woodland ordination.

**CnE—Caneyville-Rock outcrop complex, 20 to 30 percent slopes.** This complex consists of steep, moderately deep, well drained soils and Rock outcrop on hillsides and in karst areas. Limestone outcrops cover from 10 to 25 percent of the surface area and average about 20 percent. Outcrops range from a few feet to about 200 feet apart. Areas of the complex range from 5 to 575 acres in size. Slopes are convex. In the karst areas, drainageways are dismembered and lead through openings in depressions into underground streams. Some areas have severely eroded spots and shallow gullies. This complex is about 65 percent Caneyville silt loam, 20 percent Rock outcrop, and 15 percent other soils.

In a representative profile of the Caneyville soil, the surface layer is about 5 inches thick. The upper 2 inches is dark grayish brown silt loam and the lower 3 inches is yellowish brown silt loam. The subsoil, about 29 inches thick, is yellowish red clay to a depth of 22 inches, and strong brown clay mottled in shades of brown and red to a depth of 34 inches. Light gray hard limestone is at a depth of 34 inches.

Included in mapping are some soils that have a thin, very dark grayish brown, mildly alkaline silt loam surface layer, a grayish brown to brown, mildly alkaline silty clay subsoil, and calcareous shale below a depth of 6 to 15 inches; some soils that are similar to the Caneyville soil except that they are underlain by calcareous shale; some soils that have a brown to dark grayish brown surface layer, a reddish clayey subsoil, and limestone bedrock at a depth of 10 to 20 inches; and some soils that have a clayey surface layer and bedrock at a depth of less than 10 inches.

Permeability of the Caneyville soil in this complex is moderately slow. The available water capacity is moderate and the root zone is moderately deep above limestone bedrock. Reaction ranges from medium acid to very strongly acid in unlimed areas. Runoff is rapid. The plow layer has a moderate to low content of organic matter and fair tilth. The clayey subsoil has a moderate shrink-swell potential and low strength. Depth to hard limestone bedrock is 20 to 40 inches.

This complex is in trees, brush, and rough pasture. It is not suited for cultivated crops or pasture, and it is poorly suited to nearly all urban uses. It has potential for trees and for openland or woodland wildlife habitat.

Cultivated crops are not suited to this complex because of Rock outcrop, steep slopes, and the risk of very severe damage by erosion if the plant cover is removed.

Pasture is not suited to this complex because of Rock outcrop, steep slopes, and the difficulty of operating equipment to prepare seedbeds and control weeds.

Trees are suited to this complex, and most of the acreage is in trees and brush. Control of erosion and equipment limitations are the main concerns of management. To help control erosion, all logging roads and skid trails should be on the contour. The use of equipment is limited mainly because of slope and the presence of limestone rock outcrops. Machine planting is impractical.

This complex is poorly suited to all urban uses mainly because of slope, depth to bedrock, and Rock outcrop. It is subject to very severe damage by erosion if the plant cover is removed. Capability subclass VIIs; Caneyville part in woodland ordination 3c, Rock outcrop part not placed in a woodland ordination.

**CrB—Crider silt loam, 2 to 6 percent slopes.** This gently sloping, deep, well drained soil is in bands, blocks, and oval areas on ridgetops and in karst areas. The slopes are convex, and in karst areas steepness varies within short distances. Areas are 5 to 460 acres in size. In karst areas, drainageways are dismembered and lead through openings in depressions into underground streams. Some of the depressions are ponded for very brief periods; others are ponded for years before they suddenly drain.

In a representative profile the plow layer is brown silt loam about 8 inches thick. The subsoil, more than 50 inches thick, is brown silt loam to a depth of about 26 inches. From 26 inches to 48 inches it is reddish brown silty clay loam, and below that it is red, very firm, plastic silty clay.

Included with this soil in mapping are some small intermingled areas of soils similar to Crider soils except that limestone bedrock is at a depth of 3 1/2 to 5 feet, and in the northern part of Hardin County some soils similar to Crider soils except that the texture of the lower part of the subsoil is silt loam. Also included are some soils similar to Crider soils except that they have a cherty layer 5 to 15 inches thick at a depth of about 26 inches. Some small areas of Huntington and Newark soils are in depressions.

Permeability of this soil is moderate and the available water capacity is high. The root zone is deep. The plow layer has a moderate organic-matter content and good tilth. Reaction ranges from strongly acid to medium acid in unlimed areas. Runoff is medium. The shrink-swell potential is low to a depth of about 48 inches and moderate below that.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture (fig. 8). This soil is limited for some urban uses because of low strength and the tendency of the lower part of the subsoil to shrink and swell.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is moderate, but the control of erosion is a major concern of management where the soil is cultivated. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, the use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are well suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition to young seedlings planted in open fields.

This soil is limited for most urban uses, mainly because of low strength and moderate shrink-swell potential in the lower part of the subsoil. If the soil is used as a construction site, care should be taken to keep all drainage outlets cleared of sediment and debris to prevent ponding. To control erosion and reduce the amount of sediment produced, development of the site should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Stockpiling of topsoil and using it to form the surface layer at developed sites can help establish and maintain lawns and shrubs. Capability subclass IIe; woodland ordination 1o.

**CrC—Crider silt loam, 6 to 12 percent slopes.** This sloping, deep, well drained soil is in bands on the upper parts of hillsides and the head of ravines and in blocks in karst areas. Slopes are convex, and in the karst areas steepness varies within short distances. In the karst areas, drainageways are dismembered and lead through openings in depressions into underground streams. Some of the depressions are ponded for very brief periods, and some are permanently ponded. Areas are about 5 to 440 acres in size.

In a representative profile the plow layer is brown silt loam about 8 inches thick. The subsoil, more than 50 inches thick, is brown silt loam to a depth of about 26 inches. From 26 inches to 38 inches it is reddish brown silty clay loam, and below that it is red, very firm, plastic silty clay.

Included with this soil in mapping are some small intermingled areas of soils similar to Crider soils except that limestone bedrock is at a depth of 3 1/2 to 5 feet. Also included are some soils similar to Crider soils except that they have a cherty layer 5 to 15 inches thick at a depth of about 26 inches. Soils in a few included areas in the northern part of Hardin County are like Crider soils except that the texture of the lower part of the subsoil is silt loam. Some Huntington and Newark soils occur in small depressions.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The loamy plow layer has a moderate organic-matter content and good tilth. Reaction ranges from strongly acid to medium acid in unlimed areas. Runoff is medium. The shrink-swell potential is low to a depth of about 38 inches and moderate below that. This soil has low strength.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture (fig. 9). Urban uses are limited because of the slope, low strength, and the tendency of the lower part of the subsoil to shrink and swell.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without clodding or crusting. The hazard of erosion is severe if the soil is cultivated, and this is a major concern of management. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, using cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

This soil is suited to all of the pasture grasses and legumes commonly grown in the area. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or by grazing when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce plant competition until seedlings are established.

This soil is limited for most urban uses, mainly because of slope, low strength, and the tendency of the lower part of the subsoil to shrink and swell. It erodes easily if the plant cover is removed. If the soil is used as a construction site, development should be on the contour, removal of vegetation should be held to a minimum, and vegetation should be established quickly in denuded areas. Drainage outlets in depressions should be kept open to prevent ponding. In some places it is practical to construct dikes and sediment basins that help hold sediment in the construction area and prevent damage below the site. Stockpiling the topsoil and using it to form the surface layer of developed sites can help establish and maintain vegetative cover. Capability subclass IIIe; woodland ordination 1o.

**CrD—Crider silt loam, 12 to 20 percent slopes.** This moderately steep, well drained soil is in bands on the upper parts of hillsides and the head of ravines and in blocks in karst areas. Slopes are convex, and in the karst areas steepness varies within short distances. In the karst areas, drainageways are dismembered and lead through depressions into underground streams. Some of the depressions are ponded for very brief periods, and some are ponded for years before they suddenly drain. Areas of this soil are about 5 to 175 acres in size.

In a representative profile, the plow layer is brown silt loam about 8 inches thick. The subsoil, more than 50 inches thick, is brown silt loam to a depth of about 26 inches. From 26 inches to 38 inches it is reddish brown silty clay loam, and below that it is red, very firm, plastic silty clay.

Included with this soil in mapping are some small intermingled areas of soils similar to Crider soils except that limestone bedrock is at a depth of 3 1/2 to 5 feet. Soils in a few included areas are like the Crider soils except that the texture of the lower part of the subsoil is silt loam. Some Huntington and Newark soils occur in a few small depressions.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The loamy plow layer has moderate organic-matter content and good tilth. Reaction ranges from strongly acid to medium acid in unlimed areas. Runoff is rapid. The shrink-swell potential is low to a depth of about 38 inches and moderate below that.

This soil is suited for farming, but most of it is in brush or woods. It is better suited to hay and pasture than to cultivated crops. Woodland and openland wildlife habitat are also suited. This soil is limited for most urban uses mainly because of slope.

This soil is poorly suited to cultivated crops because of slope and the risk of very severe damage by erosion. It can be used occasionally for cultivated crops. If this soil is cultivated, practices are needed that will help control erosion and maintain tilth and the supply of organic matter. Some practices that help to control erosion are minimum tillage, contour tillage, stripcropping, and the use of cover crops and grasses and legumes in the cropping system. Keeping crop residue on or near the surface helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Lime and fertilizer should be applied according to crop needs. Drainageways need a permanent vegetative cover to reduce erosion.

This soil is suited to all of the pasture grasses and legumes commonly grown in the area. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants leaves the soil unprotected, increases the hazard of soil erosion and weed competition, and may make it necessary to renovate pasture to maintain production.

Trees are suited to this soil, and most of the acreage is in woods or brush. Plant competition, hazard of erosion, and equipment limitations are the main problems in management. Shrubbing in cutover areas and cultivation in open fields can be used to control competition of undesirable plants until seedlings are established. The use of equipment is restricted mainly by slope. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour.

This soil is limited for most urban uses mainly because of slope. It also has low strength, and the lower part of the subsoil has a tendency to shrink and swell. This soil can be severely damaged by erosion unless it is protected by vegetative cover. If the soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Care should be taken to keep drainage outlets in depressions open. If outlets become clogged with sediment and debris, ponding can become a problem. In some places it is practical to construct dikes and sediment basins to help hold sediment in the construction area and reduce the amount of damage below the site. Capability subclass IVe; woodland ordination 1r.

**CsC—Cumberland silt loam, 6 to 12 percent slopes.** This deep, well drained, sloping soil is on karst uplands. Slopes are convex, and steepness varies within short distances. Areas are 5 to 175 acres in size. Drainageways are dismembered and lead through openings in depressions into underground streams. Some of these sinking creeks drain several hundred acres of land. In rainy seasons many of the depressions are ponded, and some are permanently ponded.

In a representative profile, the plow layer is dark reddish brown silt loam about 5 inches thick. The subsoil, more than 60 inches thick, is dark reddish brown silty clay loam to a depth of about 11 inches, and below that it is dark red, plastic clay. Chert fragments are scattered through the profile and make up about 10 percent of the volume of the upper part of the subsoil.

Included with this soil in mapping are some soils similar to Cumberland soils except that they have as much as 20 percent fragments of chert in the profile. Small areas of the Huntington and Newark soils in depressions are also included.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep, and the plow layer has a moderate organic-matter content and good tilth. Reaction ranges from medium acid to strongly acid in unlimed areas. Runoff is medium. The clayey plastic subsoil has a moderate shrink-swell potential and low strength.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture. The use of this soil for urban development is limited because of slope, low strength, and the tendency of the subsoil to shrink and swell.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate organic-matter content and is easy to till except in a few spots where chert fragments interfere with tillage. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. In some areas, deep plowing has resulted in mixing of some of the clayey subsoil with the plow layer. In these areas the plow layer has a tendency to clod and crust if it is worked outside a suitable range in moisture content. Control of erosion is a major concern of management. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, cover crops and grasses and legumes in the cropping system, and applying lime and fertilizer according to crop needs. Keeping crop residue on or near the surface helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

This soil is suited to all of the pasture grasses and legumes commonly grown in the area. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil, and machine planting is practical. Cultivation or other suitable methods generally are required to reduce plant competition until young seedlings are established.

Slope, low strength, and the tendency of the clayey subsoil to shrink and swell limit the use of this soil for urban developments. Depressions are subject to ponding if the outlets are clogged with sediment or debris (fig. 10). If this soil is used as a construction site, care should be taken to keep drainage outlets open. To control erosion and reduce the amount of sediment produced, development of construction sites should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover needs to be established quickly in denuded areas. In some places it is practical to construct dikes or sediment basins to help hold sediment in the construction area and reduce the amount of damage below the site. The clayey subsoil is a poor source for topsoil. Capability subclass IIIe; woodland ordination 2c.

**CsD—Cumberland silt loam, 12 to 20 percent slopes.** This moderately steep, deep, well drained soil is in karst areas and in bands on hillsides. Slopes are convex, and in the karst areas steepness varies within short distances. Drainageways in karst areas are dismembered and lead through openings in depressions into underground streams. Most of the depressions are ponded for short periods in rainy seasons, and some are permanently ponded. Areas of this soil are about 5 to 60 acres in size.

In a representative profile, the plow layer is dark reddish brown silt loam about 5 inches thick. The subsoil, more than 60 inches thick, is dark reddish brown silty clay loam to a depth of about 11 inches, and below that it is dark red, plastic clay. Chert fragments are scattered through the profile and make up about 10 percent of the volume of the upper part of the subsoil.

Included with this soil in mapping are some soils similar to Cumberland soils except that they have as much as 20 percent fragments of chert in the profile. These cherty soils make up about 10 percent of the mapping unit. Also included are some areas of Huntington and Newark soils in depressions and some Fredonia soils around the rims of depressions.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep, and the plow layer has a moderate organic-matter content and good tilth. Reaction ranges from medium acid to strongly acid in unlimed areas. Runoff is rapid. The clayey, plastic subsoil has moderate shrink-swell potential and low strength.

This soil is suited to farming and to trees. Most of the acreage is in pasture and hay. Because of the high risk of damage by erosion if it is cultivated, this soil is better suited to pasture and hay than to cultivated crops. It is limited for most urban uses mainly because of slope and the tendency of the subsoil to shrink and swell.

Slope and the high risk of damage by erosion limit the use of this soil for cultivated crops. It is suited for occasional use for cultivated crops if management practices are used that will control erosion and maintain tilth and the supply of organic matter. Some practices that help to control erosion are minimum tillage, contour tillage, stripcropping, and the use of cover crops and grasses and legumes in the cropping system. Keeping crop residue on or near the surface also helps slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Lime and fertilizer should be applied according to crop needs. Drainageways need a permanent vegetative cover that will reduce erosion.

All of the pasture grasses and legumes commonly grown in the area are suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants leaves the soil unprotected, increases the hazard of soil erosion and weed competition, and may make it necessary to renovate pasture to maintain production.

Trees are suited to this soil, but most of the acreage is farmed. Plant competition, hazard of erosion, and equipment limitations are the main concerns of management. Shrubbing in cutover areas and cultivation in open fields can be used to control competition of undesirable plants until seedlings are established. The use of equipment is restricted mainly by the steepness of the slopes. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour.

This soil is limited for most urban uses because of slope. Low strength and the tendency of the subsoil to shrink and swell limit its use for some urban developments. Soil erosion is very difficult to control if the vegetation is removed. If this soil is used for construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Care should be taken to keep drainage outlets in depressions open. If outlets become sealed with sediment and debris, ponding can become a problem. In some places it is practical to construct dikes and sediment basins to help hold sediment in the construction area and reduce the amount of damage below the site. The clayey subsoil is a poor source for topsoil. Capability subclass IVe; woodland ordination 2c.

**CtC3—Cumberland silty clay loam, 6 to 12 percent slopes, severely eroded.** This sloping, deep, well drained soil is on karst uplands. Slopes are convex, and steepness varies within short distances. Drainageways are dismembered and lead through openings in depressions into underground streams. Some depressions are ponded for very brief periods; some are ponded for years before they suddenly drain. This soil is truncated by erosion and is gullied. Areas are 5 to 260 acres in size.

This soil has lost most of its original surface layer through erosion. In a representative profile the plow layer is dark reddish brown silty clay loam 6 inches thick. The subsoil, more than 60 inches thick, is dark red plastic clay. Fragments of chert are scattered through the profile and make up about 10 percent of the upper part.

Included in mapping are some areas of the Huntington and Newark soils in small depressions. Also included are some soils similar to Cumberland soils except that they have as much as 20 percent chert fragments through the profile. These included soils make up about 10 percent of the mapping unit.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep, but the plow layer has a low organic matter content and poor tilth. Reaction ranges from medium acid to strongly acid in unlimed areas. Runoff is rapid. The clayey plastic subsoil has a moderate shrink-swell potential and low strength.

This soil is suited for farming, and most of the acreage is in pasture and hay. It is better suited to pasture and hay or to trees than to cultivated crops. Potential is good for openland or woodland wildlife habitat. Use for most urban developments is limited mainly because of the slope, moderate shrink-swell potential, and low strength.

The effects of past erosion and the high risk of further damage limits the use of this soil for cultivated crops. It is suited for occasional cultivation, but yields of most crops are generally lower than those on uneroded Cumberland soils. The plow layer is low in organic matter content, and the silty clay loam texture makes it somewhat difficult to work. It tends to clod and crust unless it is worked within a fairly narrow range in moisture content. Shallow to moderately deep gullies hinder the use of equipment. Controlling erosion, increasing the supply of organic matter, and improving tilth are major concerns of management if the soil is cultivated. Some practices that help to control erosion and increase crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps slow surface runoff and control erosion. Incorporating crop residue into the plow layer helps increase the supply of organic matter and improve tilth. Drainageways need a permanent vegetative cover to reduce erosion.

All of the pasture grasses and legumes commonly grown in the area are suited to this soil. Obtaining and maintaining stands of pasture plants that provide adequate forage and control erosion are the main concerns of management. Important management practices are adequate seedbed preparation, applying lime and fertilizer according to crop needs, stocking rates sufficient to maintain desired plant species, deferred grazing, rotation grazing, and restricted grazing when the soil is wet. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil, but most of the acreage is farmed. Equipment limitations and rate of seedling mortality are the main concerns of management. The use of equipment is limited because the surface layer of the soil is slick when wet. Machine planting is practical. Strong healthy plants that are properly set are most likely to survive.

This soil is limited for most urban uses because of slope, low strength, and tendency of the subsoil to shrink and swell. Soil erosion is very difficult to control if the vegetation is removed. If this soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Care should be taken to keep drainage outlets in depressions open. If outlets become clogged with sediment and debris, ponding can become a problem. In some places it is practical to construct dikes and sediment basins to help hold sediment in the construction area and reduce the amount of damage below the site. The clayey subsoil is a poor source of topsoil. Capability subclass IVe; woodland ordination 3c.

**CtD3—Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded.** This moderately steep, deep, well drained soil is on karst uplands and in bands on hillsides. Slopes are commonly convex, and steepness commonly varies within short distances. Drainageways are dismembered and lead through openings in depressions into underground streams. Some of these sinking creeks drain several hundred acres of land. Some of the depressions are ponded very briefly, and some are ponded for years before they suddenly drain. Areas of this soil are 5 to 175 acres in size. The areas are truncated by erosion and most are gullied.

This soil has lost most of its original surface layer through erosion. In a representative profile, the plow layer is dark reddish brown silty clay loam about 6 inches thick. The subsoil, more than 60 inches thick, is dark red, plastic clay. Fragments of chert are scattered through the profile and make up about 10 percent of the upper part.

Included with this soil in mapping are some small areas of Huntington and Newark soils in depressions, and some intermingled areas of uneroded Cumberland soils. Also included are some soils similar to Cumberland soils except that they have as much as 20 percent chert fragments through the profile. These cherty soils make up about 10 percent of the acreage.

The available water capacity of this soil is high, and permeability is moderate. The root zone is deep, but the plow layer has a low organic-matter content and poor tilth. The reaction ranges from medium acid to strongly acid in unlimed areas. Runoff is rapid. The clayey plastic subsoil has a moderate shrink-swell potential and low strength.

This soil is in pasture, brush, and trees. It is poorly suited to cultivated crops and many urban uses. It is suited to pasture or trees and to use as habitat for woodland or openland wildlife. The hazard of erosion is very severe if the plant cover is removed.

This soil is not suited to cultivated crops because of the effects of past erosion and the high risk of further damage if it is cultivated. It is poorly suited to hay crops that leave the soil unprotected after harvest. A good permanent vegetative cover is needed to reduce runoff and control erosion.

All of the pasture grasses and legumes commonly grown in the area are suited to this soil. Control of erosion and establishment and maintenance of suitable grasses and legumes are the major concerns of management. Because of low content of organic matter in the plow layer and poor tilth, suitable stands of grasses and legumes generally are difficult to establish. Thick cover is needed to protect the soil from erosion. Severe damage to the plant cover can result from overgrazing or from grazing when the soil is too wet. Grazing animals can compact the soil when it is too wet, and this increases the rate of runoff and the hazard of soil erosion. Important management practices are adequate seedbed preparation, application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, rotation grazing, deferred grazing, and restricted grazing when the soil is wet.

Trees are suited to this soil, but most areas are in pasture or brush. Hazard of erosion, equipment limitations, and rate of seedling mortality are the main concerns of management. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour. Properly transplanted strong plants are most likely to survive. The use of equipment is restricted mainly by the moderately steep slopes and the tendency of the soil to become slick when wet. Machine planting is difficult because of the moderately steep slope, the uneven surface, and gullies.

This soil is limited for most urban uses because of slope, low strength, and tendency of the soil to shrink and swell. Soil erosion is very difficult to control if the plant cover is removed. If this soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Care should be taken to keep drainage outlets in depressions open. If outlets become clogged with sediment and debris, ponding can become a problem. In some places it is practical to construct dikes and sediment basins to help hold sediment in the construction area and reduce the amount of damage below the site. The clayey subsoil is a poor source for topsoil. Capability subclass VIe; woodland ordination 3c.

**Dn—Dunning silty clay loam** (0 to 2 percent slopes). This very poorly drained, nearly level soil is in depressions and karst valleys on the uplands and in low areas on flood plains. Areas are about 5 to 50 acres in size. In the karst areas, drainageways lead through openings in depressions into underground streams. This soil is subject to frequent flooding from November to May, and a few areas in depressions are ponded for short periods in rainy seasons.

In a representative profile the plow layer is very dark grayish brown silty clay loam about 7 inches thick. The subsoil, about 25 inches thick, is very dark grayish brown to dark gray silty clay. The substratum, more than 28 inches thick, is dark gray silty clay mottled in shades of brown.

Included in mapping are some soils similar to Dunning soils except that they have a brown silt loam plow layer and silty clay loam in the upper 10 inches of the subsoil.

This soil has slow permeability and a high available water capacity. The root zone is deep. Reaction ranges from slightly acid to mildly alkaline. Runoff is very slow.

The plow layer is high in content of organic matter and has fair tilth. Because of the high clay content it is somewhat difficult to work. The seasonal high water table is within 6 inches of the surface. This soil has moderate shrink-swell potential and low strength.

Most of the acreage of this soil is used for hay and pasture. This soil generally is not used for cultivated crops unless it is artificially drained. It is suited to trees and to use as habitat for wetland and woodland wildlife. The hazard of flooding, wetness, seasonal high water table, and slow permeability limit its use for urban developments.

Cultivated crops are poorly suited to this soil because of wetness and flooding. Farming operations are commonly delayed because of wetness. If tillage is delayed, weeds compete with crops. Crops sometimes fail because of the high water table. Plowing when the soil is too wet causes clods to form and makes seedbed preparation difficult.

Artificial drainage improves the suitability of this soil for crops. Tile drains, open ditches, and improved channels have been used to reduce soil wetness. Some areas do not have suitable outlets for artificial drains. In some areas ditches can be used to control runoff and overwash from adjacent soils. Care should be taken to maintain all drainage outlets in depressions. If outlets are sealed, ponding becomes a problem. If drained, this soil is suited to a fairly wide range of crops. Winter crops are poorly suited because of flooding and the high water table in winter and spring. Crops that can tolerate moderate to severe wetness are best suited.

This soil is easiest to work when the moisture content is most favorable. The high content of organic matter is fairly easy to maintain if crop residue is returned to the soil and if green manure cover crops are used in the cropping system. Lime is generally not required. Fertilizer is needed if the soil is cropped intensively.

Unless it is drained this soil is better suited to pasture than to intertilled crops. Pasture grasses and legumes that can tolerate wetness and flooding are best suited. Grazing should be restricted when the water table is near the surface, and overgrazing should be prevented. Grazing animals can compact the soil and cause excessive damage to the plants when the soil is saturated. Overgrazing results in thin cover of pasture plants and permits increased competition from weeds.

Trees are suited to this soil, but most of the acreage is cleared. The major management concerns for woodland are limited use of equipment and competiton from weeds with tree seedlings. Competing plants grow rapidly because of the abundance of available moisture during the growing season. Trees planted in open fields generally require cultivation or weeding by other suitable methods to control competition until the seedlings are established. The use of equipment is restricted mainly because of the seasonal high water table and extreme wetness of the soil.

This soil is limited for most urban uses mainly because of the hazard of flooding. Even if the soil is protected from flooding, the extreme wetness and seasonal high water table make it poorly suited for most uses. Shrink-swell potential, low strength, and the slow permeability also affect its use for some urban developments. Capability subclass IIIw; woodland ordination 1w.

**ElB—Elk silt loam, 2 to 6 percent slopes.** This gently sloping, deep, well drained soil is on stream terraces. The areas are oval or in bands 200 to 1,200 feet wide and 5 to 120 acres in size. Most areas of this soil are subject to occasional flooding from about November to May. Shallow drainageways occur in most areas.

In a representative profile, the plow layer is brown silt loam about 9 inches thick. The subsoil, about 31 inches thick, is dark yellowish brown silt loam to a depth of 13 inches. From 13 to 26 inches it is brown silt loam, and from 26 inches to 40 inches it is yellowish brown silty clay loam. The substratum, more than 20 inches thick, is yellowish brown silty clay loam mottled in shades of brown and gray.

The available water capacity of this soil is high, and permeability is moderate. The root zone is deep. The plow layer has a moderate organic matter content and good tilth. Reaction ranges from medium acid to strongly acid in unlimed areas. Runoff is medium. The shrink-swell potential is low.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture. Because most areas are subject to occasional flooding, this soil is poorly suited for nearly all urban development.

Nearly all of the cultivated crops commonly grown in the area are suited to this soil. Winter crops are poorly suited because of the hazard of flooding during the growing season. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is moderate, but the control of erosion is a major concern of management where the soil is cultivated. Some practices that help control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are well suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, restricted grazing during wet seasons, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce plant competition to young seedlings planted in open fields.

This soil is limited for nearly all urban uses because most areas are flooded occasionally. Areas that are protected from flooding are suited for most urban developments. Capability subclass IIe; woodland ordination 2o.

**ElC—Elk silt loam, 6 to 12 percent slopes.** This sloping, deep, well drained soil is on stream terraces. Areas are in bands 150 to 500 feet wide and 5 to 80 acres in size. Shallow to moderately deep drainageways cross most areas. Most areas of this soil are subject to occasional flooding from about November to May.

In a representative profile of this soil, the plow layer is brown silt loam 9 inches thick. The subsoil, about 31 inches thick, is yellowish brown heavy silt loam to a depth of 26 inches. From 26 inches to 40 inches it is yellowish brown silty clay loam. The substratum, more than 20 inches thick, is yellowish brown silty clay loam mottled in shades of brown.

Included in mapping are some steep soils on stream banks and some soils similar to Nolin silt loam except that they have a thinner solum and the substratum is stratified silt and sand.

The available water capacity of this soil is high, and permeability is moderate. The root zone is deep. The plow layer has a moderate organic-matter content and good tilth. Reaction ranges from medium acid to strongly acid in unlimed areas. Runoff is medium. The shrink-swell potential is low.

This soil is suited to farm crops and trees. Most of the acreage is in cultivated crops, hay, and pasture. Because most areas are flooded occasionally, this soil is poorly suited to nearly all urban uses.

Nearly all of the cultivated crops commonly grown in the area are suited to this soil. Winter crops are poorly suited because of the hazard of flooding during the growing season. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is severe if the soil is cultivated, and this is a major concern of management. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are well suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, restricted grazing during wet seasons, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods generally are required to reduce plant competition to young seedlings planted in open fields.

This soil is limited for nearly all urban uses because most areas are flooded occasionally. Areas that are protected from flooding are suited for most developments. Slope is a limitation to some uses. Capability subclass IIIe; woodland ordination 2o.

**FdC—Fredonia-Rock outcrop complex, 6 to 20 percent slopes.** This complex consists of sloping to moderately steep, moderately deep, well drained soils and Rock outcrop on karst uplands. Limestone outcrops spaced from 1 to 200 feet apart cover 10 to 25 percent of the surface area and average 20 percent. Slopes are complex. Drainageways are dismembered and lead through openings in depressions into underground streams. Most areas have severely eroded spots and shallow gullies. This complex is about 65 percent Fredonia silt loam, 20 percent Rock outcrop, and 15 percent other soils. Areas are from 10 to 400 acres in size.

In a representative profile of the Fredonia soil, the surface layer is dark brown silt loam about 10 inches thick. The subsoil, about 18 inches thick, is dark red to dark reddish brown clay. Hard limestone bedrock is below a depth of about 28 inches.

Included with this complex in mapping are some small areas of Cumberland soils, some soils that have a dark brown to brown silty clay loam surface layer that is 5 to 10 inches thick and is underlain by limestone bedrock, and some severely eroded Fredonia soils that have a a silty clay loam plow layer.

Permeability of the Fredonia soil in this complex is moderately slow. The available water capacity is moderate, and the root zone is moderately deep to limestone bedrock. Reaction ranges from medium acid to moderately alkaline. The plow layer has a moderate organic-matter content and good tilth. Operation of farm machinery is impractical because of the extent of Rock outcrop. Runoff is rapid. Depth to hard limestone bedrock is 20 to 40 inches. The clayey subsoil has a moderate shrink-swell potential.

This complex is in trees, brush, and rough pasture. It is poorly suited to cultivated crops and nearly all urban uses. It has potential for pasture and trees and for openland or woodland wildlife habitat.

Cultivated crops are not suited to this complex because of the extent of Rock outcrop and the risk of very severe damage by erosion unless the soil is protected by permanent vegetative cover.

This complex is suited to pasture, but seedbed preparation and weed control are difficult because of the extent of Rock outcrop. There is a high risk of severe damage by erosion unless the soils are kept in thick stands of vegetative cover. Suited plants that require the least amount of renovation should be selected for seeding. Fertilizer and lime need to be applied in sufficient amounts to provide for rapid growth of seedlings and quick establishment of cover. Grazing should be delayed until cover is well established. Overgrazing should be avoided.

Trees are suited to this complex, and some of the acreage is in woods. Equipment limitations are the main concerns of management. Machine planting is difficult because of the extent of Rock outcrop. Rock outcrop and clayey spots that are slick when wet restrict the use of equipment.

This complex is poorly suited for nearly all urban uses because of the extent of Rock outcrop, depth to bedrock, moderately slow permeability, moderately steep slopes, and moderate shrink-swell potential. The soils in this complex can be severely damaged by erosion if the plant cover is removed. If the soils are used as construction sites, development should be on the contour. Removal of vegetative cover should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass VIs; Fredonia part in woodland ordination 3c, Rock outcrop part not placed in a woodland ordination.

**FrC—Frondorf-Lenberg silt loams, 6 to 12 percent slopes.** This complex consists of sloping, well drained soils on upper side slopes and narrow ridges. The slopes commonly are slightly concave, but on ridgetops they are convex. The areas are in strips 150 to 600 feet wide and 5 to 125 acres in size. A few seepy spots occur in most areas. Shallow drainageways are common, and some severely eroded spots have shallow gullies. The complex is about 60 percent Frondorf silt loam and 40 percent Lenberg silt loam and similar soils. The Frondorf and Lenberg soils in this complex form such an intricate pattern that they were not separated in mapping.

In a representative profile of the Frondorf soil in this complex, the plow layer is brown silt loam about 6 inches thick. The subsoil, about 27 inches thick, is brown to strong brown silt loam and silty clay loam in the upper part and yellowish brown gravelly silt loam in the lower 11 inches. Sandstone bedrock is below a depth of about 33 inches.

In a representative profile of the Lenberg soil, the plow layer is brown silt loam about 6 inches thick. The subsoil, about 25 inches thick, consists of a thin layer of yellowish brown silt loam underlain by yellowish red, very firm, plastic clay that has fragments of shale and gray mottles in the lower 6 inches. The substratum, about 6 inches thick, is very firm shaly clay mottled in shades of brown and gray. Soft acid gray shale is below a depth of about 37 inches.

Included with this soil complex in mapping are soils similar to the Lenberg soil except that they have as much as 20 percent shale and sandstone fragments in the upper part of the profile. A few spots scattered through most areas of this complex are severely eroded. The plow layer of the severely eroded Lenberg soil is silty clay loam. Also included are some small intermingled areas of the Steinsburg and Wellston soils. The Steinsburg soil has a brown fine sandy loam plow layer and a brown sandy loam subsoil. The Wellston soil is similar to the Frondorf soil except that it is deeper to bedrock.

Permeability is moderately slow in the Lenberg soil and moderate in the Frondorf soil. These soils are moderate in available moisture capacity, and they have a moderately deep root zone. Root growth is restricted by the clayey subsoil of the Lenberg soil. The plow layers are moderate to low in content of organic matter. Tilth is fair. In some severely eroded spots of the Lenberg soil, the clayey plow layer is difficult to work. Except for these clayey spots and some included soils that have a high content of coarse fragments, the plow layer is generally easy to work. Surface runoff is rapid. The reaction in unlimed areas is strongly acid to very strongly acid. The depth to sandstone or soft shale bedrock ranges from about 20 to 40 inches. The clayey subsoil of the Lenberg soil has a moderate shrink-swell potential.

This soil complex is mostly in brush, grass, or trees. It has very limited potential for cultivated crops and for many urban uses. The hazard of erosion is very severe if the plant cover is removed.

The soils in this complex are better suited to pasture and hay crops than to cultivated crops. They are poorly suited for cultivated crops because of excessive runoff and the high risk of very severe damage by erosion if the plant cover is removed. Maintaining and improving tilth in cultivated areas are difficult. The response of crops to lime and fertilizer is low to moderate. If these soils are cultivated, effective management practices are required to control erosion, to increase the supply of organic matter, and to improve tilth. Contour tillage, stripcropping, minimum tillage, use of cover crops, and including grasses and legumes in the cropping system are practices that help to reduce runoff and control erosion. Drainageways need to be kept in permanent vegetative cover to reduce erosion. Incorporating some crop residue into the plow layer reduces the tendency of these soils to clod and crust. Tilling within the proper moisture content also helps to reduce soil compaction and clodding.

These soils are suited to most of the pasture plants commonly grown in the area. Grasses and legumes that can stand short periods of drought are best suited. Pasture management practices are needed that will maintain a good plant cover, slow surface runoff, and control erosion. Overgrazing and grazing when the soils are wet should be avoided. Overgrazing damages the pasture plants and leaves the soil surface unprotected. If the pasture is grazed when the soils are wet, the surface layer compacts easily, runoff is increased, and soil losses through erosion are excessive. Operating equipment on the contour, proper stocking rates to maintain desirable plant species, deferred grazing, and rotation of pastures are practices that are also needed to control erosion.

The soils in this complex are suited to trees. Hazard of erosion on the Lenberg soil and plant competition on the Frondorf soil are the main concerns of management. To control erosion all logging roads, skid trails, and planting operations should be on the contour. Clearing shrubs from cutover woods and controlling weeds in open fields can help control undesirable plants until seedlings are established. Machine planting is practical.

The soils in this complex are limited for most urban uses, mainly because of the moderately slow permeability and shrink-swell potential in the Lenberg soil, and the steepness of the slopes. Shallow excavations are difficult to make in these soils because of the shale or sandstone bedrock at a depth of 20 to 40 inches. These soils can be severely damaged by erosion unless they are protected by vegetative cover. If the soils are used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. The clayey subsoil of the Lenberg soil is poorly suited for use as topsoil. Stockpiling the silt loam surface layer and using it to resurface developed areas can speed revegetation. Capability subclass IVe; Frondorf part in woodland ordination 2o, Lenberg part in woodland ordination 3c.

**FrD—Frondorf-Lenberg silt loams, 12 to 20 percent slopes.** This complex consists of moderately steep, well drained soils on upper side slopes and on foot slopes. The areas that are on foot slopes are in the eastern part of the survey area. In these areas the slopes are convex. The side slopes are concave. A few seepy spots are in most areas. Shallow drainageways are common. Most areas have small severely eroded spots and shallow gullies. The areas are in bands 150 to 400 feet wide and 5 to 75 acres in size. The complex is about 60 percent Frondorf silt loam and 40 percent Lenberg silt loam and similar soils. These soils form such an intricate pattern that they were not separated in mapping.

The Frondorf and Lenberg soils differ mainly in the texture and color of the subsoil. In a representative profile of the Frondorf soil, the plow layer is brown silt loam about 6 inches thick. The subsoil, about 27 inches thick, is brown to strong brown silt loam and silty clay loam in the upper part and yellowish brown gravelly silt loam in the lower 11 inches. Sandstone bedrock is below a depth of about 33 inches. In a representative profile of the Lenberg soil, the plow layer is brown silt loam about 6 inches thick. The subsoil is about 25 inches thick. The upper part consists of a thin layer of yellowish brown silt loam. The lower part is yellowish red, very firm, plastic clay that has fragments of shale and gray mottles in the lower 6 inches. The substratum, about 6 inches thick, is very firm shaly clay mottled in shades of brown and gray. Soft, acid gray shale is below a depth of about 37 inches.

Included with this soil complex in mapping are soils similar to the Lenberg soil except that they have as much as 20 percent fragments of sandstone, shale, and chert in the upper part of the profile. A few spots of severely eroded Frondorf and Lenberg soils are in most areas. The plow layer of the severely eroded Lenberg soil is silty clay loam. Also included are some small intermingled areas of the Steinsburg and Wellston soils. The Steinsburg soil has a brown fine sandy loam plow layer and a brown sandy loam subsoil. The Wellston soil is similar to the Frondorf soil except that it is deeper to bedrock.

Permeability is moderately slow in the Lenberg soil and moderate in the Frondorf soil. These soils are moderate in available moisture capacity, and they have moderately deep root zones. The root zone in the Lenberg soil is restricted because of the clayey subsoil. Tilth of these soils is fair. The plow layer is generally easy to work, but some clayey spots of the severely eroded Lenberg soil and some included soils that have gravelly plow layers are difficult to work. Runoff is rapid. The reaction in unlimed areas is strongly acid to very strongly acid. The depth to sandstone or shale bedrock ranges from 20 to 40 inches. The clayey subsoil of the Lenberg soil has a moderate shrink-swell potential.

This complex is in brush, grass, and trees. These soils have poor potential for cultivated crops and for many urban uses. They are suited for pasture or trees and for openland or woodland wildlife habitat. The hazard of erosion is very severe if plant cover is removed.

These soils are not suited for cultivated crops because of the moderately steep slopes and the risk of very severe damage by erosion. Hay crops that leave the soil unprotected after harvest are poorly suited. A permanent vegetative cover is needed to reduce runoff and control erosion.

These soils are suited to pasture. If the soil is used for pasture, management practices are needed that will slow surface runoff and control erosion. Plants that require the least amount of renovation should be selected for seeding. All equipment operations should be on the contour. Lime and fertilizer need to be applied in sufficient quantities to provide for rapid growth of seedlings and quick establishment of cover. Grazing should be delayed until cover is well established, and overgrazing should be avoided.

The soils in this complex are suited to trees, and some of the acreage is in woods. Hazard of erosion and equipment limitations are the main concerns of management. For control of erosion, all logging roads, skid trails, and machine plantings should be on the contour. The use of equipment is restricted mainly by the moderately steep slopes. In a few seepy spots and in some spots where the surface is clayey, equipment may bog down or slip when the soils are wet.

The soils in this complex are limited for most urban uses, mainly because of slope. Shallow excavations are difficult to make because of the underlying shale and sandstone bedrock at a depth of about 20 to 40 inches. The moderately slow permeability in the Lenberg soil is a limitation for waste disposal systems. The shrinking and swelling in the Lenberg soil can cause damage to foundations and pavements. Areas of this complex that occur on foot slopes are subject to slides. These soils can be severely damaged by erosion unless they are protected by vegetative cover. If the soils are used as construction sites, development should be on the contour. Removal of vegetative cover should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass VIe; Frondorf part in woodland ordination 2r, Lenberg part in woodland ordination 3c.

**GmE—Garmon silt loam, 25 to 60 percent slopes.** This steep to very steep, moderately deep, well drained soil is on hillsides. Areas are in long bands 200 to 2,500 feet wide on valley walls, and the widest areas extend across narrow ridges and valleys.

In a representative profile of this soil the surface layer is silt loam about 10 inches thick. The upper 4 inches is very dark grayish brown and the remainder is brown. The subsoil, about 11 inches thick, is yellowish brown shaly silt loam. The substratum, about 11 inches thick, is dark yellowish brown shaly silty clay loam. Limestone and shale bedrock is at a depth of about 32 inches.

Included in mapping are some thin bands of the Caneyville-Rock outcrop complex at the upper boundary and on ridgetops. Also included are some small areas of soils that have a dark grayish brown surface layer and a brown silt loam subsoil that is underlain by bedrock at a depth of 8 to 15 inches. These included soils and rock outcrops make up about 15 percent of the mapping unit.

Permeability of this soil is moderately rapid, and the available water capacity is moderate. The root zone is moderately deep, and the plow layer has a moderate content of organic matter and good tilth. Reaction ranges from medium acid to neutral. Runoff is very rapid. The shrink-swell potential is low.

This soil is mostly in trees. It is not suited for farming and most urban uses mainly because of the steep slopes. It is suited for trees and for woodland wildlife habitat.

Pasture is not suited to this soil because of the steep slopes. Even the use of light equipment for seeding and for maintenance of stands of grasses and legumes is impractical. This soil is subject to very severe damage by erosion if the plant cover is removed.

Trees are suited to this soil, and most of the acreage is in woods. Hazard of erosion and equipment restrictions are main concerns of management. To control erosion, all logging roads and skid trails should be on the contour wherever possible. The use of equipment is restricted mainly by the steepness of the slopes. Specialized logging equipment is generally required for harvesting, and machine planting is impractical.

This soil is not suited for urban uses because of the steep slopes and depth to bedrock. It is subject to very severe damage by erosion if the plant cover is removed. It is suited for woodland wildlife habitat. Capability subclass VIIe; woodland ordination 4r.

**GnB—Gatton silt loam, 2 to 6 percent slopes.** This gently sloping, well drained soil is on ridgetops and on benches on rolling uplands and in fan-shaped areas at the head of drainageways. Areas are about 7 to 325 acres in size, and some are cut by shallow drainageways.

In a representative profile, the plow layer is dark yellowish brown silt loam about 6 inches thick. The subsoil, more than 59 inches thick, is strong brown silt loam to a depth of about 22 inches. From 22 inches to 42 inches is a very firm, compact fragipan. The upper 14 inches is yellowish brown fine sandy loam mottled gray and reddish yellow, and the lower 6 inches is strong brown sandy clay loam mottled gray and brownish yellow. Below the fragipan is red, brownish yellow, and gray mottled sandy clay more than 23 inches thick.

Included in mapping are some small spots of severely eroded Gatton soils in which the plow layer is mostly subsoil.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted by a very firm, dense fragipan. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. The plow layer has moderate organic-matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. The shrink-swell potential is low in the upper part of the profile and moderate in horizons beneath the fragipan.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture. This soil is limited for most urban uses mainly because of slow permeability in the fragipan and wetness.

This soil is suited for cultivated crops that have shallow to moderately deep roots and that can tolerate slight wetness. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. This seasonal wetness sometimes delays farming operations. The root zone is limited by a very firm, dense fragipan at a depth of about 22 inches. Lack of roots in the fragipan sometimes results in this soil being droughty during dry seasons. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Tile drainage is generally not feasible, but runoff and overwash from higher adjacent soils can be controlled in some areas by diversion ditches.

The hazard of erosion is moderate, but control of erosion is a major concern of management where the soil is cultivated. Some practices that will slow surface runoff and help control erosion are minimum tillage, contour tillage, terracing, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residue should be kept on or near the surface; incorporating some of it into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways should have a permanent vegetative cover to reduce erosion. Lime and fertilizer should be applied according to crop needs.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes that tolerate slight wetness are best suited. Lime and fertilizer are required for establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Machine planting is practical.

This soil is limited for urban uses because of slow permeability in the fragipan, wetness, seasonal high water table within 18 to 24 inches of the surface, and moderate shrink-swell potential and low strength in the lower part of the subsoil. The slow permeability and wetness make it poorly suited for waste disposal systems. Excess water pressure that results from the seasonal high water table can damage basements and cause other severe water problems. This soil erodes easily where it is exposed. If the soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass IIe; woodland ordination 3o.

**Gu—Gullied land.** This mapping unit consists of land that is so deeply cut by gullies or that has undergone such severe sheet erosion that the soil profile has been largely destroyed. Of the original soil, only the narrow strips between the gullies remain. In places where sheet erosion has occurred, the parent materials are exposed and the gullies are less evident. Slope ranges from about 7 to 30 percent. Areas are 3 to 40 acres in size. Gullied land is most closely associated with the Sonora, Riney, Wellston, Waynesboro, Crider, and Vertrees soils. One or more of these soils make up as much as 35 percent of some areas.

Gullied land is generally moderate to high in available water capacity and low in content of organic matter. The root zone ranges from moderately deep to deep. Permeability is moderate to moderately slow, and runoff is very rapid. Reaction ranges from medium acid to very strongly acid. Depth to bedrock is commonly more than 4 feet.

Most of the acreage is in sparse cover of brush or trees. It is not suited for cultivation, and it is not suited for pasture unless the gullies are filled and the surface is smoothed. Reclamation generally requires the use of heavy equipment. Most reclaimed areas have potential for pasture, trees, woodland wildlife habitat, and some types of urban development. Because of the variation in characteristics of the soil material and the range in slope, onsite investigation is required to predict behavior for various land uses. Areas need a permanent vegetative cover that will protect the soils from further damage by erosion. Not placed in a capability subclass or woodland ordination.

**HnB—Hagerstown silt loam, 2 to 6 percent slopes.** This gently sloping, deep, well drained soil is on narrow ridgetops and in karst areas. Slopes are convex, and in the karst areas steepness varies within short distances. Areas are from 5 to 125 acres in size. In the karst areas, runoff goes into openings in depressions and into underground streams. Some depressions are ponded for very brief periods, but some ponds remain for years before they suddenly drain. In most areas of this soil there are a few rock outcrops.

In a representative profile, the plow layer is brown silt loam about 6 inches thick. The subsoil, about 42 inches thick, is yellowish red plastic silty clay loam to a depth of 13 inches, and from 13 inches to 48 inches it is red to reddish brown plastic clay. Limestone bedrock is at a depth of 48 inches.

Included in mapping are Caneyville and Crider soils in some small intermingled areas that are generally less than one acre in size. The included Caneyville soil is underlain by bedrock at a depth of 20 to 40 inches, and the Crider soil has a silty clay loam subsoil that extends to a depth of about 30 inches. These inclusions make up about 10 percent of the mapping unit.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The plow layer has a moderate organic-matter content and good tilth. Reaction ranges from strongly acid to neutral. Runoff is medium. Depth to bedrock ranges from about 40 to 60 inches. The subsoil is moderate in shrink-swell potential and has low strength.

This soil is suited to farming and to trees. About two-thirds of the acreage is in cultivated crops, hay, and pasture (fig. 11). It is limited for most urban uses because of depth to bedrock, low strength, and the tendency of the clayey subsoil to shrink and swell. This soil is suited to openland and woodland wildlife habitat.

All of the crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is moderate, and the control of erosion is a major concern of management where the soil is cultivated. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil, and about one-third of the acreage is in woods. Undesirable plants compete favorably with tree seedlings. Shrubbing in cutover areas and cultivation or other suitable methods in open fields are generally required to control plant competition until the young seedlings are established. Machine planting is practical.

This soil is limited for most urban uses because of low strength and the tendency of the clayey subsoil to shrink and swell. Depth of excavations is limited because hard limestone bedrock is at a depth of 40 to 60 inches. If the soil is used as a construction site, care should be taken to keep all drainage outlets open. If drainage outlets in depressions become clogged with sediment and debris, ponding can become a problem. To control erosion and reduce the amount of sediment produced, development of the site should be on the contour. Removal of vegetation should be held to a minimum, and plant cover needs to be established quickly in denuded areas. The clayey subsoil is a poor source of topsoil. Stockpiling of topsoil and using it to form the surface layer of developed sites can help to establish and maintain lawns and shrubs. Capability subclass IIe; woodland ordination 1o.

**HnC—Hagerstown silt loam, 6 to 12 percent slopes.** This sloping, deep, well drained soil is on narrow ridgetops and in karst areas. Slopes are convex, and in the karst areas steepness varies within short distances. Areas are from 5 to 375 acres in size. In the karst areas, drainageways are dismembered because runoff goes into openings in depressions and into underground streams. Some depressions are ponded for very brief periods, but some ponds remain for years before they suddenly drain. In most areas of this soil there are a few rock outcrops. Shallow drainageways are common.

In a representative profile the plow layer is brown silt loam about 6 inches thick. The subsoil, about 42 inches thick, is yellowish red plastic silty clay to a depth of 13 inches, and from 13 inches to 48 inches it is red to reddish brown plastic clay. Limestone bedrock is at a depth of 48 inches.

Included in mapping are some small intermingled areas of Caneyville soils that are underlain by limestone bedrock at a depth of 20 to 40 inches. Also included are some spots of Hagerstown soils that have been severely damaged by erosion and that have a clayey plow layer.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The plow layer has a moderate organic-matter content and good tilth. Reaction ranges from strongly acid to neutral. Runoff is rapid. Depth to bedrock ranges from about 40 to 60 inches. The subsoil is moderate in shrink-swell potential and has low strength.

This soil is suited to farming and to trees. About two-thirds of the acreage is in cultivated crops, hay, and pasture. It is limited for most urban uses because of depth to bedrock, slope, low strength, and the tendency of the clayey subsoil to shrink and swell. This soil is suited to use as habitat for openland and woodland wildlife.

All of the crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The severe hazard of erosion is a major concern of management where the soil is cultivated. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or by grazing when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil, and about one-third of the acreage is in woods. Undesirable plants compete favorably with tree seedlings. Shrubbing in cutover areas and cultivation or other suitable methods in open fields are generally required to control competition until the seedlings are established. Machine planting is practical.

This soil is limited for most urban uses because of low strength, slope, and the tendency of the clayey subsoil to shrink and swell. The depth of excavations is limited because hard limestone bedrock is at a depth of 40 to 60 inches. If the soil is used as a construction site, care should be taken to keep all drainage outlets open. If drainage outlets in depressions become clogged with sediment and debris, ponding can become a problem. To control erosion and reduce the amount of sediment produced, development of the site should be on the contour. Removal of vegetation should be held to a minimum, and plant cover needs to be established quickly in denuded areas. The clayey subsoil is a poor source of topsoil. Stockpiling of the topsoil and using it to form the surface layer on developed sites can help establish and maintain lawns and shrubs. Capability subclass IIIe; woodland ordination 1o.

**HnD—Hagerstown silt loam, 12 to 20 percent slopes.** This moderately steep, deep, well drained soil is in narrow bands on hillsides and in karst areas. Slopes are convex, and in the karst areas steepness varies within short distances. Areas are from 5 to 85 acres in size. In the karst areas runoff goes into openings in depressions and into underground streams. Some of the depressions are ponded for very brief periods, but some ponds remain for years before they suddenly drain. Shallow drainageways are common. There are a few rock outcrops in most areas.

In a representative profile the plow layer is brown silt loam 6 inches thick. The subsoil, about 42 inches thick, is yellowish red plastic clay to a depth of about 13 inches, and from 13 inches to 48 inches it is red to reddish brown plastic clay. Limestone bedrock is at a depth of 48 inches.

Included in mapping are some small intermingled areas of Caneyville and Waynesboro soils. The Caneyville soil has limestone bedrock at a depth of 20 to 40 inches. The included Waynesboro soil has a brown loam plow layer and a thick, yellowish red to red, plastic clay loam to clay subsoil. Also included are some spots of Hagerstown soils that have been truncated by erosion and have a clayey plow layer.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The plow layer has a moderate organic-matter content and good tilth. Reaction ranges from strongly acid to neutral. Runoff is rapid. Depth to bedrock ranges from about 40 to 60 inches. The subsoil is moderate in shrink-swell potential and has low strength.

This soil is suited to farming, and about half of the acreage is in pasture. The remainder is in brush or trees. It is better suited to hay and pasture than to cultivated crops. Trees and openland and woodland wildlife habitat are also suited. This soil is limited for most urban uses mainly because of slope.

This soil is poorly suited to cultivated crops because of slope and the risk of very severe damage by erosion. It is suited to occasional use for cultivated crops, but it needs a permanent plant cover. If this soil is cultivated, practices are needed that will help control erosion and maintain tilth and the supply of organic matter. Some practices that help to control erosion are minimum tillage, contour tillage, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants leaves the soil unprotected, increases the hazard of soil erosion and weed competition, and may make it necessary to renovate a pasture to maintain production.

Trees are suited to this soil. Plant competition, hazard of erosion, and equipment limitations are the main concerns of management. Shrubbing in cutover areas and cultivation or weeding in open fields can be used to control competition from undesirable plants until seedlings are established. The use of equipment is restricted mainly by slope and by clayey spots that are slick when wet. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour. Machine planting is difficult because of the moderately steep slopes.

This soil is limited for most urban uses because of low strength, steepness of the slope, and the tendency of the clayey subsoil to shrink and swell. Depth of excavations is limited because hard limestone bedrock is at a depth of 40 to 60 inches. This soil can be very severely damaged by erosion unless it is protected by vegetative cover. If the soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Care should be taken to keep drainage outlets in depressions open. If outlets become clogged with sediment and debris, ponding can become a problem. In some places it is practical to construct dikes and sediment basins to help hold sediment in the construction area and reduce the amount of damage below the site. The clayey subsoil is a poor source of topsoil. Capability subclass IVe; woodland ordination 1r.

**Hu—Huntington silt loam** (0 to 2 percent slopes). This nearly level, well drained soil is in karst valleys and depressions on the uplands and on the Ohio River flood plain. Most areas are oval, some are circular, and a few are in strips on flood plains. Areas are from 2 to about 35 acres in size. Some of the depressions drain through openings that lead to underground drains. This soil is subject to frequent flooding from November to May, and some areas in depressions are ponded for short periods.

In a representative profile of this soil, the plow layer is dark brown silt loam about 6 inches thick. The subsoil, more than 44 inches thick, is dark brown to brown silt loam.

Included with this soil in mapping are somewhat poorly drained Newark soils in areas that are less than one acre in size.

This soil has moderate permeability and a high available water capacity. The root zone is deep. The reaction ranges from neutral to medium acid. Runoff is slow. The loamy plow layer has a moderate content of organic matter and good tilth. The seasonal high water table is below a depth of about 4 feet. The shrink-swell potential is low.

This soil is suited for farming, and most of the acreage is in cultivated crops, hay, and pasture. A few isolated areas are in trees, and the potential for trees is very high. Urban uses are severely limited because of flooding.

This soil is suited for most of the crops commonly grown in the area. Winter crops are poorly suited because of flooding in winter and spring. Runoff and overwash from adjacent soils are hazards in many of the depressions. Where suitable outlets are available, a diversion ditch placed at the base of the slope can reduce overwash. Care should be taken to prevent openings in depressions from becoming clogged with debris and sediment. Ponding often occurs if drains are closed. Practices are required that will maintain the content of organic matter and good tilth. Some effective practices are stubble mulching, returning crop residue to the soil, planting winter cover crops, using minimum tillage, and including grasses and legumes in the cropping system. The plow layer is moderate in content of organic matter and is easy to work. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Some areas need moderate applications of lime, but lime is not needed in most areas. Crop response to fertilizer is good.

Pasture grasses and legumes that can withstand flooding for short periods are best suited to this soil. Productive stands of pasture grasses and legumes are fairly easy to establish and maintain. Grazing should be delayed until the plants are well established, controlled to prevent overgrazing, and restricted when the soil is saturated. Grazing animals can cause excessive damage to the plants when the soil is wet. Overgrazing damages the plants, results in thin, sparse plant cover, and increases weed competition.

Trees are suited to this soil, but most of the acreage is farmed. Plant competition is a major concern of management because of the high available water supply during the growing season. Open fields need to be cultivated to help control undesirable plants until seedlings are established.

This soil is limited for most urban uses because of a flooding hazard. If this soil is protected from flooding, other factors may limit it for urban uses. The seasonal high water table at a depth of about 4 feet limits use of the soil for houses with basements and as sites for area type sanitary landfills. The moderate permeability makes it poorly suited as a site for sewage lagoons. If this soil is used as a construction site, care should be taken to prevent drainage outlets from becoming clogged with debris and sediment. Ponding commonly occurs if drainage outlets are closed. Capability class I; woodland ordination 1o.

**Lc—Lawrence silt loam** (0 to 2 percent slopes). This nearly level, somewhat poorly drained soil is on stream terraces, in depressions on the uplands, and in fan-shaped areas at the head of drainageways. Areas are from 2 to 175 acres in size. This soil is subject to occasional flooding from November to May except that a few areas are subject to rare flooding.

In a representative profile of this soil, the plow layer is grayish brown silt loam about 8 inches thick. The subsoil, more than 56 inches thick, is brownish yellow silt loam mottled in shades of gray and brown to a depth of 17 inches. A firm, compact, brittle layer or fragipan is below this to a depth of 44 inches. It is silt loam mottled in yellowish brown, gray, and light gray. The lower part of the subsoil, to a depth of more than 64 inches, is silt loam mottled in yellowish brown, pale brown, and light gray.

This soil has slow permeability and a moderate available water capacity. The root zone is moderately deep and is restricted by a firm, dense fragipan at a depth of about 17 inches. Reaction ranges from strongly acid to very strongly acid in unlimed areas. Runoff is slow. The seasonal high water table is at a depth of 6 to 18 inches. The plow layer has a low content of organic matter and fair tilth, but the silt loam texture makes it easy to work. The shrink-swell potential is low.

Most of the acreage of this soil is used for hay and pasture. A few areas remain in trees. Unless this soil is artificially drained, it is better suited to pasture, hay, or trees than to cultivated crops. It is poorly suited to most urban developments because of wetness and flooding, but it has potential for wetland wildlife habitat.

Cultivated crops are poorly suited to this soil unless it is artificially drained. Shallow rooted crops that can tolerate wetness are best suited. Winter crops are poorly suited because of flooding and a high water table in winter and spring. This soil has a moderately deep root zone that is saturated in winter and remains wet well into the growing season. When farming operations are often delayed because of wetness, weed competition increases. Root growth is restricted by a firm, dense fragipan at a depth of about 17 inches. Artificial drainage can lengthen the time available for farming operations and widen the range of suited plants. Open ditch drainage is generally preferred, because the slowly permeable fragipan layer limits the effectiveness of tile drains. In some areas, suitable outlets are not available for drainage systems. Ditches can sometimes help control runoff and overwash from adjacent soils. The silt loam plow layer is generally easy to work. Tilth can be improved and the supply of organic matter increased and maintained by returning crop residue to the soil, using minimum tillage, growing green manure cover crops, and including grasses and legumes in the cropping system. Lack of roots in the fragipan makes this soil droughty during some periods in dry seasons. Lime and fertilizer should be applied according to crop needs.

Shallow rooted pasture grasses and legumes that can tolerate moderate wetness and flooding are best suited to this soil. If it is artificially drained, this soil is suited to a somewhat wider range of plants. Overgrazing should be prevented, and grazing should be restricted when the water table is near the surface. Grazing animals can cause excessive damage to the plants when the soil is saturated. Overgrazing results in sparse or thin cover of pasture plants and increases weed competition. Lime and fertilizer should be applied according to crop needs.

Trees are suited to this soil, but most of the acreage is cleared. Restricted use of equipment because of wetness and weed competition is the main concern of management. Undesirable plants compete with young seedlings planted in open fields. Cultivation is often required to control competition until seedlings are established.

This soil is poorly suited for most urban developments because of the hazard of flooding and wetness. The slow permeability makes it poorly suited for waste disposal systems. Capability subclass IIIw; woodland ordination 2w.

**LfE—Lenberg-Frondorf complex, 20 to 30 percent slopes.** This complex consists of moderately deep, well drained soils on hillsides and knobs. The slopes are complex and have small benches and very steep banks. Numerous small drainageways that have narrow steep walls are in most areas. These areas have a microrelief that consists of narrow ridges and valleys on hillsides. In a few areas, the slopes are smoother and small drainageways are less common. These soils are in long bands on hillsides and in irregular areas on knobs. They are 150 to 700 feet wide and 25 to 200 acres in size. These Lenberg and Frondorf soils occur together in such an intricate pattern that they were not separated in mapping. The complex is about 50 percent Lenberg silt loam, 30 percent Frondorf silt loam, and 20 percent other soils.

The Lenberg and Frondorf soils contrast mainly in the texture and color of the subsoil. In a representative profile of the Lenberg soil, the surface layer, about 4 inches thick, is silt loam. The upper 2 inches is dark grayish brown and the lower 2 inches is brown. The subsoil, about 25 inches thick, consists of a thin layer of yellowish brown silt loam that is underlain by yellowish red, very firm, plastic clay that has fragments of shale and gray mottles in the lower 4 inches. The substratum, about 8 inches thick, is very firm shaly clay mottled in shades of brown and gray. Soft acid gray shale is below a depth of about 37 inches. In a representative profile of the Frondorf soil, the surface layer, about 5 inches thick, is silt loam. The upper 2 inches is dark grayish brown and the lower 3 inches is brown. The subsoil, about 27 inches thick, is brown to strong brown silty clay loam in the upper part and yellowish brown gravelly silty clay loam in the lower 11 inches. Shale bedrock is at a depth of about 32 inches.

Included with this soil complex in mapping are soils similar to the Frondorf soil except that they have fragments of shale, siltstone, and chert throughout the profile. Fragments make up 10 to 25 percent of the surface layer and upper part of the subsoil and 25 to 50 percent of the lower part of the subsoil. Also included in mapping are some soils that have a thin, dark grayish brown to brown silt loam surface layer, a brown to red clayey subsoil, and black shale bedrock at a depth of about 15 to 40 inches. Intermingled with these soils are spots of exposed shale bedrock.

The permeability is moderately slow in the Lenberg soil and moderate in the Frondorf soil. These soils are moderate in available moisture capacity, and they have moderately deep root zones. The root zone is restricted in the Lenberg soil by the clayey subsoil. Tilth is fair to poor. Surface runoff is very rapid. The reaction in unlimed areas is strongly acid to very strongly acid. The depth to shale bedrock ranges from about 20 to 40 inches. The clayey subsoil in the Lenberg soil has a moderate shrink-swell potential.

This soil complex is in trees, brush, and grass. These soils are not suited for cultivated crops, and they have poor potential for nearly all urban uses. They have potential for pasture and trees and for woodland or openland wildlife habitat.

These soils are not suited to cultivated crops because of the steep and rough slopes and the high risk of severe damage by erosion. Hay crops that leave the soil unprotected after harvest are not suited. A permanent vegetative cover is needed to slow runoff and control erosion.

The soils in this complex are suited to pasture. The use of equipment on these soils is difficult because of the rough, steep slopes. There is a high risk of severe damage by erosion unless the soils are kept in thick stands of vegetative cover. Suited plants that require the least amount of renovation should be selected for seeding. Lime and fertilizer need to be applied in sufficient amounts to provide for rapid growth of seedlings and quick establishment of cover. Grazing should be delayed until cover is well established. Overgrazing should be avoided.

The soils in this complex are suited to trees. The hazard of erosion, equipment limitations, and plant competition on the Frondorf soil are the main management concerns. For control of erosion, all logging roads and skid trails should be on the contour wherever possible. The use of equipment is restricted mainly by the steep and rough slopes. Machine planting is generally not practical. Young conifers may have competition from undesirable understory species in cutover areas and from weeds in openland areas. Removing brush and weeds reduces competition until the seedlings are established.

The soils in this complex are poorly suited for most urban uses, mainly because of the steep slopes. Shallow excavations are difficult to make because of the shale bedrock at a depth of 20 to 40 inches. The moderately slow permeability of the Lenberg soil is a limitation to systems for waste disposal. Most of the areas in this complex are subject to slides. These soils can be severely damaged by erosion unless they are protected by vegetative cover. If they are used as construction sites, development should be on the contour wherever possible. Removal of vegetative cover should be held to a minimum, and plant cover should be established quickly on denuded areas. Capability subclass VIe; Lenberg part in woodland ordination 3c and Frondorf part in woodland ordination 2r.

**Ln—Lindside silt loam** (0 to 2 percent slopes). This moderately well drained, nearly level soil is on flood plains and in karst valleys and depressions on the uplands. The areas are 5 to 30 acres in size. Some depressions drain through openings into underground streams. In some of these areas there are no visible outlets. This soil is subject to frequent flooding from November to May.

In a representative profile of this soil, the plow layer is dark grayish brown silt loam about 9 inches thick. The subsoil, about 33 inches thick, is brown silt loam that has gray mottles in the lower part. The substratum, more than 24 inches thick, is grayish brown silt loam mottled in shades of gray.

Included with this soil in mapping are some small areas of the somewhat poorly drained Newark soils and the well drained Nolin soils. These inclusions are less than 2 acres in size.

This soil has moderate permeability and a high available water capacity. The root zone is deep. The reaction ranges from medium acid to neutral. The loamy plow layer has a moderate content of organic matter and good tilth. Surface runoff is slow. The seasonal high water table is about 18 to 36 inches below the surface. The shrink-swell potential is low.

This soil is suited for farming, and most of the acreage is in row crops, hay, and pasture. It is suited to trees, but it is limited for most urban uses because it is subject to flooding.

Cultivated crops that can tolerate slight wetness are best for this soil. Winter crops are poorly suited because of the hazard of flooding and a seasonal high water table in winter and spring. Preparing seedbeds, tillage, and harvesting are sometimes delayed because of excess wetness. Severe competition from weeds can be a problem when tillage is delayed in rainy seasons. Drainage is not required for most crops, although it can increase the time available for field operations and improve the suitability of the soil for some crops. Tile drains and open ditches have been used in some areas to improve drainage. Diversion ditches can be used effectively to control runoff and overwash from adjacent soils. In some areas suitable outlets for these drainage systems are not available. In depressions, care should be taken to keep all openings to underground drains free of debris or sediment to prevent ponding.

The soil has good tilth, and the plow layer is easy to work. If the soil is used intensively for crops, practices need to be applied that will maintain tilth and the supply of organic matter. Returning crop residue to the soil, growing green manure cover crops, using minimum tillage, and including grasses and legumes in the cropping system are effective practices. Light applications of lime may be required in some areas. Fertilizer is required if the soil is to be used for intensive crop production.

This soil is suited to pasture grasses and legumes that can withstand flooding for short periods. Grazing of pasture should be controlled to prevent overgrazing and should be restricted when the water table is near the surface. Grazing animals can cause excessive damage to the plants when the soil is saturated. In addition to damaging the plants, overgrazing results in thin plant cover and increases competition from weeds.

Trees are suited to this soil. The major management problems are weed competition and equipment limitations. Undesirable plants compete with young seedlings planted in open fields, and cultivation is often required to reduce competition until the seedlings are established.

Because this soil is subject to flooding, it is poorly suited to most urban uses. Even if it is protected from flooding, the seasonal high water table is a limitation to some uses. Areas of this soil in depressions are subject to ponding if the drainage outlets are closed. If these areas are used as construction sites, care should be taken to keep drainage outlets open. Capability class I; woodland ordination 1o.

**MdC3—Markland silty clay, 6 to 12 percent slopes, severely eroded.** This sloping, well drained to moderately well drained soil is in long narrow bands on stream terraces. It is truncated by erosion and is gullied. It is subject to occasional flooding from November to May. Areas are about 10 to 175 acres in size.

In a representative profile the plow layer is dark grayish brown silty clay about 5 inches thick. The subsoil, about 35 inches thick, is brown clay mottled yellowish brown to a depth of 28 inches. From 28 inches to 40 inches it is yellowish brown silty clay mottled in shades of gray and brown. The substratum, more than 30 inches thick, is yellowish brown silty clay loam mottled in shades of gray and brown.

Included in mapping are McGary soils that are in some areas less than one acre in size on very narrow ridgetops, some narrow areas of Nolin silt loam and Newark silt loam in valleys, and some areas where slope is more than 12 percent.

This soil has slow permeability and a high available water capacity. The root zone is deep, but root growth is restricted by the clayey subsoil. Reaction ranges from strongly acid to mildly alkaline. The silty clay loam plow layer has a low content of organic matter and poor tilth. Runoff is rapid, and the seasonal high water table is below a depth of about 4 feet. The shrink-swell potential in the clayey subsoil is high, and the soil has low strength.

Most of the acreage of this soil is in trees or is reverting to trees. Over half of it is in a military reservation. Cultivated crops are not suited because of the effects of past erosion and the high risk of further damage by erosion if it is cultivated. Pasture, trees, and woodland wildlife habitat are suited. This soil is poorly suited to most urban uses because of the hazard of flooding, slow permeability, low strength, slope, and the tendency of the subsoil to shrink and swell.

Because of the effects of past erosion and the high risk of further damage, this soil is not suited for cultivation. A permanent vegetative cover is needed that will protect it from runoff and erosion. Hay crops that leave the soil unprotected after harvest are poorly suited.

Pasture grasses and legumes that can withstand flooding are best suited to this soil. Management practices are needed that will slow surface runoff and control erosion. Suited plants that require the least amount of renovation should be selected for seeding. Lime is needed in some areas. Fertilizer should be applied according to crop needs or in sufficient quantity to provide for rapid plant growth and quick establishment of cover. Grazing should be delayed until cover is well established and controlled to prevent overgrazing. Thin vegetative cover leaves the soil exposed and makes it more susceptible to erosion. To help control erosion, all equipment operations should be on the contour.

Trees are suited to this soil, and most of the acreage is in woods or brush. Hazard of erosion, rate of seedling mortality, and equipment limitations are the major concerns of management for woodland. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour. The use of equipment is restricted because of the silty clay loam surface layer, which is slick when wet. Because of the low content of organic matter in the plow layer and rapid runoff, seedling losses are likely to be excessive. Strong, healthy, well planted seedlings are most likely to survive.

This soil is limited for nearly all urban uses because of the hazard of flooding. Even if it is protected from flooding, the slow permeability, potential in the clayey subsoil for shrinking and swelling, and low strength limit its use for many urban developments. Capability subclass VIe; woodland ordination 3c.

**Mr—McGary silt loam** (0 to 2 percent slopes). This somewhat poorly drained, nearly level soil is on stream terraces in blocks and bands 10 to 1,200 acres in size. Many areas have a shallow network of drains and ridges as a result of bedfurrowing to improve drainage, and most areas are subject to occasional flooding from November to May.

In a representative profile the plow layer is grayish brown silt loam about 6 inches thick. The subsoil, about 43 inches thick, is yellowish brown silty clay loam mottled in shades of brown and gray to a depth of about 16 inches. From 16 to 29 inches, the subsoil is light gray silty clay loam mottled in shades of brown. And to a depth of 49 inches it is gray, firm, plastic clay mottled in shades of brown. The substratum, more than 21 inches thick, is very firm, plastic, gray and brown mottled clay.

Included with this soil in mapping are a few areas of a soil that has a dark gray clay plow layer about 10 inches thick and a subsoil, which is more than 3 feet thick, of very dark gray, very firm plastic clay mottled in shades of gray. This included soil is poorly drained and makes up about 1 percent of the mapping unit.

This soil has slow permeability and a high available water capacity. The root zone is deep, but the clayey subsoil restricts root growth. The loamy plow layer has a low content of organic matter and fair tilth. Runoff is slow. Reaction is strongly acid to very strongly acid in unlimed areas. The seasonal high water table is 6 inches to about 18 inches below the surface. The clayey subsoil has a moderate shrink-swell potential and low strength.

Most of the acreage of this soil is in trees, pasture, or brush and over half the acreage is within a military reservation. Unless the soil is drained, it is better suited to hay and pasture than to cultivated crops. It is suited to and has potential for wetland wildlife habitat. Wetness and flooding limit its use for most urban developments.

Cultivated crops that can tolerate moderate wetness are best suited to this soil. Winter crops are poorly suited because of flooding and a seasonal high water table near the surface in winter and spring. This soil is slow to warm up and dry out. Farming operations are often delayed because of wetness, and weed competition is often a severe problem during rainy seasons. Some areas have been bedfurrowed to help remove surface water, but most of the areas are too large and too flat for this method of drainage to be effective. Because of the slow permeability of the clayey subsoil, open ditches are likely to be more effective than tile drains in improving drainage. Even though the plow layer has a low content of organic matter and fair tilth, the silt loam texture makes it easy to work. Unless it is worked within the fairly narrow range of the suitable moisture content it tends to clod and crust. Tilth can be improved and the supply of organic matter increased by returning crop residue to the soil, growing green manure cover crops, using minimum tillage, and using grasses and legumes in the cropping system. Lime and fertilizer should be applied according to crop needs.

Pasture grasses and legumes that can tolerate moderate wetness and flooding are best suited to this soil. If it is drained to reduce wetness, this soil is suited to a wider range of pasture plants. If it is pastured, grazing should be controlled to prevent overgrazing and should be restricted during wet seasons. Grazing animals can cause excessive damage to the plant cover when the soil is saturated, and overgrazing results in a thin cover of grasses and legumes and increases the hazard of weed competition. Lime and fertilizer should be applied according to plant needs to establish and maintain productive pasture.

Trees are suited to this soil, and much of the acreage is in woods. Control of plant competition and the equipment restrictions are the main concerns of management for trees. Cultivation of seedlings in open fields and clearing in cutover woods can help to reduce plant competition until seedlings are established. The use of equipment is restricted because of wetness.

This soil is limited for most urban uses because of flooding, wetness, seasonal high water table, tendency of the subsoil to shrink and swell, and low strength. Capability subclass IIIw; woodland ordination 3w.

**Mv—Melvin silt loam** (0 to 2 percent slopes). This poorly drained, nearly level soil is in low areas on flood plains, in depressions on the uplands, and in karst valleys. It is subject to flooding from November to May, and areas in depressions are subject to ponding for brief periods in rainy seasons. Areas are about 3 to 80 acres in size.

In a representative profile the plow layer is grayish brown silt loam mottled in shades of brown and is about 8 inches thick. The subsoil, about 18 inches thick, is olive gray silt loam mottled in shades of gray and brown. The substratum, more than 24 inches thick, is gray silty clay loam mottled in shades of brown.

Included with this soil in mapping are some areas of soils similar to Melvin soils except that they formed in recent overwash materials and have a yellowish brown silt loam to silty clay loam plow layer. Also included are some soils similar to Melvin soils except that the subsoil below a depth of about 27 inches is gray clay about 21 inches thick over strong brown clay that extends to a depth of more than 60 inches.

This soil has moderate permeability and a high available water capacity. The root zone is deep, and the plow layer has a moderate content of organic matter and fair tilth. Reaction is medium acid to mildly alkaline. Runoff is slow, and the seasonal high water table is within 6 inches of the surface.

Most of the acreage of this soil is in pasture or trees. It is poorly suited for cultivated crops unless drainage is improved. It is suited for woodland and wetland wildlife habitat, and for pasture and trees. It is limited for most urban uses because of frequent flooding and wetness.

Cultivated crops are poorly suited to this soil because of wetness. Plowing, planting, tillage, and harvesting are often delayed because of excessive wetness, and crops sometimes fail because of the high water table. Artificial drainage can improve the suitability of this soil for crops. Tile drains, open ditches, and improved channels have been used to reduce wetness. Suitable outlets are sometimes not available for tile drains. Control of runoff and overwash from adjacent soils in some areas can be accomplished by constructing ditches. If drained, this soil is suited to crops that can tolerate moderate to severe wetness. Winter crops are poorly suited because of flooding in winter and spring. The content of organic matter can be maintained, and tilth can be improved, by returning crop residues to the soil, growing green manure cover crops, and including grasses and legumes in the cropping system. Some areas need lime for some crops. Fertilizer should be applied according to crop needs.

Pasture grasses and legumes that can tolerate flooding for brief periods and wetness are best suited to this soil. If it is used for pasture, overgrazing should be prevented, and grazing should be restricted when the soil is wet. Overgrazing and grazing when the water table is near the surface can damage the plant cover, increase the hazard of weed competition, and make necessary early renovation to maintain production.

Trees are suited to this soil, but more than half the acreage is cleared. Competition from undesirable plants and restricted use of equipment are the major concerns of management for woodland. Because of the high available moisture supply during the growing season, undesirable plants compete with seedlings. Cultivation or other suitable methods of weed control in open fields and shrubbing in cutover areas can be used to reduce competition until the seedlings are established. The use of equipment is restricted mainly because of extreme wetness.

This soil is limited for nearly all urban uses mainly because of the hazard of flooding, extreme wetness, and a seasonal high water table near the surface. Even if the soil is protected from flooding and drainage is improved, wetness limits its suitability for many uses. Capability subclass IIIw; woodland ordination 1w.

**Nb—Newark silt loam** (0 to 2 percent slopes). This somewhat poorly drained, nearly level soil is in low areas on flood plains and in karst valleys and depressions on uplands. The areas are about 3 to 80 acres in size and are subject to frequent flooding from about November to May.

In a representative profile, the plow layer is dark grayish brown silt loam about 10 inches thick. The subsoil, about 27 inches thick, is grayish brown silt loam. The upper 5 inches is mottled in shades of gray, and the lower part is mottled in shades of gray and brown. The dark grayish brown silt loam substratum is more than 13 inches thick and has gray mottles.

Small areas of moderately well drained Lindside soils are included with this soil in mapping. Some soils in sinks or depressions and along narrow flood plains have a loam to sandy loam surface layer. A few areas of soils similar to Newark silt loam, except that they are strongly acid, are also included in mapping.

This soil has moderate permeability and high available water capacity. The root zone is deep, and the plow layer has a moderate content of organic matter and fair tilth. Reaction is medium acid to mildly alkaline. Surface runoff is slow, the seasonal high water table is 6 to 18 inches below the surface, and this soil is subject to flooding.

The soil is used mainly for cultivated crops, hay, and pasture. A few areas are in trees. Unless drained, this soil is better suited to pasture and hay than to intertilled crops. Seasonal wetness and flooding limit this soil for most urban uses. This soil is well suited to trees and to use as habitat for woodland wildlife. It has potential for development of habitat for wetland and openland wildlife.

This soil is suited to cultivated crops that can tolerate excessive wetness and flooding. Winter crops are poorly suited because of a seasonal high water table and flooding during winter and spring. Farming operations are often delayed because of excessive wetness and because the soil is slow to warm up and dry out in the spring. When this happens, competition from weeds can become a severe problem. Tile drains and open ditches may improve internal drainage, and in some places ditches help control surface runoff and overwash from adjacent soils. Where artificial drainage systems can be installed, they lengthen the effective growing season, reduce the length of time that farming operations are delayed, and widen the range of suitable plants. Tilth can be improved and the supply of organic matter maintained by returning crop residue to the soil, growing green manure cover crops, using minimum tillage, and including grasses and legumes in the cropping system. Lime is required in some areas. Crops have good response to fertilizer.

This soil is suited to pasture that is planted to grasses and legumes that can tolerate moderate wetness and can withstand flooding for brief periods. If drained, it is suited to a wide range of pasture plants. Pastures should not be overgrazed or grazed when the soil is wet. Grazing animals damage plants when the soil is saturated, and overgrazing results in sparse cover of grasses and legumes and increases weed competition.

This soil is well suited to trees, but most of the acreage is farmed. A seasonal high water table limits the use of equipment during wet periods. Undesirable plants compete with seedlings during the growing season. Cultivation of seedlings in open fields and shrubbing of cutover woods reduce the amount of competition until the seedlings are established.

This soil is limited for nearly all urban uses because of flooding and wetness. It is well suited to woodland use and has potential for openland and wetland wildlife habitat. Capability subclass IIw; woodland ordination 1w.

**NcA—Nicholson silt loam, 0 to 2 percent slopes.** This nearly level, moderately well drained soil is on broad ridgetops and in low areas around the head of drainageways. A few shallow drainageways are in most areas. Areas are from about 5 to 125 acres in size.

In a representative profile, the plow layer is brown silt loam about 7 inches thick. The subsoil, more than 79 inches thick, is yellowish brown silt loam to a depth of about 23 inches. From 23 to 41 inches, it is a very firm, compact, silt loam fragipan. The upper 11 inches of the fragipan is pale brown mottled with strong brown and gray, and the lower 7 inches is mottled in shades of brown and gray. Below the fragipan, the subsoil is red, very firm silty clay more than 45 inches thick and is mottled in shades of brown and gray.

Included in mapping are some thin bands of the somewhat poorly drained Lawrence soils along drainageways.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted by the very firm, dense fragipan. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is slow. The plow layer has moderate organic-matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. The shrink-swell potential is low in the upper part of the profile and moderate in horizons beneath the fragipan.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture. This soil is limited for most urban uses mainly because of slow permeability in the fragipan and wetness.

This soil is suited to cultivated crops that have shallow to moderately deep roots and that can tolerate slight wetness. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. This seasonal wetness sometimes delays farming operations. The root zone is limited by a very firm, dense fragipan at a depth of about 23 inches. Lack of roots in the fragipan can result in this soil being droughty during dry seasons. The loamy plow layer has a moderate organic matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting, and the erosion hazard is slight. Tile drainage is generally not feasible, but runoff and overwash from higher adjacent soils can be controlled in some areas by diversion ditches. Constructing open ditches improves drainage in some spots. Running the rows up and down the slope can help to remove excess surface water. Some practices that help insure continued high crop yields are returning crop residue to the soil, applying lime and fertilizer according to crop needs, growing green manure cover crops, and including grasses and legumes in the cropping system.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes that tolerate slight wetness are best suited. Lime and fertilizer are required for establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition to young conifers planted in open fields.

This soil is limited for urban uses because of slow permeability in the fragipan, wetness, a seasonal high water table within 18 to 24 inches of the surface, and moderate shrink-swell potential and low strength in the lower part of the subsoil. Slow permeability and wetness make it poorly suited for use as septic tank filter fields. Excess water can damage basements and cause severe water problems during wet periods. Capability subclass IIw; woodland ordination 2o.

**NcB—Nicholson silt loam, 2 to 6 percent slopes.** This gently sloping, moderately well drained soil is on ridgetops and benchlike positions on rolling uplands and around the head of drainageways. Areas are about 5 to 1,200 acres in size, and most are cut by shallow drainageways.

In a representative profile, the plow layer is brown silt loam about 7 inches thick. The subsoil, more than 79 inches thick, is yellowish brown silt loam to a depth of about 23 inches. From 23 to 41 inches, it is a very firm, compact, silt loam fragipan. The upper 11 inches of the fragipan is pale brown mottled with strong brown and gray, and the lower 7 inches is mottled in shades of brown and gray. Below the fragipan, the subsoil is red, very firm silty clay more than 45 inches thick and is mottled in shades of brown and gray.

Included in mapping are some small areas of the somewhat poorly drained Lawrence soils along drainageways.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted by the very firm, dense fragipan. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. The plow layer has moderate organic-matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. The shrink-swell potential is low in the upper part of the profile and moderate in horizons beneath the fragipan.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture (fig. 12). This soil is limited for most urban uses mainly because of slow permeability in the fragipan and wetness.

This soil is suited to cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. This seasonal wetness sometimes delays farming operations. The root zone is limited by a very firm, dense fragipan at a depth of about 23 inches. Lack of roots in the fragipan can result in this soil being droughty during wet seasons. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Tile drainage is generally not feasible but runoff and overwash from higher adjacent soils can be controlled in some areas by diversion ditches. The hazard of erosion is moderate, but control of erosion is a major concern of management where the soil is cultivated. Some practices that will slow surface runoff and help control erosion are minimum tillage, contour tillage, terracing, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residue should be kept on or near the surface, and incorporating some of it into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways should be kept in permanent vegetative cover to reduce erosion. Lime and fertilizer should be applied according to crop needs.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes that tolerate slight wetness are best suited. Lime and fertilizer are required for establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition to young conifers planted in open fields.

This soil is limited for urban uses because of slow permeability in the fragipan, wetness, a seasonal high water table within 18 to 24 inches of the surface, and moderate shrink-swell potential and low strength in the lower part of the subsoil. The slow permeability and wetness make it poorly suited for use as septic tank filter fields. Excess water during wet periods can damage basements and cause severe water problems because of the seasonal high water table. This soil erodes easily where it is exposed. If it is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass IIe; woodland ordination 2o.

**No—Nolin silt loam** (0 to 2 percent slopes). This nearly level, well drained soil is in strips 175 to 2,000 feet wide on flood plains and in circular and oval areas in depressions. In the depressions, surface water drains through openings into underground streams. Most areas are cut by deep stream channels. Areas are from 3 to 300 acres in size. This soil is subject to frequent flooding from November to May.

In a representative profile the plow layer is dark grayish brown silt loam about 10 inches thick. The subsoil, more than 56 inches thick, is brown silt loam.

Included in mapping are moderately well drained Lindside soils in some narrow strips that are less than one acre in size and occur along shallow drainageways, and some small areas of the Sensabaugh soils near stream channels. Also included are some soils similar to Nolin soils except that they have a silty clay subsoil, are sloping to moderately steep, and occur on banks near stream channels.

This soil has moderate permeability and a high available water capacity. The root zone is deep. Reaction ranges from neutral to medium acid. Runoff is slow. The loamy plow layer has a moderate content of organic matter and good tilth. Bedrock and the seasonal high water table are below a depth of 4 feet. The shrink-swell potential is low.

This soil is suited for farming, and most of the acreage is in row crops, hay, and pasture. Winter crops are poorly suited because of flooding in winter and spring. It is suited to trees, but only a small acreage is in woods. Its potential for urban uses is limited because of the hazard of flooding. Openland and woodland wildlife habitat are also suited.

Most of the cultivated crops commonly grown in the area are suited to this soil. Winter crops are poorly suited because of the hazard of flooding in winter and spring. The loamy plow layer has a moderate content of organic matter and is easy to work. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Special practices to control runoff and erosion are not generally required. Runoff and overwash from adjacent soils can be reduced by constructing ditches near the base of the slope. Scouring along well defined drainageways can be controlled by use of permanent vegetative cover. In some areas, improvement of the stream channel can reduce the amount of overflow. Drainage outlets in depressions should be kept open. If they are sealed, ponding can present a problem. Practices are required that will maintain the supply of organic matter and good tilth. Some practices that are effective include stubble mulching, returning crop residue to the soil, planting winter cover crops, using minimum tillage, and including grasses and legumes in the cropping system. Lime is required for some crops, and fertilizer should be applied according to crop needs.

Pasture grasses and legumes that can withstand flooding of short duration are best suited to this soil. Maintaining productive stands of suited grasses and legumes is the main concern of management for pastureland. Deferred grazing, prevention of overgrazing, and restricted grazing when the soil is wet are practices that can help to maintain production. Grazing before the plants are well established, overgrazing, and grazing when the soils are saturated damage the plants and result in thin cover which increases the hazard of weed competition and the need for early renovation. Lime and fertilizer should be applied according to crop needs.

Trees are suited to this soil, but most of the acreage is farmed. Control of plant competition is the main concern of management for woodland. Because of the high available moisture supply during the growing season, undesirable plants compete with seedlings. Cultivation or weeding by other suitable methods is required to control undesirable plants until seedlings are established.

This soil is limited for nearly all urban developments because it is subject to flooding. Depth to bedrock, moderate permeability, and depth to the seasonal high water table limit its use for some developments. If areas in depressions are used as construction sites, care should be taken to maintain drainage outlets. If they are sealed with sediment or debris, ponding can present a problem. Capability class I; woodland ordination 1o.

**Nv—Nolin variant fine sandy loam** (0 to 2 percent slopes). This nearly level, well drained soil is in strips 200 to 600 feet wide near stream channels on flood plains. It is subject to frequent flooding from November to May. Areas are about 6 to 90 acres in size.

In a representative profile the plow layer is dark grayish brown fine sandy loam about 9 inches thick. The substratum, more than 51 inches thick, is brown loamy fine sand to a depth of 29 inches. Between depths of 29 and 48 inches it is dark yellowish brown very fine sandy loam, and between 48 and 60 inches it is yellowish brown silt loam.

Included in mapping are some small spots of gravel deposits.

This soil has moderately rapid permeability and a moderate available water capacity. The root zone is deep. Reaction ranges from strongly acid to neutral. Runoff is slow. The loamy plow layer has a low content of organic matter and fair tilth. The seasonal high water table is at a depth of about 3 feet, and depth to bedrock is more than 5 feet. The shrink-swell potential is low.

This soil is suited for farming and for trees. Most of the acreage is in row crops, hay, or pasture. The soil is poorly suited to winter crops because of flooding in winter and spring. Urban uses are limited because of the hazard of flooding.

Cultivated crops are suited to this soil, but winter crops are poorly suited because of flooding in winter and spring. Because of the limited water capacity of this coarse textured soil, the water available to plants is sometimes limited in dry seasons. The plow layer is low in organic-matter content, but the fine sandy loam texture makes it easy to work. It can be worked over a wide range in moisture content without danger of clodding or crusting. If it is cultivated, practices are needed that will increase the amount of organic matter and improve tilth. Some practices that are effective include stubble mulching, returning crop residue to the soil, planting winter cover crops, using minimum tillage, and including grasses and legumes in the cropping system. A ditch constructed at the base of the slope can help to control runoff. The erosive action of overflow water can be reduced by establishing permanent vegetative cover along drainageways. In some areas, improvement of the stream channel can reduce the amount of overflow. Lime and fertilizer should be applied according to crop needs.

Pasture grasses and legumes that can withstand flooding and tolerate slightly droughty conditions are best suited to this soil. Grazing of pasture should be delayed until the plants are well established, and overgrazing should be prevented. Overgrazing results in thin or sparse cover of pasture plants and increases the hazard of weed competition and scour erosion during periods of overflow. Lime and fertilizer should be applied according to crop needs.

This soil is suited to trees, but most of the acreage is farmed. Weeds compete with seedlings planted in open fields. Cultivation or weeding by other suitable methods is generally required to control weeds until the seedlings are established.

This soil is limited for nearly all urban uses because of frequent flooding. Even if it is protected from flooding, the depth to the seasonal high water table and the moderately rapid permeability limit its use for some urban developments. Capability subclass IIs; woodland ordination 2o.

**OtA—Otwell silt loam, 0 to 2 percent slopes.** This nearly level, moderately well drained soil is on stream terraces and in low depressions on uplands. The areas are oval or are bands 200 to 1,600 feet wide and 3 to 185 acres in size. Most areas of this soil are subject to occasional flooding. The soil map does not show small excavated ponds that are in some areas.

In a representative profile, the plow layer is brown silt loam about 8 inches thick. The subsoil, more than 56 inches thick, is yellowish brown silt loam to a depth of 26 inches. To a depth of 42 inches it is a very firm, compact, yellowish brown, gray mottled fragipan. The upper part of the fragipan is silt loam, and the lower part is silty clay loam. Below the fragipan, the subsoil is yellowish brown, gray mottled silt loam more than 22 inches thick.

Included with this soil in mapping are some small areas of the somewhat poorly drained Lawrence soils in low spots.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted in the very firm, dense fragipan. Reaction ranges from neutral to strongly acid except that the fragipan may be very strongly acid. Runoff is slow. The plow layer has moderate organic matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. The soil has a low shrink-swell potential.

This soil is suited to farm crops and trees. Most of the acreage is in cultivated crops, hay, and pasture. This soil is limited for nearly all urban uses because of flooding, slow permeability in the fragipan, and wetness.

This soil is suited to cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. It is poorly suited to winter crops because of flooding and a seasonal high water table near the surface during winter and spring. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. This seasonal wetness sometimes delays farming operations. The root zone is limited by a very firm, dense fragipan at a depth of about 26 inches. Lack of roots in the fragipan can result in this soil being droughty during dry seasons. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range of moisture content without danger of clodding or crusting, and the erosion hazard is slight. Tile drainage is generally not feasible, but runoff and overwash from higher adjacent soils can be controlled in some areas by diversion ditches. Constructing open ditches improves drainage in some spots. Running the rows up and down the slope helps to remove excess surface water. Some practices that help insure continued high crop yields are returning crop residue to the soil, applying lime and fertilizer according to crop needs, growing green manure cover crops, and including grasses and legumes in the cropping system.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes that tolerate slight wetness and flooding grow best. Some areas need lime, but most do not. Fertilizer is required for establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established, by grazing when the soil is too wet, or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Machine planting is practical.

This soil is limited for nearly all urban uses because it is flooded occasionally. Even if it is protected from flooding, the slow permeability of the fragipan and seasonal wetness limit its use for many developments. The seasonal high water table can damage basements and cause water problems during wet periods. Capability subclass IIw; woodland ordination 3o.

**OtB—Otwell silt loam, 2 to 6 percent slopes.** This gently sloping, moderately well drained soil is on stream terraces and in low depressions on uplands. The areas are oval or in bands 200 to 800 feet wide and are 3 to 70 acres in size. Most areas of this soil are subject to occasional flooding from about November to May. The soil map does not show small excavated ponds that occur in some areas.

In a representative profile, the plow layer is brown silt loam about 8 inches thick. The subsoil, more than 56 inches thick, is yellowish brown silt loam to a depth of 26 inches. From 26 to 42 inches it is a very firm, compact, yellowish brown, gray mottled fragipan. The upper part of the fragipan is silt loam, and the lower part is silty clay loam. Below the fragipan, the subsoil is yellowish brown, gray mottled silt loam more than 22 inches thick.

Included with this soil in mapping are some small areas of the somewhat poorly drained Lawrence soils in low spots.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted by the very firm, dense fragipan. Reaction ranges from neutral to strongly acid except that the fragipan may be very strongly acid. Runoff is medium. The plow layer has moderate organic-matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. Most areas are subject to occasional flooding. This soil has a low shrink-swell potential.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture. This soil is limited for nearly all urban uses because of flooding, slow permeability in the fragipan, and wetness.

This soil is suited for cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. Winter crops are poorly suited because of flooding and a seasonal high water table near the surface during winter and spring. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. This seasonal wetness sometimes delays farming operations. The root zone is limited by a very firm, dense fragipan at a depth of about 26 inches. Lack of roots in the fragipan can result in this soil being drouthy during dry seasons. The loamy plow layer has a moderate content of organic matter and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting.

Tile drainage is generally not feasible, but runoff and overwash from higher adjacent soils can be controlled in some areas by diversion ditches. The hazard of erosion is moderate, but control of erosion is a major concern of management where the soil is cultivated. Some practices that will slow surface runoff and help control erosion are minimum tillage, contour tillage, terracing, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residue should be kept on or near the surface, and incorporating some of it into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways should be kept in permanent vegetative cover to reduce erosion. Lime and fertilizer should be applied according to crop needs.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes that tolerate slight wetness and flooding are best suited. Some areas need lime, but most do not. Fertilizer is required for establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and makes it necessary to renovate the pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Machine planting is practical.

This soil is limited for nearly all urban uses because of occasional flooding. Even if it is protected from flooding, the slow permeability of the fragipan and seasonal wetness limit its use for many developments. The seasonal high water table can damage basements and cause water problems during wet periods. This soil erodes easily if it is exposed. If it is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass IIe; woodland ordination 3o.

**PmB—Pembroke silt loam, 2 to 6 percent slopes.** This gently sloping, deep, well drained soil is on karst uplands. Slopes are convex, and steepness varies within short distances. Runoff goes into openings in depressions and into underground streams. Some of the depressions are ponded for very brief periods, but some ponds remain for years before they suddenly drain. Areas are from 10 to 700 acres in size.

In a representative profile, the plow layer is dark brown silt loam 7 inches thick. The subsoil, more than 59 inches thick, is reddish brown silt loam to a depth of 14 inches. From 14 to 40 inches it is red to dark red silty clay loam, and from 40 to 66 inches it is dark red silty clay.

Included with this soil in mapping are some Huntington and Newark soils in small depressions.

The available water capacity of this soil is high, and permeability is moderate. The plow layer has a moderate organic-matter content and good tilth. The reaction ranges from very strongly acid to medium acid in unlimed areas. Runoff is medium. The shrink-swell potential is low to a depth of 40 inches, and below that it is moderate. The soil has low strength.

This soil is suited to farming and trees. Most of the acreage is in cultivated crops, hay, and pasture. Low strength and the moderate shrink-swell potential in the lower part of the subsoil limit its use for urban developments.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is moderate, but the control of erosion is a major concern of management where the soil is cultivated. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are well suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition to seedlings planted in open fields.

This soil is limited for most urban uses, mainly because of low strength and the tendency of the lower part of the subsoil to shrink and swell. If the soil is used as a construction site, care should be taken to keep all drainage outlets open. If the drainage outlets in depressions become clogged with sediment and debris, ponding becomes a severe problem. To control erosion and reduce the amount of sediment produced, development of the site should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Stockpiling topsoil and using it to form the surface layer of developed sites can help in establishment and maintenance of lawns and shrubs. Capability subclass IIe; woodland ordination 1o.

**PmC—Pembroke silt loam, 6 to 12 percent slopes.** This sloping, deep, well drained soil is on karst uplands. Slopes are convex, and steepness varies within short distances. Drainage water empties into openings in depressions and into underground streams. Some of the depressions are ponded for very brief periods, but some ponds remain for several years before they suddenly drain. Areas are from 5 to 225 acres in size. In a few spots, the soil has been truncated by erosion and the plow layer is subsoil material.

In a representative profile the plow layer is dark brown silt loam 7 inches thick. The subsoil, more than 59 inches thick, is reddish brown silt loam to a depth of 14 inches. From 14 to 40 inches it is red to dark red silty clay loam, and from 40 to 66 inches it is dark red silty clay.

Included with this soil in mapping are some Huntington and Newark soils in small depressions and some thin bands of Fredonia soils around the rims of depressions.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The loamy plow layer has a moderate organic-matter content and good tilth. The reaction ranges from very strongly acid to medium acid in unlimed areas. Runoff is medium. The shrink-swell potential is low to a depth of 40 inches, and below that it is moderate. This soil has low strength.

This soil is suited to farming and trees. Most of the acreage is in cultivated crops, hay, and pasture (fig. 13). Urban uses are limited because of slope, low strength, and the tendency of the lower part of the subsoil to shrink and swell.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is severe if the soil is cultivated, and this is a major concern of management. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

This soil is suited to all of the pasture grasses and legumes commonly grown in the area. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established, by grazing when the soil is too wet, or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition until seedlings are established.

This soil is limited for most urban uses, mainly because of slope, low strength, and a moderate shrink-swell potential in the lower part of the subsoil. If this soil is used as a construction site, care should be taken to keep all drainage outlets open. If the drainage outlets become clogged with sediment and debris, ponding can become a severe problem. To control erosion and reduce the amount of sediment produced, development of the site should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. In some places it is practical to construct dikes and sediment basins to help hold sediment in the construction area and reduce the amount of damage below the site. If the topsoil is stockpiled and used to form the surface of developed sites, establishing and maintaining lawns and shrubs will be easier. Capability subclass IIIe; woodland ordination 1o.

**RaE—Ramsey-Steinsburg-Allegheny complex, 20 to 40 percent slopes.** This complex consists of somewhat excessively drained and well drained, shallow, moderately deep, and deep soils on hillsides. Areas are in bands 200 to 1,000 feet wide and are 5 to 125 acres in size. Slopes are complex. The areas are commonly on the upper part of hillsides, but some are on the lower part. A few areas are on the upper and lower parts and are separated by benches. Narrow bands of rock escarpments occur in most areas. The Ramsey soil commonly is on the highest part of mapped areas, the Steinsburg soil is below the Ramsey soil, and the Allegheny soil is below the Steinsburg soil. These soils occur together in such an intricate pattern that they were not separated in mapping. The complex consists of about 40 percent Ramsey fine sandy loam, 20 percent Steinsburg fine sandy loam, 15 percent Allegheny loam, and 25 percent other soils.

The soils in this complex differ mainly in depth to the underlying bedrock except that the Allegheny soil also has more clay in the subsoil than the Ramsey and Steinsburg soils. In a representative profile of the Ramsey soil, the surface layer is very dark grayish brown and brown fine sandy loam about 5 inches thick. The subsoil, 11 inches thick, is pale brown and light yellowish brown loam. Sandstone bedrock is at a depth of 16 inches. In a representative profile of the Steinsburg soil, the surface layer is dark grayish brown and brown fine sandy loam 7 inches thick. The subsoil, 11 inches thick, is brown sandy loam. The substratum, 17 inches thick, is yellowish brown channery sandy loam that has about 35 percent sandstone fragments. Sandstone bedrock is at a depth of 35 inches. In a representative profile of the Allegheny soil, the surface layer is dark grayish brown to brown loam 6 inches thick. The subsoil, 27 inches thick, is strong brown clay loam to a depth of 24 inches, and from 24 to 33 inches it is strong brown sandy clay loam. The substratum, 15 inches thick, is strong brown sandy loam. Sandstone bedrock is below a depth of 48 inches.

Included with this soil complex in mapping are some soils similar to the Allegheny soil except that they have more than 15 percent coarse fragments throughout the profile, some soils that formed in 10 to 30 inches of sandy to silty soil material overlying acid clay shale and limestone, some shallow clayey soils that formed in material weathered from limestone, and some Lenberg, Caneyville, and Wellston soils. These included soils make up about 25 percent of the mapping unit.

Permeability is rapid in the Ramsey soil, moderately rapid in the Steinsburg soil, and moderate in the Allegheny soil. Available water capacity is moderate in the Steinsburg soil, high in the Allegheny soil, and low in the Ramsey soil. The root zone is shallow in the Ramsey soil, moderate in the Steinsburg soil, and deep in the Allegheny soil. Runoff is rapid. The content of organic matter is low in all three of these soils, and reaction is strongly acid or very strongly acid. Bedrock is at a depth of 10 to 20 inches in the Ramsey soil, 20 to 40 inches in the Steinsburg soil, and more than 48 inches in the Allegheny soil. The shrink-swell potential is low.

This soil complex is in trees or brush. These soils are not suited for cultivated crops, and they are poorly suited for nearly all urban uses. Because of the steep to very steep slopes and droughtiness, they are poorly suited to pasture. They have potential for trees and for woodland wildlife habitat.

Cultivated crops are not suited to these soils because of the steep to very steep slopes, droughtiness, and the risk of very severe damage by erosion if they are not kept in protective vegetative cover.

This soil complex is poorly suited to pasture because of the difficulty of establishing and maintaining suited grasses and legumes on these steep to very steep, droughty soils. They are subject to very severe damage by erosion unless they are kept in permanent vegetative cover.

Trees are suited to the soils in this complex, and most of the acreage is in woods. Moisture conditions in the Ramsey soil are more favorable for tree growth on the north facing slopes than on those that face south. Hazard of erosion and rate of seedling mortality on the Allegheny soil, equipment limitations on all the soils, and rate of seedling mortality on the Ramsey and Steinsburg soils are the main concerns of management. To help control erosion, all logging roads and skid trails should be on the contour. Use of equipment is restricted because of the steep to very steep slopes. Machine planting is not practical, and special logging equipment is commonly required. The rate of seedling mortality is high for newly germinated seedlings or young planted trees because of the low moisture supply during brief dry periods. Losses are likely to be highest on the south-facing slopes.

The soils in this complex are poorly suited to nearly all urban uses mainly because of the steepness of the slopes and depth to bedrock. They are subject to very severe damage by erosion if the plant cover is removed. They have very limited potential for recreation uses. Capability subclass VIIe; Ramsey part in woodland ordination 4d, Steinsburg part in woodland ordination 3r, and Allegheny part in woodland ordination 2r.

**RbC—Riney loam, 6 to 12 percent slopes.** This deep, well drained, sloping soil is in bands on the upper parts of hillsides, at the head of drainageways, and on narrow ridgetops. Areas are 200 to 900 feet wide and 5 to 200 acres in size. Slopes are convex. Most areas are cut by shallow to moderately deep drainageways. Gravel pits are in areas on ridgetops in southeastern Larue County.

In a representative profile of this soil, the plow layer is brown loam about 8 inches thick. The subsoil, about 46 inches thick, is yellowish red clay loam to a depth of 32 inches, and from 32 to 54 inches it is red sandy clay loam mottled with strong brown. The substratum, more than 11 inches thick, is red sandy loam mottled with brown.

Included with this soil in mapping are some soils similar to Riney soils except that soft sandstone bedrock is at a depth of 25 to 40 inches. Also included are Sonora soils in intermingled areas that are less than about two acres in size.

Permeability of this soil is moderately rapid, and the available water capacity is high. The root zone is deep. The plow layer is low in content of organic matter and is easy to work. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. The shrink-swell potential is low, and the soil has low strength.

This soil is suited for farming, and about half of the acreage is used for hay, pasture, and cultivated crops. The remainder is in trees or brush. The potential for urban developments is limited mainly by slope. Trees and openland and woodland wildlife habitat are suited.

Cultivated crops are suited to this soil, and most crops commonly grown in the area are suited. Control of erosion, increasing the content of organic matter, and maintaining good tilth are the major concerns of management. If this soil is cultivated, minimum tillage, contour tillage, terracing, stripcropping, and use of cover crops and grasses and legumes in the cropping system are practices that can help to slow surface runoff and control erosion. Crop residue should be kept on or near the surface. Incorporating some crop residue into the plow layer helps maintain tilth and increase the supply of organic matter. Well defined drainageways need a permanent vegetative cover that will reduce erosion.

All of the pasture grasses and legumes commonly grown in the area are suited to this soil. Control of erosion and the establishment and maintenance of productive plants are the major concerns of management for pasture. The application of lime and fertilizer according to crop needs, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil, and about half of the acreage is in trees or brush. Control of plant competition is a major concern of management. Shrubbing in cutover woods and brush in open fields can help reduce the amount of competition until the seedlings are established. Cultivation of seedlings in open fields can help control weeds. Machine planting is practical.

Slope and low strength are the main limitations to use of this soil for urban developments. This soil erodes very easily where it is exposed. If the soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover needs to be established quickly in denuded areas. Drainage outlets in sinks and depressions should be kept open to prevent ponding. In some places it is practical to construct sediment basins or dikes to hold sediment in the construction area to reduce the amount of sediment damage below the site. The subsoil is a poor source of topsoil. Establishing and maintaining vegetation on the developed site can be helped by stockpiling the topsoil and using it as the surface layer of developed sites. Capability subclass IIIe; woodland ordination 2o.

**RbD—Riney loam, 12 to 20 percent slopes.** This moderately steep, deep, well drained soil is in bands 150 to 700 feet wide on hillsides. Slopes are convex, and most areas are cut by shallow to moderately deep drainageways. In the southeastern part of Larue County, this soil has a higher content of quartz pebbles than in other parts of the survey area. Areas are about 5 to 170 acres in size.

In a representative profile of this soil, the surface layer is brown loam about 8 inches thick. The subsoil, about 46 inches thick, is yellowish red clay loam to a depth of 32 inches, and from 32 to 54 inches it is red sandy clay loam mottled with strong brown. The substratum, more than 11 inches thick, is red sandy loam mottled with brown.

Included with this soil in mapping are Waynesboro soils in intermingled areas that generally are less than one acre in size. These soils have a brown loam surface layer and a thick, yellowish red to red, clay loam to clay subsoil. Also included are some very small intermingled areas of soils that have a dark grayish brown to brownish yellow surface layer and a thick, yellowish brown sandy loam subsoil. Another included soil is similar to Riney soils except that weakly cemented sandstone is at a depth of 25 to 40 inches. These inclusions make up about 20 percent of the mapping unit.

This soil has moderately rapid permeability, high available water capacity, and a deep root zone. The plow layer is low in content of organic matter and fair in tilth. Reaction is strongly acid to very strongly acid in unlimed areas. Runoff is rapid. Soil strength and shrink-swell potential are low.

About one-third of the acreage of this soil is farmed, and the remainder is in woods or brush. It is better suited to hay and pasture than to intertilled crops because it is subject to very severe damage by erosion if it is cultivated. It is suited to trees and to woodland and openland wildlife habitat. Slope and low strength limit its use for urban developments.

This soil is suited for only occasional use for cultivated crops because of the moderately steep slopes and the risk of very severe damage by erosion if it is cultivated. It should be kept in close-growing crops most of the time. All of the crops commonly grown in the area are suited. The plow layer has a low content of organic matter, but the loam texture makes it easy to work. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Control of erosion, increasing the supply of organic matter, and improving tilth are the major concerns of management for cropland. Some practices that will slow surface runoff and help control erosion are minimum tillage, contour tillage, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residue should be kept on or near the surface. Incorporating some crop residue into the plow layer helps improve tilth and increase the supply of organic matter. Small, well defined drainageways need a vegetative cover that will protect them from erosion. Lime and fertilizer should be applied according to crop needs.

Overgrazing and grazing of pasture when the soil is too wet are the major concerns of management for pastureland. Important management practices are proper stocking rates to maintain desired pasture plants, applying lime and fertilizer according to crop needs, rotation of pasture, deferred grazing, and restricted grazing during wet seasons.

Trees are suited to this soil, and about two-thirds of the acreage is in trees or brush. Control of plant competition and equipment restrictions are the main concerns of management for woodland. Shrubbing in cutover areas and cultivation or other suitable methods in open fields are generally required to control competition until seedlings are established. The use of equipment is restricted because of the moderately steep slopes. Machine planting is difficult.

This soil is limited for most urban developments mainly because of slope and low strength. It is subject to very severe damage by erosion if the plant cover is removed. To help control erosion on soils used as construction sites, all development should be on the contour. Removal of vegetation should be held to a minimum, and vegetation should be established quickly in denuded areas. In some places it is practical to construct sediment basins and dikes to help hold sediment in the construction area and prevent damage below the site. Denuded areas are difficult to revegetate. Capability subclass IVe; woodland ordination 2r.

**RbE—Riney loam, 20 to 30 percent slopes.** This deep, well drained, steep soil is in bands on the lower parts of hillsides and at the head of ravines. Areas are about 200 to 1,300 feet wide and 5 to 185 acres in size. Most areas are cut by shallow to moderately deep drainageways, and some areas are severely eroded and have moderately deep to deep gullies. A few areas have exposures of limestone bedrock near the lower boundary.

In a representative profile of this soil, the plow layer is brown loam about 6 inches thick. The subsoil, about 46 inches thick, is yellowish red clay loam to a depth of 32 inches, and from 32 to 52 inches it is red sandy clay loam mottled with strong brown. The substratum, more than 13 inches thick, is red sandy loam mottled with brown.

Included with this soil in mapping are Waynesboro soils in intermingled areas that are generally less than one acre in size. Also included are some small intermingled areas of soils that have a dark grayish brown to brownish yellow surface layer and a thick, yellowish brown sandy loam subsoil. Another included soil is similar to Riney soils except that weakly cemented sandstone is at a depth of 25 to 40 inches. These included soils make up about 20 percent of the mapping unit.

Permeability of this soil is moderately rapid, and the available water capacity is high. The root zone is deep. The plow layer has a low content of organic matter and fair tilth. The reaction is strongly acid or very strongly acid in unlimed areas. This soil has low shrink-swell potential and low strength. Runoff is rapid.

This steep soil is not suited for farming except for pasture grasses and legumes. About one-third of the acreage is in pasture, and the remainder is in trees and brush. It has potential for trees, for openland and woodland wildlife habitat, and for pasture. The steep slopes limit its use for urban developments.

This soil is not suited for row crops because of the steep slopes and the risk of very severe damage by erosion if it is cultivated. Permanent cover is required to protect it from erosion.

Most of the pasture grasses and legumes commonly grown in the area are suited to this soil. Control of erosion and establishment and maintenance of desired pasture plants are the major concerns of management. Erosion is difficult to control where the soil is exposed, but it can be worked sufficiently to prepare a seedbed for pasture establishment if measures are taken to control erosion. Working the soil on the contour, application of fertilizer and lime according to plant needs, proper stocking rates to maintain desired plants, deferred grazing, and rotation grazing are practices that can help to control erosion and maintain pasture production.

Trees are suited to this soil, and about two-thirds of the acreage is in trees and brush. Control of plant competition and equipment limitations are the major concerns of management. Shrubbing in cutover woods and cultivation in open fields can help to reduce plant competition until the seedlings are established. Weed competition in open fields can be controlled by cultivation or other suitable means. The use of equipment is restricted because of the steep slopes and clayey spots that are slick when wet. Machine planting is generally impractical.

This soil is limited for urban development mainly because of the steepness of the slopes. Erosion is very difficult to control if the plant cover is removed. This soil also has low strength. Capability subclass VIe; woodland ordination 2r.

**RcD3—Riney sandy clay loam, 6 to 20 percent slopes, severely eroded.** This sloping to moderately steep, deep, well drained soil is in bands that range from about 200 to 700 feet wide on the upper parts of hillsides and on the head of ravines. Most areas are cut by shallow to moderately deep drainageways. Slopes are convex. This soil is truncated by erosion, and most areas are gullied. Areas range from about 5 to 65 acres in size.

This soil has lost most of its original surface layer through erosion. In a representative profile, the plow layer is yellowish brown sandy clay loam about 6 inches thick. The subsoil, about 44 inches thick, is yellowish red clay loam to a depth of about 30 inches, and from 30 to 50 inches it is red sandy clay loam. The substratum, more than 14 inches thick, is red sandy loam mottled with brown.

Included with this soil in mapping are Waynesboro soils in intermingled areas that are generally less than one acre in size. These soils have a yellowish brown clay loam surface layer and a thick, yellowish red to red, clay loam to clay subsoil. Some small areas of Sonora soils occur in thin strips at the upper boundary of many mapped areas. Included in some areas in the southeastern part of Larue County are some soils similar to Riney soils except that weakly cemented sandstone is at a depth of 25 to 40 inches. These included soils make up less than 15 percent of the mapping unit.

This soil has moderately rapid permeability, high available water capacity, and a deep root zone. The plow layer has a low content of organic matter and poor tilth. Reaction is strongly acid to very strongly acid in unlimed areas. Runoff is rapid. This soil has low shrink-swell potential and low strength.

Nearly all of the acreage of this soil is in woods and brush. It is not suited for farming, except for pasture grasses and legumes. It is suited for trees and for openland or woodland wildlife habitat. The main limitations to its use for urban development are slope and low strength.

Because of past erosion and the high risk of further damage unless protected, the soil is not suited for cultivated crops. Permanent vegetative cover is needed that will protect it from erosion.

Obtaining adequate stands of pasture grasses and legumes, overgrazing, and grazing when the soil is too wet are major concerns of management for pastureland. Because of the low content of organic matter, poor tilth, and uneven surface, adequate seedbeds are difficult to prepare, and suitable stands of grasses and legumes are difficult to establish. Thick vegetative cover is needed to protect the soil from erosion. Important management practices are adequate seedbed preparation, proper stocking rates to maintain desired pasture plants, application of lime and fertilizer according to crop needs, deferred grazing, rotation of pasture, and restricted grazing when the soil is too wet. Severe damage to the plant cover can result from grazing when the soil is wet or from overgrazing. Grazing animals can compact the soil when it is wet, and this increases the rate of runoff and amount of erosion. Overgrazing results in thin cover that does not adequately protect the soil from erosion and that may require renovation of pasture to maintain production.

Trees are suited to this soil, and most of the acreage is in brush or trees. Machine planting is difficult in most areas because of the gullies and uneven surface.

This soil is limited for most urban uses mainly because of slope and low strength. The moderately rapid permeability limits its use for some developments. It is subject to very severe damage by erosion if the plant cover is removed. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum and vegetative cover should be established quickly in denuded areas. In some places it is practical to construct sediment basins or dikes to hold sediment in the construction area and prevent damage below the site. Denuded areas are difficult to revegetate. Capability subclass VIe; woodland ordination 3o.

**Rd—Robertsville silt loam** (0 to 2 percent slopes). This poorly drained, nearly level soil is in low positions on stream terraces. The slopes are slightly concave, and areas range from 5 to 130 acres in size. This soil is subject to occasional flooding from November to May.

In a representative profile of this soil, the plow layer is light brownish gray silt loam mottled with light gray and is about 8 inches thick. The subsoil, about 37 inches thick, is light brownish gray silt loam mottled in shades of brown to a depth of about 16 inches. A firm, brittle, dense silt loam fragipan extends from a depth of 16 to 45 inches. It is light gray mottled with yellowish brown. The substratum, more than 13 inches thick, is light brownish gray silty clay loam mottled in shades of brown and gray.

This soil has slow permeability and a moderate available water capacity. The root zone is shallow because of a firm, dense fragipan at a depth of about 16 inches. The loamy plow layer has poor tilth because of the low content of organic matter and wetness. Reaction is strongly acid to very strongly acid in unlimed areas. Runoff is very slow, and the seasonal high water table is within about 12 inches of the surface. The shrink-swell potential is low.

Most of the acreage of this soil is in pasture or trees. This soil is poorly suited to cultivated crops because it is saturated in winter and remains wet until late in the growing season, and because it is subject to flooding in winter and spring. It is best suited to pasture grasses and legumes that tolerate extreme wetness and flooding for short periods. Trees and openland, wetland, and woodland wildlife habitat are suited. Urban uses are limited mainly because of flooding, wetness, and slow permeability.

This soil is too wet for most cultivated crops. It is saturated in winter and remains wet until late in the growing season. Because of a firm, dense, slowly permeable fragipan at a depth of about 16 inches, the seasonal high water table is near the surface. It generally is too wet to work, but lack of roots in the fragipan can cause it to be droughty in dry seasons. The root zone is shallow above the fragipan. The wetness, shallow root zone, and hazard of flooding severely limit the range of suited plants. Because of the slow permeability, open ditches are likely to be more effective than tile drains in improving drainage. Runoff and overwash from adjacent soils can be reduced by constructing ditches to intercept the water. Suitable outlets are not available for drainage in some areas. Even after drainage is improved, the soil is poorly suited for many cultivated crops because of wetness, the shallow root zone, and flooding. Tilth can be improved and the supply of organic matter increased by returning crop residue to the soil, growing green manure cover crops, and including grasses and legumes in the cropping system. Lime and fertilizer should be applied according to crop needs.

Shallow rooted pasture grasses and legumes that can tolerate wetness and flooding are best suited to this soil. The range of suited plants is very limited. If this soil is used for pasture, grazing should be restricted when the water table is near the surface, and overgrazing should be prevented. Grazing animals can cause excessive damage to the plants when the soil is saturated, and overgrazing results in thin cover of pasture plants and permits increased weed competition. Lime and fertilizer should be applied according to crop needs.

Trees are suited to this soil, and some of the acreage is in woods. Equipment restrictions, rate of seedling mortality, and plant competition are the main concerns of management for woodland. Cultivation or weeding by other suitable methods and shrubbing in cutover woods are generally required to control competition of undesirable plants until the seedlings are established. Because of droughtiness in summer and low fertility, seedling mortality is likely to be very high. Healthy, properly planted seedlings are most likely to survive. The use of equipment is restricted mainly because of the seasonal high water table and extreme wetness.

This soil is limited for most urban uses because of wetness, slow permeability, and flooding. Capability subclass IVw; woodland ordination 1w.

**RoE—Rock outcrop-Corydon complex, 12 to 30 percent slopes.** This complex consists of Rock outcrop and shallow, well drained soils on karst uplands. Slopes are complex. Runoff empties into openings in depressions and into underground streams. Areas are 7 to 100 acres in size. The Rock outcrop and Corydon soils occur together in such an intricate pattern that they were not separated in mapping. The Rock outcrop is limestone that occurs mostly as discontinuous outcrops, but in places the rock is ledges that are separated by narrow strips of soil. The complex is about 40 percent Rock outcrop, 30 percent Corydon silty clay loam, and 30 percent other soils.

In a representative profile of the Corydon soil in this complex, the surface layer is dark brown silty clay loam 5 inches thick. The subsoil, 11 inches thick, is reddish brown clay. Limestone bedrock is at a depth of 16 inches.

Included in mapping are some areas of the Caneyville, Hagerstown, and Fredonia soils that make up about 15 percent of the complex. Some soils in areas that are less than one-fourth acre in size have a dark brown silty clay loam surface layer, a grayish brown silty clay subsoil, and calcareous shale at a depth of about 15 inches. Also included in this complex are a few areas that are mostly limestone outcrops and exposed, soft, gray shale.

The Corydon soil in this complex has moderately slow permeability and low available water capacity. The root zone is shallow over limestone bedrock. The plow layer has a high organic matter content. Reaction ranges from slightly acid to mildly alkaline. Runoff is rapid. The clayey subsoil has a moderate shrink-swell potential. Limestone bedrock is at a depth of 10 to 20 inches.

This complex is in trees or brush. The soils are suited for cultivated crops or pasture, and they have poor potential for nearly all urban uses. Trees and woodland wildlife habitat are suited.

Cultivated crops are not suited to the soils in this complex mainly because of the extent and pattern of Rock outcrop, shallow depth of the root zone, and steepness of the slope. A permanent vegetative cover is needed to slow surface runoff and control erosion.

The soils in this complex are poorly suited to pasture because of the shallow depth of the root zone, low available water capacity, and the extent of Rock outcrop. The number of outcrops on the surface makes operation of equipment for seeding and for control of weeds impractical.

Trees are suited to the soils in this complex, and most of the acreage is in woods or brush. The hazard of erosion, equipment limitations, and the rate of seedling mortality are the main management concerns. To help control erosion, all logging roads and skid trails should be on the contour. The use of equipment is restricted because of the extent of Rock outcrop and the steepness of slope. The rate of seedling mortality is high for newly germinated seedlings and young planted trees because of the low available moisture supply during brief dry periods. Losses are likely to be highest on the south-facing slopes where moisture conditions are less favorable.

The soils in this complex are poorly suited to nearly all urban uses. Use of the soils is limited by the extent of Rock outcrop, steepness of the slopes, shallow soil depth, moderately slow permeability, and shrink-swell potential in the Corydon soil. Capability subclass VIIs; Corydon part in woodland ordination 3d, Rock outcrop part not in a woodland ordination.

**SdA—Sadler silt loam, 0 to 2 percent slopes.** This nearly level, moderately well drained soil is on broad ridgetops. Areas are about 7 to 300 acres in size, and most are dissected by shallow drainageways.

In a representative profile, the plow layer is dark grayish brown silt loam about 10 inches thick. The subsoil, about 41 inches thick, is yellowish brown silt loam to a depth of 24 inches. From 24 to 28 inches, the subsoil is pale brown silt loam mottled with yellowish brown and gray, and from 28 to 51 inches, it is a very firm, compact, strong brown loam fragipan mottled with gray. The substratum, more than 13 inches thick, is mottled yellowish brown and light gray silt loam.

Included in mapping are somewhat poorly drained Lawrence soils in some narrow bands that are less than one acre in size along drainageways.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted by the very firm, dense fragipan. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is slow. The plow layer has moderate organic-matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. The shrink-swell potential is low.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, pasture, or brush. This soil has limitations for urban uses because of slow permeability in the fragipan and wetness.

This soil is suited for cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. Seasonal wetness delays farming operations in some years. The root zone is limited by a very firm, dense fragipan at a depth of about 28 inches. Lack of roots in the fragipan can cause this soil to be droughty during dry seasons. The loamy plow layer has a moderate organic matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting, and the erosion hazard is slight. Tile drainage is generally not feasible, but constructing open ditches improves drainage in some areas. Running the rows up and down the slope often helps to remove excess surface water. Some practices that help insure continued high crop yields are returning crop residue to the soil, applying lime and fertilizer according to crop needs, growing green manure cover crops, and including grasses and legumes in the cropping system.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes that tolerate slight wetness are best suited. Lime and fertilizer are required for establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Machine planting is practical.

This soil is limited for urban uses because of slow permeability in the fragipan and a seasonal high water table within 18 to 24 inches of the surface. The slow permeability and wetness make it poorly suited to use as septic tank absorption fields. Excess water that results from the seasonal high water table can damage basements and cause severe water problems. Capability subclass IIw; woodland ordination 3o.

**SdB—Sadler silt loam, 2 to 6 percent slopes.** This gently sloping, moderately well drained soil is on ridgetops. The shape of the areas follows the pattern of the ridges, which are commonly long and winding. Slopes are slightly convex. Areas are from about 5 to 700 acres in size. On the margin of most areas are shallow drainageways.

In a representative profile, the plow layer is brown silt loam about 8 inches thick. The subsoil, about 43 inches thick, is yellowish brown silt loam to a depth of about 24 inches. From 24 to 28 inches, it is pale brown silt loam mottled with yellowish brown and gray. From 28 to 51 inches, the subsoil is a very firm, compact, strong brown loam fragipan mottled with gray. The substratum, more than 13 inches thick, is mottled yellowish brown and light gray silt loam.

Included in mapping are some thin bands and small areas of the somewhat poorly drained Lawrence soils that are along drainageways and in low places.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted by the very firm, dense fragipan. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is slow. The plow layer has moderate organic-matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. The shrink-swell potential is low.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, pasture, or brush. This soil is limited for urban uses mainly because of slow permeability in the fragipan and wetness.

This soil is suited for cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. This seasonal wetness delays farming operations in some years. The root zone is limited by a very firm, dense fragipan at a depth of about 28 inches. Lack of roots in the fragipan can cause this soil to be droughty during dry seasons. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Tile drainage is generally not feasible, but constructing open ditches improves drainage in some areas. The hazard of erosion is moderate, and control of erosion is a major concern of management where the soil is cultivated. Some practices that will slow surface runoff and help control erosion are minimum tillage, contour tillage, terracing, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residue should be kept on or near the surface, and incorporating some of it into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways should be kept in permanent vegetative cover to reduce erosion. Lime and fertilizer should be applied according to crop needs.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes are required for the establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Machine planting is practical.

This soil is limited for urban uses because of slow permeability in the fragipan and a seasonal high water table within 18 to 24 inches of the surface. The slow permeability and wetness make it poorly suited for use as septic tank absorption fields. Excess water that results from the seasonal high water table can damage basements and cause severe water problems. This soil erodes easily where it is exposed. If the soil is used as a construction site, development should be on the contour Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass IIe; woodland ordination 3o.

**SdC—Sadler silt loam, 6 to 12 percent slopes.** This sloping, moderately well drained soil is in bands 150 to 700 feet wide in areas between ridgetops and hillsides, on benches, and in fan-shaped areas at the head of drainageways. Slopes are slightly convex. Areas are about 5 to 30 acres in size. Shallow drainageways and wet spots occur in most areas. In a few severely eroded areas the plow layer is in the subsoil.

In a representative profile, the plow layer is brown silt loam about 6 inches thick. The subsoil, about 40 inches thick, is yellowish brown silt loam to a depth of about 21 inches. From 21 to 25 inches, it is pale brown silt loam mottled with yellowish brown and gray. From 25 to 47 inches, the subsoil is a very firm, compact, strong brown loam fragipan mottled with gray. The substratum, more than 17 inches thick, is silty clay loam mottled with yellowish brown and light gray.

Included in mapping are severely eroded Sadler soils in a few spots that are less than 2 acres in size, and in a few wet spots are some soils similar to the somewhat poorly drained Lawrence soils.

Permeability of this soil is moderate above the fragipan and slow in the fragipan. The available water capacity is moderate, and the root zone is moderately deep and is restricted by a very firm, dense fragipan. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. The plow layer has moderate organic-matter content and good tilth. A seasonal high water table is within 18 to 24 inches of the surface. The shrink-swell potential is low.

This soil is suited to farm crops and trees. Most of the acreage is in hay, pasture, or brush. This soil is limited for urban uses mainly because of slow permeability in the fragipan, wetness, and slope.

This soil is suited to cultivated crops that have shallow to moderately deep roots and can tolerate slight wetness. For long periods in winter the soil remains saturated, and it is somewhat slow to dry out and warm up in spring. This seasonal wetness delays farming operations in some years. The root zone is limited by a very firm, dense fragipan at a depth of about 25 inches. Lack of roots in the fragipan can cause this soil to be droughty during dry seasons. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range of moisture content without danger of clodding or crusting. Tile drainage is generally not feasible, but runoff and overwash from higher adjacent soils can be controlled in some areas by diversion ditches. The hazard of erosion is severe if this soil is cultivated, and control of erosion is a major concern of management. Some practices that will slow surface runoff and help control erosion are minimum tillage, contour tillage, terracing, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residue should be kept on or near the surface, and incorporating some of it into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways should be kept in permanent vegetative cover to reduce erosion. Lime and fertilizer should be applied according to crop needs.

This soil is suited to pasture. Shallow to moderately deep rooted grasses and legumes that tolerate slight wetness grow best. Hay crops that leave the soil unprotected after harvest are not well suited. Lime and fertilizer are required for establishment and maintenance of productive pasture plants. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short or sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate pasture to maintain production.

This soil is suited to trees, but most of the acreage is farmed. Control of erosion is the major concern of management. To control erosion all logging roads, skid trails, and planting operations should be on the contour. Machine planting is practical.

This soil is limited for urban uses because of slow permeability in the fragipan, slope, and a seasonal high water table within 18 to 24 inches of the surface. The slow permeability and wetness make it poorly suited to use as septic tank absorption fields. Excess water that results from the seasonal high water table can damage basements and cause severe water problems. This soil can be severely damaged by erosion unless it is protected by vegetative cover. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass IIIe; woodland ordination 3o.

**Sg—Sensabaugh silt loam** (0 to 2 percent slopes). This nearly level, well drained soil is in strips 150 to 900 feet wide on narrow flood plains. Areas are about 10 to 160 acres in size. It is subject to frequent flooding from November to May.

In a representative profile the plow layer is brown silt loam about 8 inches thick. The subsoil, about 19 inches thick, is brown silt loam. The substratum, more than 33 inches thick, is brown gravelly silt loam.

Included in mapping are some soils on alluvial fans, near stream channels, and in very narrow valleys. These soils are similar to Sensabaugh soils except that they have 15 to 30 percent gravel in the surface layer and in the subsoil. The included soils make up about 10 percent of the mapping unit.

This soil has moderately rapid permeability, high available water capacity, and a deep root zone. Reaction ranges from medium acid to mildly alkaline. Runoff is medium. The loamy plow layer has a moderate content of organic matter and good tilth. The seasonal high water table is at a depth of about 4 feet. Bedrock is at a depth of about 3 1/2 to 6 feet. The shrink-swell potential is low.

Most of the acreage of this soil is in row crops, hay, and pasture. This soil is suited to farming and trees. It is suited to cultivated crops; it is poorly suited to winter crops because of soil wetness during winter and spring. Urban uses are limited mainly because of flooding.

The plow layer has a moderate content of organic matter, and it is easy to work except in a few areas that are gravelly. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Practices are required that will maintain the content of organic matter and tilth. Some practices that are effective include stubble mulching, returning crop residue to the soil, planting winter cover crops, using minimum tillage, and including grasses and legumes in the cropping system. Runoff and overwash from adjacent soils can be controlled by constructing a ditch at the base of the slope. Scouring can be prevented along well defined drainageways by seeding them to permanent vegetative cover. In some areas, improvement of the stream channel is effective in reducing overflow and cutting along the banks. Some areas need lime, but most do not. Fertilizer should be applied according to crop needs.

Pasture grasses and legumes best suited to this soil are those that can withstand flooding. Maintaining productive stands of pasture plants and control of weeds are the main concerns of management. To help maintain pasture, grazing should be deferred until the plants are well established and controlled to prevent overgrazing and to reduce the amount of weed competition.

Trees are suited to this soil, but most of the acreage is farmed. Control of plant competition is the main concern of management for woodland. Cultivation or other suitable methods are often required to control weeds until seedlings are established.

This soil is limited for nearly all urban uses because of flooding. Even if it is protected from flooding, however, depth to seasonal high water table, moderately rapid permeability, depth to rock, and the high percentage of gravel in the substratum are limitations of this soil for some urban uses. Some included gravel deposits near the stream channels are a source of material that is used for surfacing farm roads. Capability subclass IIs; woodland ordination 2o.

**SnB—Sonora silt loam, 2 to 6 percent slopes.** This gently sloping, deep, well drained soil is on uplands. Areas are on winding, fingered ridgetops and are 200 to 2,500 feet wide and 5 to 2,000 acres in size. Shallow drainageways are in some areas.

In a representative profile the plow layer is brown silt loam 9 inches thick. The subsoil, more than 62 inches thick, is strong brown to reddish brown silt loam to a depth of about 25 inches. From 25 to 39 inches, the subsoil is reddish brown loam, and below that to a depth of 71 inches it is dark red sandy clay.

Included with this soil in mapping is Gatton silt loam in some areas that are less than one acre in size around the head of drainageways. This soil is moderately well drained and has a firm, compact layer in the subsoil.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The loamy plow layer has a moderate content of organic matter and good tilth. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. The shrink-swell potential is low to a depth of about 39 inches, and below that it is moderate. This soil has low strength.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture. The suitability of this soil for urban uses is limited mainly because of the moderate shrink-swell potential in the lower part of the subsoil and low strength.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is moderate, and the control of erosion is a major concern of management where the soil is cultivated. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need to be kept in permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are well suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally needed to reduce competition to seedlings planted in open fields.

This soil is limited for most urban uses mainly because of low strength and the tendency of the lower part of the subsoil to shrink and swell. This soil erodes easily where it is exposed. If the soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover needs to be established quickly in denuded areas. The establishment and maintenance of vegetation can be helped by stockpiling the topsoil and using it as the surface layer of developed sites. Capability subclass IIe; woodland ordination 2o.

**SnC—Sonora silt loam, 6 to 12 percent slopes.** This sloping, deep, well drained soil is on uplands. Areas are in bands 150 to 700 feet wide on winding, fingered ridgetops and on side slopes. Slopes are slightly convex. Areas are 3 to 125 acres in size, and most areas are dissected by shallow drainageways.

In a representative profile the plow layer is brown silt loam 9 inches thick. The subsoil, more than 62 inches thick, is strong brown to reddish brown silt loam to a depth of about 25 inches. From 25 to 39 inches it is reddish brown loam, and to a depth of 71 inches it is dark red sandy clay.

Included with this soil in mapping are some small areas of Gatton silt loam near the head of drainageways. The soil is moderately well drained and has a firm, compact layer in the subsoil.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The loamy plow layer has a moderate content of organic matter and good tilth. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. The shrink-swell potential is low to a depth of 39 inches and moderate below that. This soil has low strength.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, and pasture. Suitability of this soil for urban uses is limited because of slope, moderate shrink-swell potential in the lower part of the subsoil, and low strength.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has moderate organic-matter content and is easy to till. It can be worked over a fairly wide range of moisture content without danger of clodding or crusting. The hazard of erosion, which is severe if the soil is cultivated, is a major concern of management. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, the use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need to be kept in permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are well suited to this soil. The application of fertilizer, proper stocking rates to maintain desired pasture plants, deferred of grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition until seedlings are established.

This soil is limited for most urban uses mainly because of slope, tendency of the lower part of the subsoil to shrink and swell, and low strength. Controlling erosion is difficult if the plant cover is removed. If the soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. In some places it is practical to construct dikes and sediment basins to hold sediment in the construction area and reduce the amount of damage by sediment below the site. The establishment and maintenance of lawns can be helped by stockpiling the topsoil and using it as the surface layer of developed sites. Capability subclass IIIe; woodland ordination 2o.

**SnC3—Sonora silt loam, 6 to 12 percent slopes, severely eroded.** This sloping, deep, well drained soil is in bands 150 to 700 feet wide and 3 to 125 acres in size on winding, fingered ridgetops and side slopes. Slopes are slightly convex. Most areas are dissected by shallow drainageways. This soil is truncated by erosion and is gullied.

This soil has lost most of its original surface layer through erosion. In a representative profile, the plow layer is mostly yellowish brown silt loam about 7 inches thick. The subsoil, more than 62 inches thick, is strong brown to reddish brown silt loam to a depth of 23 inches. From 23 to 37 inches it is reddish brown loam, and to a depth of 69 inches it is dark red sandy clay.

Included with this soil in mapping are some small areas of Gatton silt loam around the head of drainageways. This soil is moderately well drained and has a firm, compact layer in the subsoil.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep. The loamy plow layer is low in organic-matter content and has fair tilth. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. The shrink-swell potential is low to a depth of 37 inches, and below that it is moderate. The soil has low strength.

This soil is mostly in pasture or brush, and a few areas have reverted to trees. It is better suited to pasture and hay or to trees than to cultivated crops. It is suited for occasional use for cultivated crops. Suitability of the soil for most urban uses is limited because of slope, low strength, and the tendency of the lower part of the subsoil to shrink and swell. Openland or woodland wildlife habitat are suited.

The effects of past erosion and the high risk of further damage limit the use of this soil for cultivated crops. It is suited for occasional cultivated use, but yields of most crops are generally lower than those on uneroded Sonora soils. The plow layer is low in organic-matter content, but the loamy texture makes it easy to work. It tends to clod and crust unless it is worked within a fairly narrow range in moisture content. Shallow to moderately deep gullies hinder the use of equipment. Controlling erosion, increasing the supply of organic matter, and improving tilth are major concerns of management if this soil is cultivated. Some practices that help to control erosion and increase crop yields are minimum tillage, contour tillage, terracing, stripcropping, the use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating crop residue into the plow layer helps improve tilth and increase the supply of organic matter. In some areas a few gullies may require filling to permit crossing with farm equipment. Drainageways need to be kept in permanent vegetative cover to reduce erosion.

All of the pasture grasses and legumes commonly grown in the area are suited to this soil. Obtaining and maintaining stands of pasture plants that provide adequate forage and control erosion are the main concerns of management. Important management practices are adequate seedbed preparation, applying lime and fertilizer according to crop needs, stocking rates sufficient to maintain key plant species, deferred grazing, rotation grazing, and restricted grazing when the soil is wet. Plants can be damaged by grazing before they are well established or by grazing when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate pasture to maintain production.

Trees are suited to this soil, and a small acreage is in trees. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition until seedlings are established. Undesirable plants compete more favorably with young conifers than with hardwoods.

This soil is limited for most urban uses mainly because of slope, tendency of the lower part of the subsoil to shrink and swell, and low strength. Controlling erosion is difficult if the plant cover is removed. If the soil is used as a construction site, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. In some places it is practical to construct dikes and sediment basins to reduce the amount of damage by sediment below the site. The upper part of the subsoil is suitable as topsoil, but it is low in content of organic matter. Capability subclass IVe; woodland ordination 2o.

**VrC—Vertrees silt loam, 6 to 12 percent slopes.** This deep, well drained, sloping soil is on narrow ridgetops and the upper parts of hillsides and in karst areas. The areas on ridges and hillsides are in bands 150 to 900 feet wide. Slopes are convex, most areas are cut by small drainageways. In the karst areas, depressions are common and the steepness of slopes varies within short distances. Runoff empties into openings in depressions and into underground streams. Areas of this soil are about 3 to 375 acres in size.

In a representative profile, the plow layer is dark grayish brown silt loam about 7 inches thick. About 10 percent of the volume is fragments of chert. The subsoil, more than 63 inches thick, is yellowish red, firm, plastic clay to a depth of about 24 inches. To a depth of about 70 inches it is red, firm, plastic clay that has about 12 percent, by volume, fragments of chert and soft shale.

Included with this soil in mapping are Crider soils in some areas that are less than about one acre in size. This soil has a brown silt loam surface layer and a subsoil that is strong brown silty clay loam to a depth of about 30 inches.

Permeability of this soil is moderately slow, and the available water capacity is high. Reaction in the plow layer is commonly strongly acid to very strongly acid in unlimed areas. The root zone is deep. The loamy plow layer has a moderate content of organic matter and fair tilth. It is fairly easy to work except in a few places that have fragments of chert and in clay spots. Runoff is medium. The subsoil has a moderate shrink-swell potential and low strength.

This soil is suited to farming and to trees. About three-fourths of the acreage is in pasture, hay, or row crops. The rest is in trees or brush. Urban uses of this soil are limited because of slope and moderate shrink-swell potential and low strength in the clayey subsoil. Openland and woodland wildlife habitat are suited.

All of the crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate content of organic matter and fair tilth. It is fairly easy to work except in a few places where a high content of fragments of chert or clayey spots interfere with tillage. This soil can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is severe and is a major concern of management where the soil is cultivated. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, the use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps improve tilth and maintain the supply of organic matter. Deep plowing should be avoided because it can mix the clayey subsoil with the plow layer. If this happens, the plow layer has a greater tendency to clod and crust because the subsoil is more clayey and commonly has a lower content of organic matter than the surface layer. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are suited to this soil. The application of lime and fertilizer according to crop needs, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil, but less than one-fourth of the acreage is in woods. Control of plant competition is the major concern of management for woodland. Shrubbing in cutover areas and cultivation or other suitable methods in open fields are generally required to control competition until young seedlings are established. Undesirable plants compete more favorably with young conifers than with hardwoods. Machine planting is practical.

This soil is limited for most urban uses mainly because of slope, low strength, moderately slow permeability, and the tendency of the clayey subsoil to shrink and swell. If the soil is used as a construction site, care should be taken to keep all drainage outlets open. If drainage outlets in depressions are stopped with sediment and debris, ponding can become a problem. To control erosion and reduce the amount of sediment produced, development of the site should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. The clayey subsoil is a poor source for topsoil. Stockpiling of the topsoil and using it to form the surface layer of developed sites can help in the establishment and maintenance of lawns and shrubs. Capability subclass IIIe; woodland ordination 2o.

**VrD—Vertrees silt loam, 12 to 20 percent slopes.** This deep, well drained, moderately steep soil is on hillsides and in karst areas. Areas on hillsides are in bands 150 to 1,000 feet wide that wind around the points of ridges and the heads of ravines. Slopes are convex, and most areas are cut by small drainageways. In the karst areas, depressions are common and slopes are irregular. Runoff empties into openings in depressions and into underground streams. In a few karst areas, small streams carry water to depressions that occur on adjacent soils. Some of these sinking creeks drain several hundred acres of soils. Areas of this soil are about 3 to 150 acres in size.

In a representative profile of this soil, the plow layer is dark grayish brown silt loam about 7 inches thick. About 10 percent of the volume is fragments of chert. The subsoil, more than 63 inches thick, is yellowish red, firm, plastic clay with yellowish brown mottles to a depth of about 24 inches. To a depth of 70 inches it is red, firm, plastic clay that has about 10 percent, by volume, fragments of chert and soft shale.

Included with this soil in mapping are some areas of the Crider, Nolin, and Newark soils. The included Crider soil has a brown silt loam surface layer and a strong brown silty clay loam subsoil that extends to a depth of about 30 inches. The included Nolin and Newark soils are in depressions that are less than about one acre in size. These included soils make up about 5 percent of the mapping unit.

This soil has moderately slow permeability and a high available water capacity. The root zone is deep. Reaction in the plow layer is commonly strongly acid to very strongly acid in unlimed areas. The loamy plow layer has a moderate content of organic matter and fair tilth. It is fairly easy to work except in a few places where fragments of chert or clayey spots interfere with tillage. Runoff is medium. The subsoil tends to shrink and swell, and it has low strength.

About two-thirds of the acreage is in pasture, hay, and row crops. Hay and pasture are better suited than intertilled crops because the soil is subject to severe damage by erosion unless it is protected. Trees are suited, and about one-third of the acreage is in trees or brush. The potential for urban uses is limited mainly because of slope, tendency of the subsoil to shrink and swell, low strength, and moderately slow permeability. Openland and woodland wildlife habitat are suited.

Cultivated crops are poorly suited to this soil because of slope and the risk of very severe damage by erosion. This soil is suited to occasional use for cultivated crops, but it needs to be in permanent cover most of the time. If it is cultivated, practices are needed that will help control erosion, improve tilth, and maintain the supply of organic matter. Some practices that help to control erosion are minimum tillage, contour tillage, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying lime and fertilizer according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps improve tilth and maintain the supply of organic matter. Deep plowing should be avoided because it can mix the clayey subsoil with the plow layer. If this happens, the plow layer has a greater tendency to clod and crust, because the subsoil is more clayey and commonly has a lower content of organic matter than the surface layer. Drainageways need a permanent vegetative cover to reduce erosion.

The loamy plow layer has a moderate content of organic matter and fair tilth. It is fairly easy to work except in a few places where fragments of chert or clayey spots interfere with tillage.

Pasture grasses and legumes and hay crops are better suited to this soil than cultivated crops because of the risk of damage by erosion where it is cultivated. All of the pasture grasses and legumes commonly grown in the area are suited. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil, and about one-third of the acreage is in woods or brush. Plant competition, hazard of erosion, and equipment limitations are the main concerns of management. Shrubbing in cutover areas and cultivation or weeding in open fields can be used to control competition from undesirable plants until seedlings are established. Conifers are more resistant to competition from undesirable plants than are hardwoods. The use of equipment is restricted mainly by the steepness of the slopes and by clayey spots that are slick when wet. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour. Machine planting is difficult because of the moderately steep slopes.

This soil is limited for most urban uses mainly because of steepness of the slopes, tendency of the clayey subsoil to shrink and swell, and low strength. If the soil is used as a construction site, care should be taken to keep all drainage outlets open. If outlets in depressions are stopped with sediment and debris, ponding can become a problem. To control erosion and reduce the amount of sediment produced, development of the site should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. The clayey subsoil is a poor source of topsoil. Stockpiling of the topsoil and using it to form the surface layer of developed sites can help in the establishment and maintenance of lawns and shrubs. Capability subclass IVe; woodland ordination 2c.

**VrE—Vertrees silt loam, 20 to 30 percent slopes.** This deep, steep, well drained soil is in bands 200 to 1,000 feet wide on hillsides, and in karst areas. Areas on hillsides wind around the points of ridges and the head of ravines. Slopes are convex. In the karst areas, depressions are common, and drainageways are dismembered and lead through openings in depressions into underground streams. Slopes are irregular and steepness varies within short distances. In some areas, small streams carry water to depressions that occur in areas of adjacent soils, and some of these sinking creeks drain several hundred acres of land. Areas of this soil are about 5 to 165 acres in size, and a few are truncated by erosion.

In a representative profile of this soil, the surface layer is dark grayish brown to a depth of about one inch and pale brown to a depth of 6 inches. It is silt loam and has about 8 percent, by volume, fragments of chert. The subsoil, more than 60 inches thick, is strong brown, firm silty clay loam to a depth of 14 inches. To a depth of 66 inches it is yellowish red to red, firm, plastic clay, mottled in shades of brown. About 8 percent of the subsoil consists of fragments of chert.

Included with this soil in mapping are Caneyville soils and Rock outcrop in some thin bands that are less than one acre in size on the rims of depressions. Also included are small areas of Nolin and Newark soils in areas that are less than one acre in size in depressions. Approximately 15 percent of the mapping unit is truncated by erosion and is gullied. In these severely eroded areas, the surface layer is yellowish brown to reddish brown silty clay loam.

This soil has moderately slow permeability and a high available water capacity. The root zone is deep. Reaction in the surface layer is commonly strongly acid to very strongly acid in unlimed areas. The surface layer has a moderate content of organic matter except in severely eroded areas where the content is low. Tilth is fair. The loamy plow layer is fairly easy to work except in severely eroded areas where the more clayey plow layer hinders tillage. Runoff is rapid. The clayey subsoil has low strength and tends to shrink and swell.

More than half of the acreage of this soil is in woods, and the rest is mostly in pasture or brush. It is poorly suited for cultivated crops because of the steepness of the slopes and the high risk of damage by erosion if the plant cover is removed. Pasture grasses and legumes, trees, and openland or woodland wildlife habitat are suited. Urban uses of this soil are limited mainly because of the steepness of the slopes.

This soil is not suited for cultivated crops because of the steepness of slopes and the risk of very severe damage by erosion if the plant cover is removed. Permanent vegetative cover is needed that will protect the soil from erosion.

Pasture grasses and legumes are suited to this soil. If it is used for pasture, management practices are needed that will slow surface runoff and control erosion. Suited plants that require the least amount of renovation should be selected for seeding. The application of lime and fertilizer is required to provide for quick establishment and maintenance of protective cover. Other management practices include proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants leaves the soil exposed to the forces of erosion and makes early renovation necessary to maintain production.

Trees are suited to this soil, and over half of the acreage is in woods or brush. Plant competition, hazard of erosion, and equipment limitations are the main concerns of management. Shrubbing in cutover areas and weeding in open fields can be used to control competition from undesirable plants until young seedlings are established. Undesirable plants compete more favorably with conifers than with hardwoods. The use of equipment is restricted mainly by the steepness of the slopes and by clayey spots that are slick when wet. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour. Machine planting is difficult on the steep slopes.

This soil is limited for most urban uses mainly because of steepness of the slopes, tendency of the clayey subsoil to shrink and swell, and low strength. It is subject to very severe damage by erosion if the plant cover is removed. If it is used as a construction site, removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass VIe; woodland ordination 2c.

**VtD3—Vertrees silty clay loam, 6 to 20 percent slopes, severely eroded.** This sloping to moderately steep, deep, well drained soil is on ridgetops and hillsides and in karst areas. Areas on ridgetops and hillsides are in bands 200 to 1,200 feet wide, and in karst areas they are in blocks. Slopes are convex, and in the karst areas steepness varies within short distances. The karst areas have common depressions. Runoff empties into openings in depressions and into underground streams. Some of these sinking creeks drain several hundred acres of land. Some depressions are ponded for brief periods, and some are permanently ponded. Areas of this soil are truncated by erosion and gullied and range from 5 to 400 acres in size.

This soil has lost most of its original surface layer through erosion. In a representative profile, the plow layer is yellowish brown to reddish brown silty clay loam about 6 inches thick. About 8 percent of the volume is made up of fragments of chert. The subsoil, more than 60 inches thick, is yellowish red, firm, plastic clay that has about 10 percent, by volume, fragments of chert and soft shale.

Included with this soil in mapping is a Crider soil in some intermingled areas that range from about 2 to 10 acres in size. This included Crider soil has a brown to yellowish brown silt loam surface layer and a subsoil that is strong brown silt loam and that extends to a depth of about 30 inches. It makes up about one-fourth of some areas and about 10 percent of the total acreage. Nolin silt loam and Newark silt loam occur in small depressions.

This soil has moderately slow permeability, high available water capacity, and a deep root zone. Reaction is commonly strongly acid to very strongly acid in unlimed areas. The plow layer has a low content of organic matter and fair tilth. Runoff is rapid. This soil has moderate shrink-swell potential and low strength.

Most of the acreage of this soil is in pasture or brush, and a few areas have reverted to trees. It generally is not suited for farming except for pasture grasses and legumes or other close growing crops that will protect it from further damage by erosion. It is suited for trees and for woodland or openland wildlife habitat. Urban uses of this soil are limited because of slope, shrink-swell potential, and low strength.

This soil is not suited for cultivation because of the effects of past erosion and the high risk of further damage if it is cultivated. Permanent vegetative cover is needed that will protect it from erosion.

Obtaining adequate stands of pasture grasses and legumes, overgrazing, and grazing when the soil is too wet are major concerns of management for pastureland. Because of the low content of organic matter, fair tilth, and uneven surface, adequate seedbeds are difficult to prepare, and suitable stands of grasses and legumes are difficult to establish. Thick vegetative cover is needed to protect the soil from erosion. Important management practices are adequate seedbed preparation, proper stocking rates to maintain desired pasture plants, application of lime and fertilizer according to crop needs, deferred grazing, rotation of pasture, and restricted grazing when the soil is too wet. Severe damage to the plant cover can result from grazing when the soil is wet or from overgrazing. Grazing animals can compact the soil when it is wet, and this increases the rate of runoff and the hazard of erosion. Overgrazing results in thin cover that does not adequately protect the soil from erosion and that may require renovation of the pasture to maintain production.

Trees are suited to this soil, but little of the acreage is in woods. Control of erosion, equipment limitations, and the rate of seedling mortality are the major concerns of management for trees. To help control erosion, all logging roads, skid trails, and planting operations should be on the contour. Machine planting is difficult because of the moderately steep slopes, uneven surface, and gullies. The use of equipment is restricted mainly because of the steepness of the slopes, the surface which is slick when wet, and the uneven surface. Good quality seedlings that are properly set are most likely to survive on this severely eroded soil.

This soil is limited for most urban uses mainly because of the steepness of the slopes, moderately slow permeability in the subsoil, tendency of the subsoil to shrink and swell, and low strength. If the soil is used as construction sites, care should be taken to keep drainage outlets in depressions open. If they are sealed by sediment and debris, ponding can become a severe problem. To control erosion and reduce the amount of sediment produced, development of the sites should be on the contour. Removal of vegetation should be held to a minimum, and vegetative cover should be established quickly in denuded areas. In some places it is practical to construct sediment basins or dikes to hold sediment in the construction area and prevent damage below the site. This soil is a poor source for topsoil because of the high content of clay and low content of organic matter. Capability subclass VIe; woodland ordination 3c.

**WbC—Waynesboro loam, 6 to 12 percent slopes.** This deep, well drained, sloping soil is on narrow ridgetops in bands 150 to 300 feet wide and in karst areas. Slopes are convex. In the karst areas, steepness varies within short distances. The karst areas have common depressions. Runoff empties into openings in depressions and into underground streams. Areas are about 3 to 65 acres in size, and most are cut by shallow drainageways.

In a representative profile of this soil, the surface layer is loam about 12 inches thick. It is dark gray to a depth of about 2 inches, brown to a depth of 8 inches, and strong brown to a depth of 12 inches. The subsoil, more than 48 inches thick, is yellowish red to reddish brown clay loam to a depth of about 30 inches. To a depth of 60 inches it is red clay mottled with strong brown.

This soil has moderate permeability, high available water capacity, and a deep root zone. Reaction in the surface layer is strongly acid to very strongly acid in unlimed areas. The surface layer has a moderate content of organic matter and good tilth. Runoff is medium. This soil has low strength. The shrink-swell potential is low above a depth of 30 inches, and below that it is moderate.

About half of the acreage of this soil is in trees, and the remainder is in cultivated crops, hay, and pasture. It is suited for farming and trees and for openland and woodland wildlife habitat. Hazard of erosion is the main limitation to its use for agricultural purposes. It is limited for most urban uses mainly because of slope, tendency of the lower part of the clayey subsoil to shrink and swell, and low strength.

Cultivated crops are suited to this soil, but it is subject to severe damage by erosion if it is cultivated, unless adequate measures are taken to protect it. Most of the crops commonly grown in the area are suited. The loamy plow layer has a moderate content of organic matter and is easy to work. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying lime and fertilizer according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion.

Pasture grasses and legumes are suited to this soil. The application of lime and fertilizer according to crop needs, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate pasture to maintain production.

Trees are suited to this soil, and about half of the acreage is in woods. Control of plant competition is the major concern of management for woodland. Shrubbing in cutover areas and cultivation or other suitable methods in open fields are generally required to control competition until the seedlings are established. Machine planting is practical.

This soil is limited for most urban uses mainly because of slope, low strength, and the tendency of the lower part of the subsoil to shrink and swell. It is subject to damage by erosion if the plant cover is removed. To control erosion and reduce the amount of sediment from construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Care should be taken to keep drainage outlets open in depressions. If these become sealed with sediment and debris, ponding can present a problem. In some places it is practical to construct sediment basins and dikes to hold sediment in the construction area and reduce the amount of damage below the site. The clayey subsoil is a poor source for topsoil. Stockpiling of the surface layer and using it to form the surface of developed sites can aid in the establishment and maintenance of vegetative cover. Capability subclass IIIe; woodland ordination 2o.

**WbD—Waynesboro loam, 12 to 20 percent slopes.** This moderately steep, deep, well drained soil is in bands 150 to 1,500 feet wide on narrow ridgetops and the upper parts of hillsides and in karst areas. Slopes are convex, and in the karst areas in steepness varies within short distances. Runoff empties into openings in depressions and into underground streams. Areas are 4 to 200 acres in size, and most are cut by a few shallow drainageways.

In a representative profile, the surface layer is dark gray to brown loam about 10 inches thick. The subsoil, more than 50 inches thick, is yellowish red clay loam to a depth of 30 inches. To a depth of 60 inches it is reddish brown to red clay mottled with strong brown.

Included in mapping are some small areas of Nolin and Newark soils in depressions.

This soil has moderate permeability, high available water capacity, and a deep root zone. Reaction in the surface layer is strongly acid to very strongly acid in unlimed areas. The surface layer has a moderate content of organic matter and good tilth. Runoff is rapid. This soil has low strength. The shrink-swell potential is low above to a depth of 30 inches, and below that it is moderate.

About one-half of the acreage of this soil is farmed, and the remainder is in woods. This soil is better suited to hay and pasture than to intertilled crops because it is subject to very severe damage by erosion if it is cultivated. It is suited to trees and to woodland and openland wildlife habitat. Steepness of the slopes, low strength, and the tendency of the lower part of the subsoil to shrink and swell limit its use for urban developments.

This soil is suited to only occasional use for cultivated crops because of the moderately steep slopes and a very severe hazard of erosion if it is cultivated. It should be kept in close growing crops most of the time. All of the crops commonly grown in the area are suited. The loamy plow layer has a moderate content of organic matter and is easy to work. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. Control of erosion is the major concern of management for cultivated uses. Some practices that will slow surface runoff and help control erosion are minimum tillage, contour tillage, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residues should be kept on or near the surface. Incorporating some crop residue into the plow layer helps maintain tilth and the supply of organic matter. Small, well defined drainageways need a vegetative cover that will protect erosion. Lime and fertilizer should be applied according to crop needs.

Overgrazing and grazing of pasture when it is too wet are the major concerns of management for pastureland. Important management practices are proper stocking rates to maintain desired pasture plants, applying lime and fertilizer according to crop needs, rotation of pasture, deferred grazing, and restricted grazing during wet seasons.

Trees are suited to this soil, and about one-half of the acreage is in woods. Control of plant competition and equipment restrictions are the main concerns of management for woodland. Shrubbing in cutover areas and cultivation or other suitable methods in open fields are generally required to control competition until seedlings are established. The use of equipment is restricted mainly because of the moderately steep slopes. Machine planting is difficult.

This soil is limited for most urban developments mainly because of steepness of the slopes. It also has low strength, and the lower part of the subsoil has a moderate shrink-swell potential. This soil is subject to very severe damage by erosion if the plant cover is removed. To help control erosion on construction sites, all development should be on the contour. Removal of vegetation should be held to a minimum, and vegetation should be established quickly in denuded areas. Care should be taken to leave drainage outlets open in depressions. If they are sealed with sediment and debris, ponding can become a severe problem. In some places it is practical to construct sediment basins and dikes to help hold sediment in the construction area and prevent damage below the site. The clayey subsoil is a poor source of topsoil. Stockpiling the surface layer and using it to form the surface of developed areas can help to establish protective cover. Capability subclass IVe; woodland ordination 2r.

**WbE—Waynesboro loam, 20 to 30 percent slopes.** This steep, deep, well drained soil is on hillsides in bands 150 to 800 feet wide, and in karst areas. Slopes are convex, and in the karst areas steepness varies within short distances. Depressions are common in the karst areas, and drainageways are dismembered and lead through openings in depressions into underground streams. Areas are about 3 to 190 acres in size, and some are truncated by erosion.

In a representative profile, the surface layer is dark gray to brown loam about 10 inches thick. The subsoil, more than 50 inches thick, is yellowish red clay loam to a depth of 30 inches. To a depth of 60 inches it is reddish brown to red clay mottled with strong brown.

Included in mapping are some soils similar to this Waynesboro soil except that they have about 10 to 20 percent, by volume, coarse fragments throughout the profile. Coarse fragments are pieces of chert or rounded quartz pebbles. This inclusion makes up about 10 percent of the mapping unit. Also included are some severely eroded spots of Waynesboro soils that have a clay loam surface layer.

This soil has moderate permeability, high available water capacity, and a deep root zone. Reaction in the surface layer is strongly acid to very strongly acid in unlimed areas. The plow layer is moderate in content of organic matter and has good tilth. Runoff is rapid. This soil has low strength. The shrink-swell potential is low above a depth of 30 inches, and below that it is moderate.

More than half of the acreage of this soil is in woods, and the remainder is in grass or brush. It generally is not suited for farming, but it is suited for pasture grasses and legumes. Woodland and openland wildlife habitat are suited. The steep slopes limit its use for urban developments.

Because of the steepness of the slopes and the high risk of damage by erosion, this soil is not suited for cultivated crops. It needs to be kept in vegetative cover that will protect it from erosion.

Pasture grasses and legumes are suited to this soil. If it is used for pasture, management practices are needed that will slow surface runoff and control erosion. Suited plants that require the least amount of renovation should be selected for seeding. Other management practices include proper stocking rates to maintain desired pasture plants, applications of lime and fertilizer according to crop needs, deferred grazing, rotation grazing, and control of weeds. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants leaves the soil exposed to the forces of erosion and may make early renovation necessary to maintain production.

Trees are suited to this soil, and more than half of the acreage is in woods. Control of plant competition and equipment restrictions are the main concerns of management for woodland. Shrubbing in cutover areas and cultivation or other suitable methods in open fields are generally required to control competition until seedlings are established. The use of equipment is restricted mainly because of the steep slopes. Machine planting is difficult.

This soil is limited for most urban developments mainly because of steepness of the slopes. It also has low strength, and the lower part of the subsoil has a moderate shrink-swell potential. It is subject to very severe damage by erosion if the plant cover is removed. If the soil is used as construction sites, removal of vegetation should be held to a minimum, and plant cover should be established quickly in denuded areas. Capability subclass VIe; woodland ordination 2r.

**WcC3—Waynesboro clay loam, 6 to 12 percent slopes, severely eroded.** This sloping, deep, well drained soil is in bands 150 to 800 feet wide on narrow ridgetops and the upper parts of hillsides and in karst areas. In the karst areas, depressions are common, and steepness varies within short distances. Runoff empties into openings in depressions and into underground streams. Areas of this soil are truncated by erosion, and most are cut by shallow to moderately deep drainageways. Areas range from about 3 to 50 acres in size.

This soil has lost most of its original surface layer through erosion. In a representative profile, the surface layer is yellowish brown clay loam about 8 inches thick. The subsoil, more than 52 inches thick, is yellowish red, firm, plastic clay loam to a depth of about 28 inches. To a depth of 60 inches deep it is reddish brown to red, firm, plastic clay mottled with strong brown.

Included in mapping are some small intermingled areas of uneroded Waynesboro soils that have a brown loam surface layer.

This soil has moderate permeability, high available water capacity, and a deep root zone. Reaction in the surface layer is strongly acid or very strongly acid in unlimed areas. The plow layer has a low content of organic matter and poor tilth. Runoff is rapid. The shrink-swell potential is low to a depth of about 28 inches, and below that it is moderate. This soil has low strength.

Most of the acreage of this soil is in pasture and brush. A few areas have reverted to trees. Pasture and hay crops are better suited than cultivated crops because of the risk of very severe damage by erosion if it is cultivated. Trees are suited, but little of the acreage is in trees. Openland and woodland wildlife habitat are suited. Suitability of this soil for urban uses is limited mainly because of slope, tendency of the lower part of the subsoil to shrink and swell, and low strength.

This soil is suited for only occasional use for cultivated crops because of the effects of past erosion and the high risk of further damage if it is cultivated. Yields of most crops are generally lower than those on the uneroded Waynesboro soils. The plow layer has a low content of organic matter and poor tilth. The clay loam texture and low content of organic matter make it somewhat difficult to work. It tends to clod and crust unless it is worked within a somewhat narrow range in suitable moisture content. The uneven, gullied surface hinders the operation of equipment. Control of erosion, improving tilth, and increasing the supply of organic matter are major concerns of management. Practices that will slow surface runoff and help to control erosion are minimum tillage, contour tillage, terracing, stripcropping, and use of cover crops and grasses and legumes in the cropping system. Crop residues should be kept on or near the surface. Incorporating some crop residue into the plow layer helps improve tilth and increase the supply of organic matter. Small, well-defined drainageways should be seeded to permanent vegetative cover that will protect them from erosion. Lime and fertilizer should be applied according to crop needs.

Obtaining adequate stands of pasture grasses and legumes, overgrazing, and grazing when the soil is too wet are major concerns of management for pastureland. Stands of grasses and legumes are sometimes difficult to establish mainly because of the low content of organic matter and poor tilth. Short and sparse cover of pasture plants increases the hazard of soil erosion and may make it necessary to renovate the pasture to maintain production. Important management practices are adequate seedbed preparation, applying lime and fertilizer according to crop needs, stocking rates sufficient to maintain desired plant species, deferred grazing, rotation grazing, and restricted grazing when the soil is wet. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing.

Trees are suited to this soil, but most of the acreage is farmed or is in brush. Equipment limitations and rate of seedling mortality are the main concerns of management for trees. The use of equipment is limited mainly because of the high content of clay in the surface layer which is slick when wet, slope, and the uneven surface. Machine planting is practical. Strong plants that are properly set are most likely to survive in this clayey soil that has low organic-matter content.

This soil is limited for most urban uses mainly because of slope, tendency of the lower part of the subsoil to shrink and swell, and low strength. If the soil is used as construction sites, care should be taken to keep drainage outlets open in depressions. If they are sealed by sediment and debris, ponding can become a problem. To control erosion and reduce the amount of sediment produced, development of the sites should be on the contour. Removal of vegetation should be held to a minimum, and vegetative cover should be established quickly in denuded areas. In some places it is practical to construct sediment basins and dikes in the construction area to help hold sediment in the construction area and reduce damage below the site. This soil is a poor source for topsoil because of the high content of clay and low content of organic matter. Capability subclass IVe; woodland ordination 3c.

**WcD3—Waynesboro clay loam, 12 to 20 percent slopes, severely eroded.** This moderately steep, deep, well drained soil is on the upper parts of hillsides, in bands 150 to 800 feet wide, and in karst areas. Slopes are convex, and in karst areas steepness varies within short distances. In the karst areas, runoff empties into openings in depressions and into underground streams. Areas of this soil are truncated by erosion and are gullied, and most are cut by shallow to moderately deep drainageways. They are 5 to about 50 acres in size.

This soil has lost most of its original surface layer through erosion. In a representative profile, the surface layer is yellowish brown clay loam about 8 inches thick. The subsoil, more than 52 inches thick, is yellowish red, firm, plastic clay loam to a depth of about 28 inches. To a depth of 60 inches it is reddish brown to red, firm, plastic clay mottled with strong brown.

Included in mapping are some small intermingled areas of uneroded Waynesboro soils that have a brown loam surface layer.

This soil has moderate permeability, high available water capacity, and a deep root zone. Reaction is strongly acid to very strongly acid in unlimed areas. Runoff is rapid. The plow layer has a low content of organic matter and poor tilth. The shrink-swell potential is low to a depth of about 28 inches, and below that it is moderate. This soil has low strength.

Most of the acreage of this soil is in pasture or brush, but a few areas have reverted to trees. This soil is not suited to cultivated crops because of the effects of past erosion and its high susceptibility to further damage if it is cultivated. It is suited to pasture or other close growing crops that will protect it from erosion. Trees and openland and woodland wildlife habitat are also suited. Slope, tendency of the subsoil to shrink and swell, and low strength limit its use for urban developments.

Obtaining adequate stands of pasture grasses and legumes, overgrazing, and grazing when the soil is too wet are major concerns of management for pastureland. Because of the low content of organic matter, poor tilth, and uneven surface, adequate seedbeds are difficult to prepare, and suitable stands of grasses and legumes are difficult to establish. Thick vegetative cover is needed to protect the soil from erosion. Important management practices are adequate seedbed preparation, proper stocking rates to maintain desired pasture plants, application of lime and fertilizer according to crop needs, deferred grazing, rotation of pasture, and restricted grazing when the soil is too wet. Severe damage to the plant cover can result from grazing when the soil is wet or from overgrazing. Grazing animals can compact the soil when it is wet, and this increases the rate of runoff and hazard of erosion. Overgrazing results in thin cover that does not adequately protect the soil from erosion and that may require renovation of pasture to maintain production.

Trees are suited to this soil, but little of the acreage is in woods. Equipment limitations and the rate of seedling mortality are the major concerns of management for woodland. The use of equipment is restricted mainly because of slope, the clayey surface which is slick when wet, and the uneven surface. Machine planting is difficult. Strong seedlings that are properly set are most likely to survive on this severely eroded soil.

This soil is limited for most urban uses mainly because of slope, tendency of the subsoil to shrink and swell, and low strength. If the soil is used as construction sites, care should be taken to keep drainage outlets in depressions open. If they are sealed by sediment and debris, ponding can become a severe problem. To control erosion and reduce the amount of sediment produced, development of the sites should be on the contour. Removal of vegetation should be held to a minimum, and vegetative cover should be established quickly in denuded areas. In some places it is practical to construct sediment basins or dikes to hold sediment in the construction area and prevent damage below the site. This soil is a poor source for topsoil because of the high content of clay and low content of organic matter. Capability subclass VIe; woodland ordination 3c.

**WlB—Wellston silt loam, 2 to 6 percent slopes.** This gently sloping, deep, well drained soil is on ridgetops and foot slopes. Slopes generally are slightly convex, but on foot slopes they are smooth to slightly concave. Areas are 150 to 300 feet wide and cover 3 to 25 acres. Shallow drainageways occur in most areas, and the areas on foot slopes have seepy spots and receive runoff from adjacent soils.

In a representative profile, the plow layer is dark grayish brown silt loam 8 inches thick. The subsoil, 34 inches thick, is yellowish brown silt loam to a depth of 12 inches. From 12 to 30 inches it is strong brown silty clay loam, and from 30 to 42 inches it is loam. The substratum, more than 8 inches thick, is strong brown sandy clay loam mottled in shades of red and brown. Sandstone fragments make up about 1 to 35 percent, by volume, of layers below a depth of 30 inches.

Included with this soil in mapping is a soil that is similar to this Wellston soil except that it is about 10 to 20 percent fragments of chert and siltstone in the surface layer and in the upper part of the subsoil. It makes up all of the acreage of a few areas, but in most it makes up less than 20 percent.

Permeability in this soil is moderate, and the available water capacity is high. The root zone is deep. The plow layer has a moderate content of organic matter and good tilth. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. Sandstone or shale bedrock is at a depth of 42 to 60 inches. The shrink-swell potential is low.

This soil is suited for farming and for trees. Most of the acreage is in cultivated crops, hay, or pasture. It is suited for urban developments except that depth to bedrock limits its use for some urban developments.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate organic-matter content and is easy to till. It can be worked over a fairly wide range in moisture content without danger of clodding or crusting. The hazard of erosion is moderate, and the control of erosion is the major concern of management. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to help reduce erosion. Some areas on foot slopes can be protected from overwash from adjacent soils by constructing diversion ditches.

Pasture grasses and legumes are well suited to this soil. The application of lime and fertilizer, proper stocking rates to maintain desired pasture plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are well suited to this soil, but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition to seedlings planted in open fields. Undesirable plants compete more favorably with young conifers than with hardwoods.

This soil is limited for some urban uses because of the depth to bedrock. It erodes easily if the plant cover is removed. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover should be established quickly in denuded areas. Ditches constructed near the upper boundary of areas on foot slopes can help reduce runoff and overwash from adjacent soils. Capability subclass IIe; woodland ordination 2o.

**WlC—Wellston silt loam, 6 to 12 percent slopes.** This sloping, deep, well drained soil is on upper side slopes, benches, ridgetops, and foot slopes. The areas are 150 to 700 feet wide and about 3 to 100 acres in size. Slopes generally are convex, but on foot slopes they are smooth to slightly concave. Most areas have shallow drainageways, and some areas on foot slopes have seepy spots and receive runoff and overwash from adjacent soils.

In a representative profile, the plow layer is dark grayish brown silt loam 8 inches thick. The subsoil, 34 inches thick, is yellowish brown silt loam to a depth of 12 inches. From 12 to 30 inches it is strong brown silty clay loam, and from 30 to 42 inches it is loam. The substratum, more than 8 inches thick, is strong brown sandy clay loam mottled in shades of red and brown. Sandstone fragments make up about 1 to 35 percent, by volume, of layers below a depth of about 30 inches.

Included with this soil in mapping are some soils similar to this Wellston soil except that they are about 10 to 20 percent fragments of chert and siltstone in the surface layer and in the upper part of the subsoil. These included soils make up all of the acreage in a few areas, but in most they make up less than 20 percent.

Permeability of this soil is moderate, and the available water capacity is high. The root zone is deep, and the plow layer has a moderate content of organic matter and good tilth. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. Sandstone or shale bedrock is at a depth of 42 to 60 inches. The shrink-swell potential is low.

This soil is suited to farming and to trees. Most of the acreage is in hay, pasture, and cultivated crops. Slope and depth to bedrock limit its use for urban purposes.

All of the cultivated crops commonly grown in the area are suited to this soil. The loamy plow layer has a moderate content of organic matter and is easy to till. It can be worked over a fairly wide range of moisture content without danger of clodding or crusting. The hazard of erosion is severe if the soil is cultivated, and this is a major concern of management. Some practices that help to control erosion and insure continued high crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps maintain good tilth and the supply of organic matter. Drainageways need a permanent vegetative cover to reduce erosion. Ditches constructed near the upper boundary of areas on foot slopes can help to reduce runoff and overwash from adjacent soils.

Pasture grasses and legumes are well suited to this soil. The application of lime and fertilizer according to crop needs, proper stocking rates to maintain desired plants, deferred grazing, rotation grazing, and control of weeds are important management practices. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Trees are suited to this soil but most of the acreage is farmed. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition to seedlings planted in open fields. Conifers are more resistant to competition from undesirable plants than are hardwoods.

This soil is limited for most urban uses mainly because of slope and depth to sandstone or shale bedrock. This soil erodes easily where it is exposed. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover should be established quickly in denuded areas. In some areas it may be practical to construct dikes and sediment basins in the construction area to hold sediment in the area and help reduce the amount of damage below the site. Diversion ditches constructed near the upper boundary of areas on foot slopes can help reduce the amount of runoff and overwash from adjacent soils. Areas on foot slopes are subject to slides. Capability subclass IIIe; woodland ordination 2o.

**WlC3—Wellston silt loam, 6 to 12 percent slopes, severely eroded.** This sloping, deep, well drained soil is on upper side slopes, ridgetops, and foot slopes. Areas are in bands 200 to 800 feet wide and are 7 to 100 acres in size. Slopes generally are convex, but on foot slopes they are smooth to slightly convex. Most areas have shallow drainageways and some areas on foot slopes have seepy spots and receive runoff and overwash from adjacent soils. Areas of this soil are truncated by erosion and have shallow to moderately deep gullies.

This soil has lost most of its original surface layer through erosion. Typically, the present plow layer is yellowish brown silt loam about 7 inches thick. The subsoil, about 34 inches thick, is strong brown silty clay loam to a depth of 29 inches, and to a depth of 41 inches it is yellowish brown loam. The substratum, more than 8 inches thick, is strong brown sandy clay loam mottled in shades of red and brown. Sandstone fragments make up about 1 to 35 percent, by volume, of the layers below a depth of about 29 inches.

Included in mapping are a few areas of a soil on foot slopes that is similar to Wellston soils except that it is about 10 to 20 percent fragments of chert and siltstone in the surface layer and in the upper part of the subsoil. This included soil is in areas in the eastern part of the survey area. It makes up all of the acreage in a few areas, but in most it makes up less than 25 percent.

Permeability of this soil is moderate, and the available water capacity is high. The plow layer has a low content of organic matter and fair tilth. The root zone is deep. Reaction is strongly acid or very strongly acid in unlimed areas. Runoff is medium. Sandstone or shale bedrock is at a depth of 41 to 60 inches. The shrink-swell potential is low.

Most of the acreage of this soil is in pasture, brush, or trees. This soil is better suited to hay and pasture than to cultivated crops. It is suited to trees, and some of the acreage is in trees or brush. The main limitations to use for urban developments are slope and depth to bedrock. This soil is suited to use as habitat for woodland and openland wildlife habitat.

The effects of past erosion and the high risk of further damage limit the use of this soil for cultivated crops. It is suited to occasional cultivation, but yields of most crops are generally lower than those on uneroded Wellston soils. The plow layer is low in organic-matter content, but the silt loam texture makes it easy to work. It tends to clod and crust unless it is worked within a fairly narrow range of moisture content. Controlling erosion, increasing the supply of organic matter, and improving tilth are the major concerns of management if the soil is cultivated. Some practices that help to control erosion and increase crop yields are minimum tillage, contour tillage, terracing, stripcropping, use of cover crops and grasses and legumes in the cropping system, and applying fertilizer and lime according to crop needs. Keeping crop residue on or near the surface also helps to slow surface runoff and control erosion. Incorporating some crop residue into the plow layer helps increase the supply of organic matter and improve tilth. Drainageways need a permanent vegetative cover to reduce erosion. Ditches constructed near the upper boundary of areas on foot slopes can help to reduce runoff and overwash from adjacent soils.

All of the pasture grasses and legumes commonly grown in the area are suited to this soil. Obtaining and maintaining stands of pasture plants that provide adequate forage and control erosion are the main concerns of management. Important management practices are adequate seedbed preparation, applying lime and fertilizer according to crop needs, stocking rates sufficient to maintain desired pasture plants, deferred grazing, rotation grazing, and restricted grazing when the soil is wet. Plants can be damaged by grazing before they are well established or when the soil is too wet or by overgrazing. Short and sparse cover of pasture plants increases the hazard of soil erosion and weed competition and may make it necessary to renovate the pasture to maintain production.

Some of the acreage of this soil is in brush or trees. Machine planting is practical. Cultivation or other suitable methods are generally required to reduce competition to young seedlings planted in open fields. Shrubbing in brushy areas and cutover woods helps reduce competition. Undesirable plants compete more favorably with young conifers than with hardwoods.

This soil is limited for most urban uses mainly because of slope and depth to sandstone or shale bedrock. Some areas on foot slopes are subject to slides. This soil erodes easily if it is exposed. If the soil is used as construction sites, development should be on the contour. Removal of vegetation should be held to a minimum, and temporary plant cover should be established quickly in denuded areas. In some areas it may be practical to construct dikes and sediment basins in the construction area to hold sediment and help reduce the amount of damage below the site. Diversion ditches constructed near the upper boundary of areas on foot slopes can help reduce the amount of runoff and overwash from adjacent soils. Capability subclass IVe; woodland ordination 2o.

# Use and management of the soils

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

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

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

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

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

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

## Crops and pasture

ROSCOE ISAACS, assistant state resource conservationist, Soil Conservation Service, helped prepare this section.

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

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

More than 300,000 acres in the survey area were used for crops and pasture in 1973 (*3*). Of this total, 76,000 acres were used for permanent pasture; 52,000 acres for row crops, mainly corn and tobacco; 10,000 acres for close-grown crops, mainly wheat and barley; 103,000 acres for rotation hay and pasture; and 25,000 acres for hay; 22,000 acres were in the Conservation Reserve Program; and the rest was mainly idle cropland.

The potential of the soils in Hardin and Larue Counties is good for increased production of food. About 36,000 acres of soils that have good potential as cropland are currently used as woodland, and about 38,000 acres are in pasture. In addition to the reserve productive capacity that these areas represent, food production can also be increased considerably through the use of the latest crop technology.

Acreage in crops and pasture has gradually been decreasing as more land is used for urban development. In 1967, about 18,000 acres of urban and built-up land were in the survey area; the acreage has increased at the rate of about 500 acres per year.

**Soil erosion.** The major concern of management on about 81 percent of the cropland and pastureland in Hardin and Larue Counties is soil erosion. If the slope is more than 2 percent, erosion is a hazard. Crider, Elk, Pembroke, Sonora, Hagerstown, and Wellston soils, for example, have slopes of more than 2 percent.

Loss of soil material from the surface layer through erosion reduces soil productivity and increases sedimentation in streams. Productivity is reduced as the surface layer is lost and the subsoil, which generally has lower fertility is incorporated into the plow layer. Loss of the surface layer is especially detrimental on soils with a clayey subsoil, for example, Cumberland, Hagerstown, Vertrees, Markland, Lenberg, Caneyville, and Fredonia soils, and on soils that are shallow to bedrock or that have a layer in or below the subsoil that limits the depth of the root zone. Gatton, Sadler, Nicholson, and Otwell soils, for example, have a fragipan, and Frondorf, Fredonia, Caneyville, Steinsburg, Garmon, Lenberg, Corydon, and Ramsey soils are shallow to bedrock. Erosion also reduces productivity on soils that tend to be droughty, for example, Corydon and Ramsey soils.

Controlling erosion can minimize the pollution of streams by sediment and help improve the quality of water for municipal and recreation uses and for fish and wildlife.

In many fields on sloping soils that are severely eroded or clayey, preparing a seedbed and tilling are difficult because the original friable surface soil material has been lost through erosion. For example, severely eroded Cumberland, Vertrees, and Markland soils have a plow layer that consists mostly of clayey subsoil material. In some uneroded areas, these and other soils have exposed clayey spots that are a result of erosion.

Terraces and diversions reduce the length of a slope and thereby help control runoff and erosion. They are most practical on deep, well drained soils that have regular slopes. Most areas of the Sonora, Wellston, and Elk soils and some areas of the Crider and Pembroke soils are suitable for terracing. Other soils are less suitable for terraces and diversions because of irregular slopes, excessive wetness, 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 effective erosion control practices in the survey area. They are best adapted to soils with smooth, uniform slopes, including the gently sloping Nicholson, Gatton, and Otwell soils, the gently sloping and sloping Elk, Sadler, Sonora, and Wellston soils, and some of the Crider and Pembroke soils.

Information about the design of erosion control systems can be obtained from local offices of the Soil Conservation Service.

**Soil drainage.** The major management concern on about 8 percent of the acreage used for crops and pasture in the survey area is soil drainage. Some soils are naturally so wet that the production of most crops common to the area is generally not possible. These are the poorly drained Robertsville and Melvin soils and the very poorly drained Dunning soils.

Unless artificially drained, the somewhat poorly drained soils are so wet that crops are damaged in most years. In this category are the Newark, McGary, and Lawrence soils.

The range of suited crops is somewhat limited on the moderately well drained soils in the survey area. These include the nearly level Nicholson, Otwell, Sadler, and Lindside soils, which have a major management concern of soil wetness. The gently sloping Nicholson, Gatton, and Otwell soils and the gently sloping and sloping Sadler soils are moderately well drained soils with slopes of more than 2 percent that have a major management concern of soil erosion. These soils become saturated in winter and are somewhat slow to dry out and warm up in spring. Some areas of the Lindside soils have been tile drained to increase the time available for field operations and to widen the range of suited crops. Artificial drainage is not generally practiced on the Gatton, Otwell, Nicholson, and Sadler soils. These soils have a hard, compact, brittle layer or fragipan in the subsoil which limits the depth to which tile drains can be placed and yet function properly. Ditches have been used in some areas of these soils to improve drainage. The moderately well drained soils are suited to many of the crops commonly grown in the area without the use of artificial drainage systems.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface and underground drainage is needed in most areas of poorly drained and very poorly drained soils that are used intensively for row crops. Drains have to be more closely spaced in soils with slow permeability than in the more permeable soils. Tile drainage is very slow in Lawrence, McGary, Robertsville, and Dunning soils. Finding adequate outlets for tile drainage systems is difficult in some areas of all the wet soils in the survey area, especially in depressions.

**Other soil features.** The major concerns of management on about 5 percent of the cropland and pastureland in Hardin and Larue Counties include the high content of gravel in the Sensabaugh soils, the coarse texture of the Nolin variant fine sandy loam soil, and Rock outcrop in areas of Caneyville and Fredonia soils. These features make the soils less suitable for crops and pasture because they hinder machine operations, limit the available water capacity, or both.

**Soil fertility.** Natural soil fertility is medium or low in most of the soils on uplands in the survey area. All of these soils are acid throughout the profile except that Fredonia, Garmon, Hagerstown, and Corydon soils range to neutral or mildly alkaline in horizons immediately above bedrock.

The soils on flood plains are less acid than the soils on uplands. The Huntington, Lindside, and Nolin soils range from medium acid to neutral; Melvin, Newark, and Sensabaugh soils are medium acid to mildly alkaline; and Dunning soils are slightly acid to mildly alkaline. These soils are naturally higher in plant nutrients than most upland soils.

The soils on stream terraces are naturally acid, except for the Ashton and Otwell soils, which range to neutral, and the McGary and Markland soils, which are alkaline in the lower part of the profile. The natural fertility is high in Ashton and Elk soils, medium in McGary and Lawrence soils, and low in Markland and Robertsville soils.

Many of the soils on uplands and stream terraces are naturally very strongly acid, and in unlimed areas ground limestone should be added for good growth of alfalfa and other crops that grow only on nearly neutral soils. Available phosphorus and potash levels are naturally low in most of these soils. Lime and fertilizer should be added according to results of soil tests, the crop to be grown, and the expected yield. The Cooperative Extension Service can help to determine the kinds and amounts of fertilizer and lime to apply.

**Soil tilth.** A soil characteristic that is important for the germination of seeds and the infiltration of water is soil tilth. Soils with good tilth are granular and porous.

Some of the soils used for crops in the survey area have a silt loam surface layer that is light in color and low in content of organic matter. Generally, these soils are weak, and intense rainfall causes the formation of a crust on the surface. This crust is hard when it is dry, and it is nearly impervious to water. Where the crust forms, it reduces infiltration and increases runoff. A few soils used for crops in the survey area have a silty clay loam surface layer and a low content of organic matter because erosion has removed most of the original surface layer and exposed the more clayey subsoil. These soils tend to form clods unless they are worked within a fairly narrow range in suitable moisture content. Regular additions of crop residue, manure, and other organic material can improve soil structure and reduce crusting and clodding.

Fall plowing is generally not a good practice on the light colored soils in the survey area that have a silt loam surface layer because of the crust that forms during the winter and spring. Many of the soils are nearly as dense and hard at planting time as before plowing. Also, about four-fifths of the cropland consists of sloping soils that are subject to erosion if they are plowed in the fall.

**Field crops.** The soils and climate of the survey area are suitable for many crops that are not commonly grown. Corn, tobacco, and soybeans are suitable row crops. Grain sorghum, sunflowers, navy beans, peanuts, potatoes, and similar crops can also be grown.

Wheat, barley, and oats are common close-growing crops. Rye can be grown, and grass seed can be produced from bromegrass, tall fescue, redtop, and bluegrass.

**Special crops.** Commercial crops grown in the survey area include vegetables, small fruits, tree fruits, and nursery plants. A small acreage in the survey area is used for melons, strawberries, sweet corn, Irish potatoes, tomatoes, cucumbers, peppers, snap beans, cabbage, and other vegetables and small fruits. In addition, large areas are suited to other special crops such as nursery and greenhouse products, grapes, and many vegetables. Apples and peaches are the most important tree fruits grown in the counties.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. Crops can generally be planted and harvested earlier on deep soils than on other soils in the survey area. The deep, well drained Ashton and Elk soils on stream terraces have limited potential for vegetable and fruit crops because they are subject to flooding.

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

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

### Yields per acre

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

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

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

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

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

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

### Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops (*7*). The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, as used in this survey area, all kinds of soil are grouped at two levels: capability class and subclass. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

*Capability classes*, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. 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 have other limitations, impractical to remove, that limit their use.

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

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

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

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

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

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

The capability subclass is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning."

## Woodland management and productivity

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

Kentucky is in the deciduous forest formation of eastern North America. Hardin and Larue Counties are in the Western Mesophytic Region, which is a transition zone between the mixed Mesophytic and Oak-Hickory Regions, the two forest regions in the state.

Hardin County is 38 percent woodland and Larue County is 33 percent. The dominant forest types are oak-hickory, central mixed hardwoods, and redcedar hardwoods, and they cover 100,000 acres in Hardin County and 55,700 acres in Larue County.

Only one-third of the forest area in these two counties is well stocked with merchantable or potentially merchantable trees, and only 16 percent is highly productive. Growth per commercial forest acre per year averages 54 cubic feet growing stock, which is near the average for the state.

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

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates 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 insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: w, d, c, and r.

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

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

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

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

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

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

## Engineering

RICHARD L. QUIGGINS, area engineer, and EMMETT M. BOLAND, assistant state conservation engineer, Soil Conservation Service, helped prepare this section.

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

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

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

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

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

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

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

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

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

### Building site development

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

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

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

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

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

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

### Sanitary facilities

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

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, and *poor*, which mean about the same as the terms *slight*, *moderate*, and *severe*.

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

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

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

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

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

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

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

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

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

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

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

### Construction materials

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

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

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

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

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

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

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

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

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

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

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

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

### Water management

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

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

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

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

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

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

## Recreation

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

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

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

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

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

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

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

## Wildlife habitat

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

The wildlife population of Hardin and Larue Counties includes 39 species of mammals, 116 species of breeding birds, and 73 species of reptiles and amphibians. Although the types of habitat required by wildlife vary, deer and squirrels generally use woodland habitat; rabbits, quail, doves, and woodcock use openland habitat; and ducks, geese, and muskrats use wetland habitat.

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

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

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area (*8*). This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of habitat are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

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

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

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

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

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

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

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

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

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

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

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

# Soil properties

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

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

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

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

## Engineering properties

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

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

*Texture* is described in table 14 in the standard terms used by the U.S. Department of Agriculture (*5*). These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

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

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

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

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

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

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

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

## Physical and chemical properties

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

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

*Available water capacity* is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

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

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

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

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

## Soil and water features

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

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

The four hydrologic soil groups are:

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

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

*Flooding* is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding; and on information that relates the position of each soil on the landscape to historic floods.

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

*High water table* is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

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

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

## Engineering test data

Table 17 contains the results of engineering tests performed on seven soils in the survey area by the Kentucky Department of Transportation, Bureau of Highways. These tests were made to help evaluate the soils for engineering purposes.

Moisture density data are important in earthwork. If soil material is compacted at successively higher levels of moisture content and the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, density decreases with any further increase in moisture content. The highest dry density obtained in the compaction test is termed maximum dry density. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

The results of mechanical analyses by the AASHTO method may differ somewhat from those obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-sized fractions are calculated on the basis of all material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis used in table 17 is not suitable for use in naming textural classes of soils.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as has been explained for table 14. The AASHTO and Unified methods of soil classification are explained in the section "Engineering properties".

The Crider pedon was sampled for laboratory testing because some of these soils mapped in the Crider-Vertrees-Nicholson association were thought to contain more coarse fragments in the lower part of the Bt horizon than is defined for the Crider series. Engineering data indicated this was correct; so adjustments were made in table 17 to reflect this property of some Crider soils in the survey area.

Nicholson soils were mapped extensively in the survey area. Because little engineering data were available to classify and make interpretations for these soils, it was necessary to sample them for engineering properties.

The Gatton, Riney, Sonora, and Vertrees series were established during the soil survey of this area. Some basic test data were needed for these new soil series.

The description of the Vertrees pedon is given in the section "Soil series and morphology." Descriptions of the remainder of the sampled pedons follow.

### Crider silt loam (taxajunct), S70KY47-1

Ap—0 to 7 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; common fine roots, medium acid; abrupt smooth boundary.

B21t—7 to 26 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous clay films; few worm casts; strongly acid; gradual smooth boundary.

IIB22t—26 to 41 inches; strong brown (7.5YR 5/6) cherty silt loam; 30 percent medium distinct pale brown (10YR 6/3) mottles; moderate fine subangular blocky structure; firm; 27 percent chert less than 3 inches in diameter; thin discontinuous clay films; few small brown concretions; strongly acid; clear smooth boundary.

IIB23t—41 to 66 inches; red (2.5YR 4/6) clay; common large distinct light gray (10YR 7/2) and very pale brown (10YR 7/3) mottles; moderate medium and fine angular blocky structure; very firm; sticky when wet; almost continuous clay films; strongly acid.

### Gatton silt loam, S73KY-62-5

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

B21t—7 to 22 inches; yellowish brown (10YR 5/6) heavy silt loam; moderate medium and fine subangular blocky structure; friable; common fine roots; few clay films lining small pores and root channels; lower 3 inches of horizon has few fine faint light yellowish brown (10YR 6/4) mottles; very strongly acid; clear wavy boundary.

Bx—22 to 35 inches; yellowish brown (10YR 5/4) loam; few grayish brown (10YR 5/2), light gray (10YR 7/1), and yellowish brown (10YR 5/8) mottles; strong coarse prismatic structure parting to weak thick platy very firm, brittle, compact; few fine roots between prisms; prism faces, plates, channels, and pores coated with brown (10YR 4/3); few oxide stains; few concretions; very strongly acid; gradual wavy boundary.

IIB22t—35 to 67 inches; red (2.5YR 4/6) heavy clay loam; common fine distinct yellowish brown (10YR 6/8) and very pale brown (10YR 7/4) mottles; moderate medium angular blocky structure; very firm, very sticky and plastic; almost continuous clay films; very strongly acid.

### Nicholson silt loam, S69KY-47-14

Ap—0 to 7 inches; brown (10YR 5/3) silt loam; weak fine granular structure; very friable; many roots; strongly acid; abrupt smooth boundary.

B21t—7 to 25 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common roots; few small cavities and root channels; thin patchy clay films on ped faces and in pores; common gray (10YR 6/1) silt coatings on coarse ped faces in lower 3 inches; very strongly acid; clear smooth boundary.

Bx—25 to 53 inches; yellowish brown (10YR 5/4) silt loam; common medium faint grayish brown (10YR 5/2) mottles; weak very coarse prismatic structure parting to coarse and medium angular blocky and medium platy; very firm and brittle; gray (10YR 6/1) silt coats on some ped faces and gray (5Y 5/1) clay tongues 1/4- to 1/2-inch wide; one root; 2 small pieces of chert; very strongly acid; gradual smooth boundary.

IIB22t—53 to 78 inches; brown (7.5YR 4/4) ped surfaces; mottled red (2.5YR 4/6), yellowish brown (10YR 5/6), and yellowish red (5YR 5/6) ped interiors; silty clay loam; moderate fine angular blocky structure; firm; slightly sticky; continuous clay films; few gray (10YR 5/1) vertical clay tongues 1/4 inch in width; few light gray (10YR 7/1) silt coatings; 5 percent chert fragments 1 to 2 inches in diameter; very strongly acid.

### Riney loam, S69KY-47-18

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam in upper 2 inches, yellowish brown (10YR 5/4) and brown (10YR 5/3) loam in lower 5 inches; weak fine granular structure; very friable; many roots; slightly acid; clear smooth boundary.

B21t—7 to 15 inches; red (2.5YR 4/6) ped interiors; many exterior surfaces coated with pale brown (10YR 6/3) sand; heavy loam; moderate medium and fine subangular blocky structure; firm; common roots; thin patchy clay films; 1 fragment of iron rock 1 inch in diameter; medium acid; gradual smooth boundary.

B22t—15 to 38 inches; red (2.5YR 4/6) sandy clay loam; moderate coarse and medium subangular blocky structure; firm, slightly sticky; few roots; reddish brown (5YR 4/4) medium clay films on ped surfaces and in pores and cavities; few light yellowish brown (10YR 6/4) very fine sand coatings on large ped surfaces in upper part and common in lower part; 1 rounded iron concretion 1 inch in diameter; very strongly acid; gradual smooth boundary.

B23t—38 to 44 inches; red (2.5YR 4/6) fine sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles and few pale brown (10YR 6/3) sand coats; weak coarse subangular blocky structure; firm; few roots; reddish brown (5YR 4/4) thin clay films; very strongly acid; clear smooth boundary.

C—44 to 69 inches; strong brown (7.5YR 5/6) weakly cemented sandy clay loam; reddish brown (5YR 4/4) clay coats on the horizontal and vertical cleavage planes; massive parting to coarse blocky structure when disturbed; firm; few thin discontinuous layers of sandstone; very strongly acid.

**Sonora silt loam, S73KY-62-4**

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

B21t—9 to 25 inches; strong brown (7.5YR 5/6) silty clay loam; most ped faces are brown (7.5YR 4/4); moderate medium angular blocky structure; friable; common fine roots; few thin clay films in root channels; slightly acid; clear smooth boundary.

B22t—25 to 33 inches; strong brown (7.5YR 5/6) loam; common medium faint mottles of brown (7.5YR 4/4) and light yellowish brown (10YR 6/4); weak medium angular blocky structure parting to weak thick platy; very firm; discontinuous clay films on peds and in pores; few oxide coatings; few fine roots; very strongly acid; gradual smooth boundary.

IIB23t—33 to 72 inches; red (2.5YR 4/6) ped interiors and dark red (2.5YR 3/6) ped faces; clay loam; few fine faint reddish yellow (7.5YR 6/6) mottles; strong medium and fine angular blocky structure; firm, sticky, plastic; continuous thin clay films; few fine roots; very strongly acid.

# Soil series and morphology

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

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*5*). Unless otherwise noted, colors described are for moist soil.

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

## Allegheny series

The Allegheny series consists of fine-loamy, mixed, mesic Typic Hapludults. The soils are deep, well drained and have a strong brown clay loam B2t horizon. They formed in colluvium that was derived from acid sandstone, siltstone, and shale. The Allegheny soils are on benches and footslopes. Slope ranges from 12 to 40 percent but is dominantly 15 to 30 percent.

Allegheny soils are associated with the Ramsey, Steinsburg, Lenberg, Caneyville, Frondorf, and Wellston soils. They are deeper than all of these soils except Wellston soils. They contain more clay and sand in the upper part of the solum than Wellston soils.

Typical pedon of Allegheny loam in an area of Ramsey-Steinsburg-Allegheny complex, 20 to 40 percent slopes, 100 feet east of a rural road from a point on the rural road 2.7 miles south of the intersection of Ky. Hwy. 86, which is 3/4 mile west of Howe Valley or about 13 miles west of Elizabethtown.

Ap—0 to 6 inches, brown (10YR 5/3) loam; weak fine granular structure; very friable; few roots, few sandstone fragments from 1 to 10 inches long; medium acid; abrupt, smooth boundary.

B1t—6 to 11 inches, strong brown (7.5YR 5/6) light clay loam; weak medium subangular blocky structure; friable; slightly sticky; common thin clay films; common roots; few small sandstone fragments; medium acid; clear smooth boundary.

B2t—11 to 24 inches, strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common clay films; few sandstone fragments; strongly acid; gradual smooth boundary.

B3t—24 to 33 inches, strong brown (7.5YR 5/6) sandy clay loam; weak medium and coarse subangular blocky structure; friable; slightly sticky; few clay films; few sandstone fragments; strongly acid; gradual wavy boundary.

C—33 to 50 inches, strong brown (7.5YR 5/6) sandy loam; massive; very friable; many yellow (10YR 7/6) remnants of weathered sandstone; few sandstone fragments; strongly acid.

R—50 inches, brown, coarse grained, weakly cemented sandstone.

The solum ranges from 30 to 40 inches in thickness. Depth to bedrock is more than 48 inches. Coarse fragments make up 0 to 15 percent of the solum and 0 to 35 percent of the C horizon. Reaction in all horizons is very strongly acid or strongly acid in unlimed areas.

The Ap horizon has value of 4 and 5 and chroma of 2 or 3. Uncultivated areas have an A1 horizon that has hue of 10YR, value of 4, and chroma of 2 or 3 and an A2 horizon that has hue of 10YR, value of 5, and chroma of 3 or 4. Texture of the A horizon is loam, fine sandy loam, or silt loam.

The B1t horizon has hue of 7.5YR or 10YR and chroma of 4 or 6. The texture ranges from light clay loam to fine sandy loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 and 5, and chroma of 4 or 6. It is clay loam, loam, or sandy clay loam.

The B3t horizon is sandy clay loam or loam.

The C horizon has hue of 7.5YR or 10YR. It is sandy loam, loam, or gravelly sandy loam.

The R horizon is brown, coarse grained, weakly cemented sandstone, or it is soft, acid, clayey shale in shades of gray, brown, or olive, which is often interbedded with thin strata of siltstone or sandstone.

## Ashton series

The Ashton series consists of fine-silty, mixed, mesic Mollic Hapludalfs. The soils are deep, well drained and have a brown to dark yellowish brown silt loam B2t horizon. They formed in mixed alluvium that was derived chiefly from soils that formed in limestone and loess. The Ashton soils are on stream terraces. Slope ranges from 0 to 2 percent.

Ashton soils are associated with the Elk, Lawrence, Otwell, Nolin, Newark, and Lindside soils. They are darker colored in the upper part of the solum than Elk and Nolin soils, and they also have an argillic horizon which the Nolin soils lack. Ashton soils are better drained than the Otwell, Lawrence, Newark, and Lindside soils; and unlike the Lawrence and Otwell soils, they do not have a fragipan.

Typical pedon of Ashton silt loam in a cultivated field 200 feet west of rural road from a point on the rural road 0.7 mile south of intersection with Ky. Hwy. 1136. This intersection is 0.1 mile west of intersection of Ky. Hwy. 1136 and Interstate Hwy. 65 or about 8 miles south of Elizabethtown.

Ap—0 to 10 inches, dark brown (10YR 3/3) silt loam; weak fine granular structure; friable; common roots; neutral; abrupt smooth boundary.

B1—10 to 18 inches, brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common intrusions of brown (10YR 4/3) in pores, root channels, and cracks; common roots; neutral; clear smooth boundary.

B21t—18 to 26 inches, brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm; thin clay films; few concretionary stains; few roots; few worm holes and worm casts; slightly acid; clear smooth boundary.

B22t—26 to 48 inches, dark yellowish brown (10YR 4/4) heavy silt loam; few faint mottles of pale brown (10YR 6/3) in lower part; weak fine subangular blocky structure; firm; thin clay films; few concretionary stains; few roots; medium acid; gradual smooth boundary.

C—48 to 66 inches, yellowish brown (10YR 5/4) silt loam; common mottles of light gray (10YR 7/2) and few mottles of yellowish brown (10YR 5/6); massive; firm; many concretions in the lower three inches; medium acid.

The solum ranges from 40 to 55 inches in thickness. Depth to bedrock is more than 72 inches. Reaction in all horizons is medium acid to neutral in unlimed areas.

The Ap horizon has chroma of 2 or 3.

The B1 horizon has hue of 10YR or 7.5YR and chroma of 3 or 4. The B2t horizon has hue of 10YR or 7.5YR and value of 4 and 5.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4. It is silt loam or silty clay loam.

## Caneyville series

The Caneyville series consists of fine, mixed, mesic, Typic Hapludalfs. The soils are moderately deep, well drained and have yellowish red and strong brown clay in the B2t horizon. They formed chiefly in residuum from limestone. The Caneyville soils are on hillsides and ridgetops and in karst areas. Slope ranges from 6 to 30 percent but is dominantly 12 to 20 percent.

Caneyville soils are associated with the Garmon, Hagerstown, Vertrees, Corydon, Crider, Riney, Waynesboro, Fredonia, Lenberg, and Allegheny soils. They are shallower to bedrock than the Hagerstown, Vertrees, Crider, Riney, Waynesboro, and Allegheny soils. Caneyville soils are lighter colored in the upper part of the solum than Fredonia soils. They are deeper than Corydon soils and less acid in the lower part of the profile than Lenberg soils. They have more clay in the subsoil than Garmon soils.

Typical pedon of Caneyville silt loam in an area of Caneyville-Rock outcrop complex, 6 to 20 percent slopes, in woodland, 500 feet east of a rural road and 500 feet north of a farm lane from a point on the rural road which is 1.7 miles north from the intersection of the rural road and Ky. Hwy. 434, about 8.3 miles north of Elizabethtown.

A1—0 to 2 inches, dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; very friable; many small roots; few small chert fragments; strongly acid; abrupt smooth boundary.

A2—2 to 5 inches, yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; very friable; many small roots; few small pores; strongly acid; abrupt smooth boundary.

B21t—5 to 22 inches, yellowish red (5YR 4/6) clay; moderate fine angular blocky structure; firm; common small roots; many clay films; strongly acid; gradual smooth boundary.

B22t—22 to 34 inches, strong brown (7.5YR 5/6) clay; common medium faint yellowish red (5YR 4/6) and grayish brown (10YR 5/2) mottles; moderate fine and medium angular blocky structure; very firm; few small roots; many clay films; few thin black stains on peds; slightly acid; abrupt smooth boundary.

R—34 inches, light gray limestone.

Thickness of the solum and the depth to limestone bedrock range from 20 to 40 inches. Content of limestone, chert, or sandstone fragments ranges from 0 to 10 percent. The A horizon is strongly acid to medium acid in unlimed areas. The B21t horizon is strongly acid to very strongly acid, and the B22t horizon is medium acid to slightly acid.

The A1 horizon has value of 3 and 4, and the A2 horizon has value of 5 and 6 and chroma of 3 or 4. Cultivated areas have an Ap horizon that has hue of 10YR, value of 4 and 6, and chroma of 3 or 4. The texture of the A horizon is silt loam or loam, except in some severely eroded spots where the Ap horizon is silty clay loam or silty clay.

Some pedons have a B1 or B1t horizon 3 to 7 inches thick that has hue of 7.5YR or 5YR, value of 4 and 5, and chroma of 4 or 6. It is silty clay loam.

The B21t horizon has hue of 5YR or 2.5YR, value of 4 and 5, and chroma of 4 or 6. It is silty clay or clay.

The B22t horizon has hue of 10YR to 5YR, value of 4 and 5, and chroma of 4 or 6. Mottles are in shades of brown, yellow, or gray. Some pedons do not have mottles in the B22t horizon. Texture is silty clay or clay.

Some pedons have B3t or C horizons with matrix and mottle colors in shades of red, brown, yellow, olive, or gray. These horizons are silty clay or clay.

## Corydon series

The Corydon series consists of clayey, mixed, mesic Lithic Argiudolls. The soils are shallow, well drained and have a reddish brown clay B2t horizon. They formed in residuum from limestone. The Corydon soils are on karst uplands. Slope ranges from 12 to 30 percent but is dominantly 15 to 25 percent.

Corydon soils are associated with the Fredonia, Hagerstown, Pembroke, Caneyville, and Cumberland soils. They are shallower to bedrock and have a thinner B2t horizon than all of these soils.

Typical pedon of Corydon silty clay loam in an area of Rock outcrop-Corydon complex, 12 to 30 percent slopes, in woods 300 feet south of Center Point Road at a point on the Road 0.25 mile west of Olive Hill Church. This church is 1.5 miles southwest of the intersection of Center Point Road and Ky. Hwy. 1868 or about 4 miles west of Sonora.

01—1 inch to 0, partially decayed leaves and twigs.

A1—0 to 5 inches, dark brown (7.5YR 3/2) silty clay loam; moderate medium granular structure; friable; many roots; neutral; abrupt smooth boundary.

B2t—5 to 16 inches, reddish brown (5YR 4/4) clay; moderate fine angular blocky structure; firm, sticky, plastic; common clay films; few rock fragments; common roots; neutral; abrupt irregular boundary.

R—16 inches, slightly weathered limestone.

The thickness of the solum and depth to bedrock range from 10 to 20 inches. The reaction in all horizons is slightly acid or neutral.

The A1 horizon has hue of 10YR or 7.5YR. It is silt loam or silty clay loam.

The B2t horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 to 6. It is clay, silty clay, or heavy silty clay loam.

The R horizon is cracked and broken limestone; lithic contact is at a depth of less than 20 inches.

## Crider series

The Crider series consists of fine-silty, mixed, mesic Typic Paleudalfs. The soils are deep, well drained and have a brown silt loam to light silty clay loam B2t horizon and a red silty clay IIB2t horizon. They formed in loess and the underlying residuum from limestone. In this survey area, the Crider soils in the Crider-Vertrees-Nicholson association on the General Soil Map are taxadjuncts because they have more coarse fragments in the lower part of the Bt horizon than is defined for the Crider series. Crider soils are on ridgetops and side slopes and in karst areas. Slope ranges from 2 to 20 percent but is dominantly 2 to 12 percent.

Crider soils are associated with the Nicholson, Vertrees, Pembroke, Cumberland, Caneyville, Lawrence, and Fredonia soils. They contain more silt and less clay in the upper part of the solum than all of these soils except for Nicholson soils. They are better drained; and unlike the Nicholson and Lawrence soils, they do not have a fragipan.

Typical pedon of Crider silt loam in an area of Crider silt loam, 2 to 6 percent slopes, in a cultivated field 50 feet west of farm lane at a point on the lane 1/4 mile south of Glendale Children's Home, about 9 miles south of Elizabethtown.

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

B1t—8 to 13 inches, brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common worm casts; few intrusions of brown (10YR 4/3); few fine roots; medium acid; gradual smooth boundary.

B21t—13 to 26 inches, brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; thin discontinuous clay films; few worm holes and root channels; few roots; few oxide accumulations; strongly acid; clear smooth boundary.

B22t—26 to 48 inches, reddish brown (5YR 4/4) light silty clay loam with common medium distinct mottles of pale brown (10YR 6/3) and strong brown (7.5YR 5/6); moderate medium subangular blocky structure; firm, slightly sticky when wet; thin continuous clay films; few worm casts; common oxide accumulations; few small chert fragments; strongly acid; gradual smooth boundary.

IIB23t—48 to 62 inches, red (2.5YR 4/6) silty clay; few mottles of yellowish brown (10YR 5/4) and pale brown (10YR 6/3); moderate medium subangular blocky structure; very firm, sticky when wet; continuous clay films; few oxide accumulations; 10 percent chert fragments less than 3 inches thick; strongly acid.

The solum is more than 60 inches thick. Depth to bedrock is more than 72 inches. Coarse fragments make up 0 to 15 percent of the IIBt horizon. Reaction in all horizons is strongly acid or medium acid in unlimed areas.

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

The B1t horizon has hue of 10YR or 7.5YR.

The B21t horizon has hue of 10YR or 7.5YR, value of 4 and 5, and chroma of 4 or 6. It is silt loam or light silty clay loam.

The B22t horizon has hue of 7.5YR or 5YR, value of 4 and 5, and chroma of 4 or 6. It is silt loam or light silty clay loam.

The IIB2t horizon has hue of 5YR or 2.5YR and value of 3 or 4. It is silty clay, clay, or heavy silty clay loam.

## Cumberland series

The Cumberland series consists of fine, mixed, thermic Rhodic Paleudalfs. The soils are deep, well drained and have a dark red clay B2t horizon. They formed in residuum from limestone. In this survey area, Cumberland soils are a taxadjunct because they are a few degrees cooler than the range that is defined for the series and have 1 to 15 percent chert fragments. Some horizons have 25 percent chert fragments. The Cumberland soils are on ridgetops and side slopes in karst areas. Slope ranges from 6 to 20 percent but is dominantly 6 to 12 percent.

Cumberland soils are associated with the Pembroke, Crider, Corydon, Hagerstown, and Fredonia soils. They are deeper to limestone bedrock than the Corydon, Hagerstown, and Fredonia soils. They have more clay in the upper part of the Bt horizon than Crider and Pembroke soils.

Typical pedon of Cumberland silt loam in an area of Cumberland silt loam, 6 to 12 percent slopes, in a pasture 25 feet north of rural road from a point on the rural road 1 mile east of the intersection with Ky. Hwy. 1375, which is 2.6 miles south of Star Mill or about 12 miles south of Elizabethtown.

Ap—0 to 5 inches, dark reddish brown (5YR 3/4) silt loam; moderate medium granular structure; very friable; common roots; 2 percent chert fragments less than 2 inches long; slightly acid; abrupt smooth boundary.

B1t—5 to 11 inches, dark reddish brown (2.5YR 3/4) silty clay loam that has more than 35 percent clay; moderate medium subangular blocky structure; firm, sticky, plastic; discontinuous clay films; 10 percent chert fragments up to 6 inches long; few roots; few worm casts; medium acid; clear wavy boundary.

B21t—11 to 20 inches, dark red (2.5YR 3/6) clay; moderate fine angular blocky structure; very firm, sticky, plastic; common clay films; few fine roots; 1 percent chert fragments less than 3 inches long; strongly acid; gradual smooth boundary.

B22t—20 to 39 inches, dark red (2.5YR 3/6) clay; moderate medium angular blocky structure; very firm, sticky, plastic; continuous clay films; less than 1 percent weathered chert fragments; medium acid; gradual smooth boundary.

B23t—39 to 65 inches, dark red (10R 3/6) clay; moderate medium angular and subangular blocky structure; very firm, sticky, plastic; thick continuous clay films; 1 percent chert fragments less than 1 inch long; medium acid.

The solum thickness and depth to bedrock are more than 60 inches. The chert fragments in the solum commonly range from about 1 to 15 percent, but some pedons have as much as 25 percent in one or more horizons. Reaction is medium acid or strongly acid in unlimed areas.

The Ap horizon has hue of 5YR or 7.5YR and chroma of 3 or 4. It is silt loam except in severely eroded areas where it is silty clay loam.

The BT horizon has hue of 2.5YR or 10R and chroma of 4 or 6. Some severely eroded pedons do not have a B1t horizon. Texture of the B2t horizon is clay or silty clay.

## Dunning series

The Dunning series consists of fine, mixed, mesic Fluvaquentic Haplaquolls. The soils are deep, very poorly drained and have a dark gray silty clay Bg horizon and Cg horizon. They formed in slack water alluvium that washed chiefly from soils that developed in limestone. Dunning soils are in karst valleys and depressions. Slope ranges from 0 to 2 percent.

Dunning soils are associated with the Melvin, Newark, Lindside, Nolin, and Huntington soils. They have poorer natural drainage and more clay throughout than these soils.

Typical pedon of Dunning silty clay loam, in a pasture 300 yards north of Ky. Hwy. 86 from a point on the Hwy. 1 3/4 miles west of Cecilia or about 6 miles west of Elizabethtown.

Ap—0 to 7 inches, very dark grayish brown (10YR 3/2) silty clay loam; few fine distinct mottles of light olive brown (2.5 YR 5/4); moderate fine granular structure; friable; common roots; neutral; abrupt smooth boundary.

A1g—7 to 16 inches, very dark gray (10YR 3/1) silty clay; common fine distinct mottles of light olive brown (2.5YR 5/4) and few fine distinct dark reddish brown (5YR 3/2) mottles; moderate fine and medium angular blocky structure; sticky and plastic; common roots; neutral; gradual smooth boundary.

Bg—16 to 32 inches, dark gray (5Y 4/1) silty clay; common fine distinct light olive brown (2.5Y 5/4) mottles; moderate coarse prismatic structure parting to moderate medium and fine angular blocky; firm, sticky, plastic; few roots; neutral; gradual smooth boundary.

Cg—32 to 60 inches, dark gray (5Y 4/1) silty clay; common distinct light olive brown (2.5Y 5/4) and few fine gray (5Y 5/1) and pale brown (10YR 6/3) mottles; massive; firm, sticky, plastic; few oxide materials; neutral.

The solum ranges from 30 to 40 inches in thickness. Depth to bedrock ranges from 48 inches to more than 60 inches. Thickness of the mollic epipedon ranges from 14 to 24 inches. The reaction is slightly acid to mildly alkaline.

The A horizon has matrix chroma of 1 or 2.

The Bg horizon has matrix hue of 5Y or N, value of 4 and 5, and chroma of 0 or 1. It is silty clay, heavy silty clay loam, or clay.

The C horizon has matrix hue of 5Y or N, value of 4 and 5, and chroma of 0 or 1. It is silty clay, heavy silty clay loam, or clay. In some pedons, stratified layers of loam, silty clay loam, and silty clay are below a depth of about 30 inches.

## Elk series

The Elk series consists of fine-silty, mixed, mesic Ultic Hapludalfs. The soils are deep, well drained and have a brown silt loam to light silty clay loam Bt horizon. They formed in alluvium that was derived chiefly from soils that developed in limestone, loess, and siltstone. The Elk soils are on stream terraces. Slope ranges from 2 to 12 percent but is dominantly 2 to 6 percent.

Elk soils are associated with the Otwell, Ashton, Lawrence, and Robertsville soils. They have better natural drainage; and unlike the Otwell, Lawrence, and Robertsville soils, they do not have a fragipan. They are lighter colored in the upper part of the solum than the Ashton soils.

Typical pedon of Elk silt loam in an area of Elk silt loam, 2 to 6 percent slopes, in a cultivated field 250 feet east of Ky. Hwy. 1500, from a point on the highway 1/2 mile south of Stoval Methodist Church. This church is 1 mile west of the intersection of Ky. Hwy 1500 and U.S. Hwy. 31-W at Radcliff, or about 6 miles north of Elizabethtown.

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

B1—9 to 13 inches, dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure parting to weak fine granular; friable; common roots; common worm casts; medium acid; clear smooth boundary.

B21t—13 to 26 inches, brown (7.5YR 4/4) silt loam that has more than 18 percent clay; weak fine and medium subangular blocky structure; firm; few roots; few thin clay films; few small round concretions; few worm casts; few intrusions of dark brown silt in pores and on faces of peds; few small pebbles; strongly acid; clear smooth boundary.

B22t—26 to 40 inches, yellowish brown (10YR 5/6) light silty clay loam; moderate medium subangular blocky structure; firm; common clay films; few worm casts; few small brown concretions; few small pebbles; strongly acid; gradual smooth boundary.

C—40 to 60 inches, yellowish brown (10YR 5/6) light silty clay loam; common mottles of pale brown (10YR 6/3) and light brownish gray (10YR 6/2); massive; common brown concretions; few small pebbles; strongly acid.

The solum ranges from 36 to 54 inches in thickness. Depth to bedrock is more than 60 inches. Reaction is medium acid or strongly acid in unlimed areas.

The A horizon has chroma of 2 or 3.

The B horizon has hue of 10YR or 7.5YR, value of 4 and 5, and chroma of 4 or 6. Some pedons have a few mottles of pale brown (10YR 6/3) and gray (10YR 6/2) in the lower 6 inches of the B22t horizon. The texture of the B21t horizon and B22t horizon is silt loam or light silty clay loam.

The C horizon in some pedons is stratified silt loam and silty clay loam and has 0 to 15 percent gravel.

## Fredonia series

The Fredonia series consists of fine, mixed, mesic Typic Hapludalfs. The soils are moderately deep, well drained and have a dark red clay B2t horizon. They formed in residuum from limestone. The Fredonia soils are on side slopes in karst areas. Slope ranges from 6 to 20 percent.

Fredonia soils are associated with the Hagerstown, Cumberland, Pembroke, Crider, Caneyville, and Corydon soils. They are shallower to bedrock than the Hagerstown, Cumberland, Pembroke, and Crider soils. They are darker colored in the upper part of the solum and have a redder Bt horizon than Caneyville soils. Fredonia soils are deeper to limestone bedrock than Corydon soils.

Typical pedon of Fredonia silt loam in an area of Fredonia-Rock outcrop complex, 6 to 20 percent slopes, in a pasture 400 feet east of the Upton and Sonora road from a point on the road 1 mile north of Upton, about 16 miles south of Elizabethtown.

Ap—0 to 10 inches, dark brown (7.5YR 3/2) silt loam; moderate fine and medium granular structure; friable; common roots; neutral; abrupt smooth boundary.

B2t—10 to 25 inches, dark red (2.5YR 3/6) clay; moderate fine angular blocky structure; very firm, sticky, plastic; almost continuous clay films; common roots; neutral; gradual wavy boundary.

B3t—25 to 28 inches, dark reddish brown (2.5YR 3/4) clay; moderate fine and medium angular blocky structure; very firm, sticky, plastic; discontinuous clay films; common roots; few oxide deposits; few small pieces of weathered limestone; neutral; abrupt wavy boundary.

R—28 inches, gray, hard limestone.

Solum thickness and depth to bedrock range from 20 to 40 inches. Coarse fragments of chert make up 0 to 5 percent. Reaction ranges from medium acid to mildly alkaline.

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

The B horizon has hue of 2.5YR or 10R, value of 3 and 4, and chroma of 4 or 6. It is clay or silty clay. In some pedons the B21t horizon is heavy silty clay loam.

## Frondorf series

The Frondorf series consists of fine-loamy, mixed, mesic Ultic Hapludalfs. The soils are moderately deep, well drained and have a strong brown silty clay loam B2t horizon. They formed in loess and in the underlying residuum from acid sandstone and shale. In this survey area Frondorf soils are a taxadjunct because some pedons in the eastern part of the area contain more coarse fragments in the upper part of the solum than is defined for the Frondorf series. Frondorf soils are on ridgetops, hilltops, and side slopes, and on foot slopes in the eastern part of the survey area. Slope ranges from 6 to 30 percent but is dominantly 6 to 20 percent.

Frondorf soils are associated with the Lenberg, Ramsey, Sadler, Steinsburg, Allegheny, and Wellston soils. They have less clay in the subsoil than the Lenberg soils and more clay than the Steinsburg soils. They are deeper than the Ramsey soils and shallower than the Allegheny and Wellston soils. They are better drained; and unlike the Sadler soils, they do not have a fragipan.

Typical pedon of Frondorf silt loam in an area of Frondorf-Lenberg silt loams, 6 to 12 percent slopes, 1 1/2 miles southwest of Eastview, 400 feet north of junction of Ky. Hwy. 84 and Ky. Hwy. 920, and 30 feet west of road.

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak fine granular structure; friable; many roots; 10 percent sandstone fragments; strongly acid; abrupt smooth boundary.

B1t—6 to 9 inches, brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; many roots; few thin clay films on peds; 10 percent sandstone fragments; strongly acid; clear smooth boundary.

B2t—9 to 20 inches, strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm, slightly sticky; common roots; common thin clay films on peds; 10 percent sandstone fragments; strongly acid; gradual smooth boundary.

IIB3—20 to 33 inches, yellowish brown (10YR 5/6) gravelly silt loam; common distinct light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; few roots; 20 percent sandstone fragments; strongly acid; abrupt wavy boundary.

IIR—33 inches, sandstone.

The solum thickness and depth to bedrock range from 20 to 40 inches. Depth to the IIB horizon ranges from 15 to 24 inches. Coarse fragments make up 3 to 15 percent of the upper part of the solum and 15 to 35 percent of the lower part. Reaction is very strongly acid or strongly acid in unlimed areas.

The A horizon has value of 4 or 5 and chroma of 2 or 3.

The B1 horizon and B2 horizon have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. They are silt loam or silty clay loam. The IIB3 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is gravelly channery or shaly silt loam, silty clay loam, silty clay, clay loam, or sandy clay loam.

A IIC horizon is in some pedons. It is similar to the IIB3 horizon in color and texture except that it is massive.

The R horizon is sandstone, siltstone, or soft acid clay shale.

## Garmon series

The Garmon series consists of fine-loamy, mixed, mesic Dystric Eutrochrepts. The soils are moderately deep, well drained and have a yellowish brown shaly silt loam B horizon. They formed in residuum from limestone and siltstone. The Garmon soils are on hillsides. Slope ranges from 25 to 60 percent but is dominantly 45 to 55 percent.

Garmon soils are associated with the Lenberg, Caneyville, Waynesboro, and Vertrees soils. They have less clay in the B horizon than all of these soils, and they are shallower to bedrock than the Waynesboro and Vertrees soils.

Typical pedon of Garmon silt loam in an area of Garmon silt loam, 25 to 60 percent slopes, in woods 50 feet west of rural road at a point on the rural road 1.5 miles southwest of Colesburg, which is about 8.0 miles northeast of Elizabethtown.

01—1 inch to 0, partially decayed leaves and twigs.

A11—0 to 4 inches, very dark grayish brown (10YR 3/2) silt loam; weak medium granular structure; very friable; about 7 percent pale brown weathered shale fragments; few chert fragments less than 1/2 inch in diameter; many roots; neutral; clear smooth boundary.

A12—4 to 10 inches, brown (10YR 4/3) silt loam; weak medium granular structure; friable; about 8 percent pale brown weathered shale fragments; few chert fragments less than 1 inch in diameter; many roots; neutral; clear smooth boundary.

B—10 to 21 inches, yellowish brown (10YR 5/4) shaly heavy silt loam;weak medium and fine subangular blocky structure; friable; about 15 percent pale brown shale fragments; few chert fragments less than 2 inches in diameter; common roots; neutral; clear smooth boundary.

C—21 to 32 inches, dark yellowish brown (10YR 4/4) shaly light silty clay loam; weak fine subangular blocky structure; firm; about 30 percent pale brown shale fragments; few chert fragments less than 3 inches in diameter; common roots; neutral; clear wavy boundary.

R—32 inches, pale brown and brown, slightly weathered calcareous shale and light gray limestone.

The solum ranges from 15 to 25 inches in thickness. Depth to bedrock is 20 to 40 inches. Coarse fragments make up about 2 to 20 percent of the A horizon, 15 to 30 percent of the B horizon, and 30 to 40 percent of the C horizon. Reaction is medium acid to neutral.

The A11 horizon has value of 3 and 4 and chroma of 2 or 3. The A12 horizon has value of 4 and 5 and chroma of 3 or 4.

The B horizon has chroma of 4 or 6. It is shaly silt loam or shaly light sity clay loam.

The C horizon has value of 4 and 5 and chroma of 4 or 6. It is shaly silt loam or shaly light silty clay loam.

## Gatton series

The Gatton series consists of fine-loamy, mixed, mesic Typic Fragiudalfs. The soils are deep, moderately well drained and have a very firm, compact, brittle horizon or fragipan at a depth of about 22 inches. They formed in a mantle of silt loam 15 to 30 inches thick and the underlying unconsolidated material. This material derived from sandstone and shale, which probably slumped into sinkholes during an early cycle of karst erosion of the underlying limestone. The Gatton soils are on ridgetops and benches and in depressions and fan-shaped areas at the head of drainageways. Slope ranges from 2 to 6 percent.

Gatton soils are associated with the Sonora, Riney, and Waynesboro soils. They are not so well drained as those soils, and unlike them, they have a fragipan. They also contain more silt and less sand and clay in the upper part of the solum than the Riney and Waynesboro soils.

Typical pedon of Gatton silt loam in an area of Gatton silt loam, 2 to 6 percent slopes, in a pasture 50 feet west of Ky. Hwy. 1135 at a point on the highway 0.7 mile south of the intersection with Ky. Hwy. 61 or about 4 miles south of Elizabethtown.

Ap—0 to 6 inches, dark yellowish brown (10YR 4/4) silt loam; weak fine and medium granular structure; very friable; many fine roots; neutral; clear smooth boundary.

B21t—6 to 14 inches, strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; common fine roots; few small pores; common clay films; slightly acid; gradual smooth boundary.

B22t—14 to 22 inches, strong brown (7.5YR 5/6) silt loam; few fine faint pale brown (10YR 6/3) and yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; friable; common fine roots; few small pores; common clay films; strongly acid; clear wavy boundary.

IIBx1—22 to 36 inches, yellowish brown (10YR 5/4) fine sandy loam; common medium distinct reddish yellow (7.5YR 6/6) and gray (10YR 6/1) mottles; moderate very coarse prismatic structure parting to very thick platy; very firm and brittle; few fine roots between prisms; many clay films and few clean sand grains on prisms; strongly acid; clear smooth boundary.

IIBx2—36 to 42 inches, strong brown (7.5YR 5/6) sandy clay loam; common medium distinct brownish yellow (10YR 6/6) and gray (10YR 5/1) mottles; moderate very coarse prismatic structure parting to fine angular blocky; very firm and brittle; some roots between prisms; common small pores; many clay films on prisms and blocks; strongly acid; clear wavy boundary.

IIIB23t—42 to 65 inches, mottled red (2.5YR 4/6), brownish yellow (10YR 6/8), and gray (10YR 6/1), sand clay; very thick platy structure with some vertical cracks; very firm; many clay films; few clean sand grains on vertical cracks; strongly acid.

The solum is more than 60 inches thick. Depth to bedrock is more than 10 feet. Depth to the fragipan ranges from 20 to 30 inches. Reaction is very strongly acid or strongly acid in unlimed areas.

The Ap horizon has value of 4 and 5 and chroma of 2 to 4.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 and 5, and chroma of 4 or 6. In some pedons it is mottled in shades of brown, yellow, red, or gray in the lower part. Texture is silt loam or silty clay loam.

The IIBx horizon has hue of 7.5YR to 2.5Y, value of 4 and 5, and chroma of 2 to 6, and mottles are in shades of brown, yellow, red, and gray. This horizon is fine sandy loam, loam, or sandy clay loam. It has light gray silt loam, loam, or fine sandy loam coatings up to 5 millimeters thick between prisms. Some pedons have a IIB2t horizon of fine sandy loam or loam between the IIBx and the IIIB2t horizon. Where present, the IIB2t horizon ranges from 5 to 15 inches in thickness.

The IIIB2t horizon ranges from red to shades of brown mottled with shades of red. Other mottles are in shades of gray or yellow. It is clay, sandy clay, or clay loam.

## Hagerstown series

The Hagerstown series consists of fine, mixed, mesic Typic Hapludalfs. The soils are deep, well drained and have red clay in the B2t horizon. They formed in residuum from limestone. The Hagerstown soils are on ridgetops and side slopes and in karst areas. Slope ranges from 2 to 20 percent but is dominantly 6 to 12 percent.

Hagerstown soils are associated with the Fredonia, Caneyville, Corydon, Cumberland, Vertrees, and Pembroke soils. They have a thicker solum and are deeper to bedrock than the Fredonia, Caneyville, and Corydon soils. They have a thinner B horizon and bedrock at a shallower depth than the Pembroke, Cumberland, and Vertrees soils.

Typical pedon of Hagerstown silt loam in an area of Hagerstown silt loam, 2 to 6 percent slopes, in a pasture 30 feet north of farm lane from a point on the farm lane 75 feet west of its intersection with rural road. This intersection is 0.4 mile south of the intersection of the rural road and Ky. Hwy. 224, 3/4 mile west of Upton, and about 16 miles south of Elizabethtown.

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; moderate fine granular structure; very friable; few yellowish red (5YR 4/6) mottles; common roots; slightly acid; abrupt smooth boundary.

B21t—6 to 13 inches, yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable, slightly sticky, and plastic; common clay films on ped faces and in pores; few intrusions of brown (10YR 4/3) in root channels and cracks; few roots; slightly acid; clear smooth boundary.

B22t—13 to 39 inches, red (2.5YR 4/6) clay; moderate medium and fine angular blocky structure; firm, sticky, and plastic; many clay films on ped faces; few strong brown (7.5YR 5/6) mottles; few oxide accumulations; strongly acid; clear smooth boundary.

B3t—39 to 48 inches, reddish brown (2.5YR 4/4) clay; weak and moderate medium angular blocky structure; firm, sticky, and plastic; common clay films; common oxide accumulations; few weathered white rock fragments in lower 2 inches; slightly acid; abrupt wavy boundary.

R—48 inches, gray limestone.

The thickness of the solum and depth to bedrock range from 40 to 60 inches. Coarse fragments make up 0 to 10 percent of the upper part of the solum and 0 to 15 percent of the lower part. Reaction in all horizons ranges from strongly acid to neutral.

The Ap horizon has hue of 10YR to 5YR, value of 4 and 5, and chroma of 2 to 4. Uncultivated areas have a thin A1 horizon with hues of 10YR to 7.5YR, values of 3 and 4, and chromas of 2 or 3; and an A2 horizon in hue of 10YR, values of 4 and 5, and chromas of 2 to 4.

The B21t horizon has hue of 5YR or 7.5YR, value of 4 and 5, and chroma of 4 or 6. It is silty clay loam or clay loam.

The B22t horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6, except in some pedons the lower part has hue of 7.5YR. It is clay or silty clay.

The B3t horizon has hue of 2.5YR to 7.5YR, value of 4 and 5, and chroma of 4 or 6. It is silty clay or clay.

Some pedons have a C horizon that is 1 to 20 inches thick and has hue of 10YR to 2.5YR, value of 3 to 6, and chroma of 4 to 8, and in some pedons the C horizon is mottled in shades of brown, yellow, and red. It is silty clay loam, clay loam, or clay.

## Huntington series

The Huntington series consists of fine-silty, mixed, mesic Fluventic Hapludolls. The soils are deep, well drained and have a dark brown silt loam A horizon and a brown silt loam B horizon. They formed mainly in local alluvium that washed chiefly from soils that developed in loess and limestone. Huntington soils in areas on the Ohio River flood plain formed in mixed alluvium. The Huntington soils are in depressions and on flood plains. Slope ranges from 0 to 2 percent.

Huntington soils are associated with the Lindside, Newark, Melvin, and Dunning soils. They have better natural drainage than all of these soils, and they have less clay throughout the solum than Dunning soils.

Typical pedon of Huntingdon silt loam, 100 feet west of Ky. Hwy. 222 from a point on the Highway that is 0.2 mile south of the intersection with U.S. Hwy. 62 or about 8 miles west of Elizabethtown.

Ap—0 to 6 inches, dark brown (10YR 3/3) silt loam; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A3—6 to 20 inches, dark brown (10YR 3/3) heavy silt loam; weak medium subangular blocky structure that parts to weak fine granular; friable; many roots; neutral; gradual smooth boundary.

B—20 to 50 inches, brown (10YR 4/3) heavy silt loam; weak fine subangular blocky structure that parts to weak fine granular; few roots; common brown concretions; neutral.

The solum is more than 40 inches thick. Depth to bedrock is more than 72 inches. Thickness of the mollic epipedon ranges from 10 to 24 inches. The reaction ranges from medium acid to neutral.

The Ap horizon has hue of 7.5YR or 10YR and chroma of 2 or 3.

The texture of the B horizon ranges from silt loam to light silty clay loam.

## Lawrence series

The Lawrence series consists of fine-silty, mixed, mesic Aquic Fragiudalfs. The soils are deep, somewhat poorly drained and have a very firm, compact, brittle horizon or fragipan at a depth of about 17 inches. They formed mainly in mixed alluvium. In a few areas, they formed in loess and in the underlying residuum from limestone, sandstone, or shale. Lawrence soils are on stream terraces and in depressions on uplands. Slope ranges from 0 to 2 percent.

Lawrence soils are associated with the Otwell, Robertsville, Elk, Ashton, Sadler, Nicholson, and Crider soils. They have poorer natural drainage than all of these soils except Robertsville soils. They are better drained than Robertsville soils.

Typical pedon of Lawrence silt loam, in a pasture 100 feet south of Ky. Hwy. 1500 from a point on the highway that is 1/4 mile west of the intersection with Ky. Hwy. 447, which is 5 miles north of Elizabethtown.

Ap—0 to 8 inches, grayish brown (10YR 5/2) silt loam; weak medium subangular blocky structure parting to weak fine granular; friable; few fine faint mottles of brown (10YR 5/3); many roots; common small brown concretions; very strongly acid; clear smooth boundary.

B2t—8 to 17 inches, brownish yellow (10YR 6/6) heavy silt loam; common faint light brownish gray (10YR 6/2) and few fine faint light gray (2.5Y 7/2) mottles; moderate medium subangular blocky structure; firm; common roots; few worm casts; common pale brown (10YR 6/3) silt coatings on peds; common small reddish brown concretions; few thin discontinuous clay films; very strongly acid; clear smooth boundary.

Bx1—17 to 26 inches, mottled yellowish brown (10YR 5/6), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), and light gray (10YR 6/1) light silty clay loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm, compact, brittle; thick seams of gray (5Y 5/1) clay and common light gray (5Y 7/1) silt coatings on peds; few thin clay films; very strongly acid; gradual smooth boundary.

Bx2—26 to 44 inches, mottled yellowish brown (10YR 5/6) and light gray (10YR 7/1) lighty silty clay loam that has streaks of gray (5Y 5/1) clay; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm, compact, brittle; common clay films; very strongly acid; gradual smooth boundary.

B3t—44 to 64 inches, mottled yellowish brown (10YR 5/6), pale brown (10YR 6/3), and light gray (N 6/ ) heavy silt loam; weak medium subangular blocky structure; firm; seams of gray clay 4 mm thick; few small brown concretions; strongly acid.

The solum ranges from 40 to 70 inches in thickness. Depth to bedrock is more than 72 inches. Reaction is strongly acid or very strongly acid in unlimed areas.

The Ap horizon has value of 4 and 5 and chroma of 2 or 3.

The B2t horizon has matrix colors with value of 5 and 6 and chromas of 3 to 6. Mottles are in shades of brown and gray, and mottles that have chroma of 2 or lower range from few to many. Texture is silt loam or light silty clay loam.

The Bx horizon has matrix colors in hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 8. Mottles have hue of 7.5YR to 5Y, value of 5 to 7, and chroma of 1 to 6. Texture is silt loam or light silty clay loam.

The B3t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. Mottle colors have hue of neutral to 10YR, value of 4 to 7, and chroma of 0 to 6. The texture ranges from silt loam to silty clay loam, and in a few pedons it is silty clay.

Some pedons have a C horizon below a depth of about 45 inches. Where present, the C horizon has color, texture, and reaction similar to the B3t horizon.

## Lenberg series

The Lenberg series consists of fine, mixed, mesic Ultic Hapludalfs. The soils are moderately deep, well drained and have a yellowish red clay B2t horizon. They formed in residuum from acid shale. The Lenberg soils are on ridgetops, hilltops, and side slopes and on foot slopes in the eastern part of the survey area. Slope ranges from 6 to 30 percent but is dominantly 6 to 20 percent.

Lenberg soils are associated with the Allegheny, Caneyville, Frondorf, Garmon, Ramsey, Steinsburg, and Wellston soils. Lenberg soils have more clay in the B horizon than all these soils except Caneyville soils. Lenberg soils are more acid in the lower part of the pedon than Caneyville soils.

Typical pedon of Lenberg silt loam, in an area of Frondorf-Lenberg silt loams, 6 to 12 percent slopes, 50 feet west of Ky. Hwy. 920 and 1.5 miles north of its intersection with Ky. Hwy. 84.

Ap—0 to 6 inches, brown (10YR 5/3) silt loam; weak fine granular structure; very friable; many fine roots; 2 percent shale and sandstone fragments; slightly acid; abrupt smooth boundary.

B1—6 to 11 inches, light yellowish brown (10YR 6/4) heavy silt loam; weak fine subangular blocky structure; friable; common fine roots; few fine pores; 5 percent shale and sandstone fragments; few dark grayish brown (10YR 4/2) coatings in root channels and pores; medium acid; clear wavy boundary.

B2t—11 to 25 inches, yellowish red (5YR 5/6) clay; few medium faint strong brown (7.5YR 5/6) mottles; moderate fine and medium angular blocky structure; very firm, sticky, plastic; common fine and medium roots; 2 percent shale fragments; nearly continuous yellowish red (5YR 4/6) and red (2.5YR 4/6) clay films on peds; strongly acid; clear wavy boundary.

B3t—25 to 31 inches, mottled large distinct red (2.5YR 4/6) and light yellowish brown (10YR 6/4) clay; few fine distinct light gray (10YR 7/2) mottles; weak medium and fine angular blocky structure; very firm, sticky, plastic; few fine roots; 2 percent shale fragments; common thin clay films; strongly acid; clear wavy boundary.

C—31 to 37 inches, mottled strong brown (7.5YR 5/6) light gray (10YR 7/2), yellowish red (5YR 5/6) clay; and red (2.5YR 4/6) clay; massive; very firm; few fine roots; 10 percent shale and sandstone fragments in lower 2 inches; strongly acid; clear wavy boundary.

R—37 to 45 inches, gray (5Y 5/1) soft shale; few strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) fragments; platy structure; few thin layers of white sand between plates; strongly acid.

The solum is 20 to 35 inches thick. Depth to soft shale bedrock ranges from 28 to 40 inches. Coarse fragments make up 1 to 10 percent of the solum and 5 to 20 percent of the C horizon. Reaction is very strongly acid or strongly acid in unlimed areas.

The A horizon has value of 4 or 5 and chroma of 2 to 4.

The B2t horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is silty clay or clay. It is massive or has relict platy structure.

The B3t horizon is clay, silty clay, or their channery analogs.

The C horizon is clay, silty clay, or their channery analogs.

## Lindside series

The Lindside series consists of fine-silty, mixed, mesic Fluvaquentic Eutrochrepts. The soils are deep, moderately well drained and have a brown silt loam B horizon that has gray mottles in the lower part. They formed in mixed alluvium. The Lindside soils are on flood plains and in karst valleys and depressions on the uplands. Slope ranges from 0 to 2 percent.

Lindside soils are associated with the Nolin, Nolin variant, Huntington, Newark, Melvin, and Dunning soils. They have better natural drainage than all of these soils except the well drained Huntington, Nolin variant, and Nolin soils. They are also lighter colored throughout and have less clay than the Dunning soils.

Typical pedon of Lindside silt loam, in a cultivated field 650 feet north of Ky. Hwy. 583 from a point on the highway that is 0.6 mile west of its intersection with Ky. Hwy. 52. This intersection is 1 mile north of Lyons or about 11 miles northeast of Hodgenville.

Ap—0 to 9 inches, dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; common roots, slightly alkaline; abrupt smooth boundary.

B1—9 to 17 inches, brown (10YR 4/3) silt loam; moderate fine granular structure; friable; common roots; few worm holes; neutral; clear wavy boundary.

B2—17 to 31 inches, brown (10YR 4/3) silt loam; common fine faint mottles of light brownish gray (10YR 6/2) and few fine distinct mottles of yellowish brown (10YR 5/4); weak coarse subangular blocky structure parting to granular; firm; few roots; few worm holes; few oxide stains; neutral; gradual wavy boundary.

B3—31 to 42 inches, brown (10YR 5/3) heavy silt loam; many fine faint mottles of dark grayish brown (10YR 4/2) and common fine distinct mottles of gray (5Y 5/1); weak coarse subangular blocky structure; firm; few oxide stains; neutral; clear wavy boundary.

C—42 to 66 inches, grayish brown (10YR 5/2) heavy silt loam; many medium faint gray (5Y 5/1) and common fine distinct brown (7.5YR 5/4) mottles; massive; firm; common oxide deposits; neutral.

The solum ranges from 35 to 50 inches in thickness. Depth to bedrock is more than 60 inches. Content of gravel ranges from 0 to 5 percent. Reaction ranges from medium acid to neutral.

The Ap horizon has chroma of 2 or 3.

The B horizon has value of 4 and 5 and chroma of 3 or 4. It is silt loam, light silty clay loam, or very fine sandy loam.

The C horizon has a matrix color with chroma of 2 to 4. It is silt loam to silty clay loam.

## Markland series

The Markland series consists of fine, mixed, mesic Typic Hapludalfs. The soils are deep, well drained to moderately well drained and have a brown clay to silty clay Bt horizon that has gray mottles in the lower part. They formed in old, clayey, slack water alluvium. The Markland soils are on stream terraces. Slope ranges from 6 to 12 percent.

The Markland soils are associated with the McGary, Nolin, and Newark soils. They have more clay in the B horizon than the Nolin and Newark soils, which do not have argillic horizons. They have better natural drainage than the McGary and Newark soils.

Typical pedon of Markland silty clay in an area of Markland silty clay, 6 to 12 percent slopes, severely eroded, located in a pasture 300 feet east of rural road from a point on the road 1/2 mile north of its intersection with U.S. Hwy. 62, which is about 9 miles east of Elizabethtown.

Ap—0 to 5 inches, dark grayish brown (10YR 4/2) silty clay; weak coarse subangular blocky structure; firm, slightly sticky and plastic; a few clods of yellowish brown (10YR 5/4) clay; 5 percent pebbles less than 1 inch in diameter; many roots; slightly acid; clear smooth boundary.

B21t—5 to 28 inches, brown (10YR 4/3) clay; moderate medium angular blocky structure; very firm, very sticky and plastic; dark yellowish brown (10YR 4/4) clay films on most peds; few pale brown silt coatings; common roots; strongly acid; gradual smooth boundary.

B22t—28 to 34 inches, yellowish brown (10YR 5/4) silty clay; moderate medium angular blocky structure; very firm, sticky, plastic; dark grayish brown (10YR 4/2) clay films on most peds; few fine faint light gray (10YR 6/1) mottles; neutral; gradual smooth boundary.

B3t—34 to 40 inches, yellowish brown (10YR 5/4) silty clay; common fine distinct mottles of light gray (10YR 6/1); weak medium subangular blocky structure; very firm, sticky, plastic; few thin clay films; very small lime concretions in lower part; slightly alkaline; gradual smooth boundary.

C—40 to 70 inches, yellowish brown (10YR 5/4) heavy silty clay loam; common mottles of brown (10YR 5/3) and few mottles of light brownish gray (10YR 6/2); massive; very firm, sticky, plastic; common small lime concretions; moderately alkaline.

The solum ranges from 30 to 44 inches in thickness. Depth to bedrock is more than 72 inches. Reaction in the upper part of the pedon is strongly acid in unlimed areas and ranges from slightly acid to mildly alkaline in the lower part.

The Ap horizon has value of 4 and 5 and chroma of 2 or 3.

The B21t horizon has chroma of 4 and 6.

The B3t horizon has hue of 10YR or 2.5Y and chroma of 4 or 6.

The C horizon has hue or 10YR or 2.5Y and chroma of 4 or 6. Texture is silty clay loam to silty clay.

## McGary series

The McGary series consists of fine, mixed, mesic Aeric Ochraqualfs. The soils are deep, somewhat poorly drained and have a light gray heavy silty clay loam to clay B2g horizon mottled in shades of brown. They formed in old, clayey, slack water alluvium. In this survey area, McGary soils are a taxadjunct because they have a slightly thicker solum and greater depth to carbonates than is defined for the McGary series. McGary soils are on stream terraces. Slope ranges from 0 to 2 percent.

McGary soils are associated with the Markland, Sensabaugh, Nolin, and Wellston soils. They have poorer natural drainage than all of these soils, and they have more clay in the B horizon than the Sensabaugh, Nolin, and Wellston soils.

Typical pedon of McGary silt loam, located in a pasture 700 feet east of rural road from a point on the road that is 1/2 mile north of its intersection with U.S. Hwy. 62, which is 1 mile west of Rolling Fork River or about 9 miles east of Elizabethtown.

Ap—0 to 6 inches, grayish brown (10YR 5/2) heavy silt loam; weak coarse subangular blocky structure parting to weak fine granular; friable; few fine distinct light gray (N 7/ ) mottles; common, small reddish brown concretions; common roots; medium acid; clear smooth boundary.

B21t—6 to 16 inches, yellowish brown (10YR 5/6) silty clay loam; many medium distinct mottles of light brownish gray (10YR 6/2) and grayish brown (10YR 5/2); moderate coarse angular blocky structure; very firm, slightly sticky when wet; few thin clay films; common roots; common small reddish brown oxide deposits; very strongly acid; gradual smooth boundary.

B22g—16 to 29 inches, mottled light gray (5Y 7/1), yellowish brown (10YR 5/4 and 5/6), and pale brown (10YR 6/3) heavy silty clay loam; moderate medium and coarse prismatic structure parting to medium and coarse angular blocky; very firm, sticky and plastic; few gray (10YR 5/1) clay coatings on ped faces; common clay films; few small reddish brown concretions; very strongly acid; clear smooth boundary.

B23g—29 to 38 inches, light gray (10YR 6/1) clay; many mottles of yellowish brown (10YR 5/6); moderate coarse prismatic structure parting to moderate medium and coarse angular blocky; very firm, sticky and plastic; few small reddish brown concretions; few roots; continuous clay films; very strongly acid; gradual smooth boundary.

B24g—38 to 49 inches, light gray (10YR 6/1) clay; many medium distinct mottles of light brown (10YR 5/3); weak coarse angular blocky structure; firm, sticky and plastic; few clay films; few small black and brown concretions; very strongly acid; gradual smooth boundary.

Cg—49 to 70 inches, mottled gray (10YR 5/1), yellowish brown (10YR 5/6), and brown (10YR 5/3) clay; massive; very firm, sticky and plastic; few brown and black concretions; few small lime nodules; neutral.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock is more than 72 inches. Reaction in the solum is strongly acid or very strongly acid in unlimed areas, and in the C horizon it ranges from neutral to moderately alkaline.

The Ap horizon has value of 4 to 6. Some pedons in forested areas have a dark gray (10YR 4/1) silt loam A1 horizon about 1 inch thick, a light brownish gray (2.5Y 6/2) silt loam A2 horizon about 4 inches thick, and a light brownish gray (2.5Y 6/2) silty clay loam B1g horizon about 3 inches thick.

The B21g horizon ranges from silty clay loam to silty clay.

The texture of the B22g horizon ranges from heavy silty clay loam to silty clay.

The texture of the C horizon is clay or silty clay.

## Melvin series

The Melvin series consists of fine-silty, mixed, nonacid, mesic Typic Fluvaquents. The soils are deep, poorly drained and have an olive gray silt loam B2g horizon mottled in shades of brown. They formed in mixed alluvium. The Melvin soils are on flood plains, in karst valleys, and in depressions on the uplands. Slope ranges from 0 to 2 percent.

The Melvin soils are associated with the Nolin, Huntington, Lindside, Newark, and Dunning soils. They have poorer natural drainage than all of these soils except the very poorly drained Dunning soils. They have less clay throughout the solum than Dunning soils.

Typical pedon of Melvin silt loam, located in a pasture 50 feet west of farm lane from a point on the lane 1,500 feet south of its intersection with Ky. Hwy. 86, which is 2.3 miles west of Cecilia or about 8 miles west of Elizabethtown.

Ap—0 to 8 inches, grayish brown (10YR 5/2) silt loam; few fine faint mottles of pale brown (10YR 6/3) and common medium faint mottles of dark grayish brown (10YR 4/2); weak fine granular structure; friable; few small brown oxide deposits; common roots; slightly acid; abrupt smooth boundary.

B2g—8 to 26 inches, olive gray (5Y 5/2) silt loam; common fine faint mottles of light olive brown (2.5Y 5/4) and few fine faint mottles of gray (5Y 6/1); weak medium subangular blocky structure parting to weak fine granular; friable; few small brown oxide deposits; few roots; medium acid; gradual smooth boundary.

Cg—26 to 50 inches, gray (5Y 5/1) silty clay loam; common medium distinct mottles of strong brown (7.5YR 5/6) and few fine distinct mottles of light gray (5Y 7/1); massive; friable; few small brown oxide deposits; medium acid.

The solum thickness ranges from 20 to 40 inches in thickness. Depth to bedrock is more than 60 inches. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has hue of 5Y to 10YR, value of 4 and 5, and chroma of 1 or 2.

The B2g horizon has hue of 5Y to 10YR, value of 4 and 5, and chroma of 1 or 2. It is silt loam or silty clay loam.

The Cg horizon has hue from neutral to 2.5Y, value of 4 and 5, and chroma of 0 to 1. The texture ranges from silty clay loam to silt loam above a depth of 40 inches and silt loam to silty clay below that.

## Newark series

The Newark series consists of fine-silty, mixed, nonacid, mesic Aeric Fluvaquents. The soils are deep, somewhat poorly drained and have a grayish brown silt loam B2g horizon mottled in shades of gray. They formed in mixed alluvium. The Newark soils are on flood plains, in karst valleys, and in depressions on the uplands. Slope ranges from 0 to 2 percent.

Newark soils are associated with the Nolin, Nolin variant, Huntington, Lindside, Melvin, Markland, and Dunning soils. They have poorer natural drainage than the Nolin, Nolin variant, Markland, Huntington, and Lindside soils.

They are better drained than the Melvin and Dunning soils and have less clay in the B horizon than Dunning and Markland soils.

Typical pedon of Newark silt loam, located in a pasture on Cole Creek 600 feet south of rural road from a point on the road 700 feet east of its underpass at the Kentucky Turnpike and about 1.3 miles southeast of Elizabethtown.

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

B21—10 to 15 inches, grayish brown (10YR 4/2) silt loam; common fine faint mottles of light brownish gray (10YR 6/2); weak fine granular structure; friable; few roots; few dark reddish brown concretions; neutral; gradual smooth boundary.

B22g—15 to 37 inches, grayish brown (2.5Y 5/2) silt loam; many light brownish gray (2.5Y 7/2) and common light gray (5Y 7/1) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure parting to weak fine granular; common reddish brown concretions; few pebbles; neutral; gradual smooth boundary.

Cg—37 to 50 inches, dark grayish brown (2.5Y 4/2) heavy silt loam; common fine distinct mottles of light gray (10YR 7/1); massive; friable; few roots; few oxide stains; neutral.

The solum ranges from 20 to 40 inches in thickness. Depth to bedrock is more than 60 inches. Gravel content ranges from 0 to 5 percent. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has chroma of 3 and 4.

The B21 horizon has value of 4 and 5 and chroma of 2 to 4 and is mottled in shades of brown and gray. It is silt loam or light silty clay loam.

The B22g horizon has hue of 10YR or 2.5Y, value of 5 and 6, and chroma of 1 or 2. Mottles are in shades of brown and gray and range from few to many. Texture is silt loam or light silty clay loam.

The Cg horizon matrix and mottles are in shades of brown and gray. Texture is silt loam or light silty clay loam except that some pedons have thin layers of loam, fine sandy loam, and silty clay.

## Nicholson series

The Nicholson series consists of fine-silty, mixed, mesic Typic Fragiudalfs. The soils are deep, moderately well drained and have a very firm, compact, brittle horizon or fragipan at a depth of about 23 inches. They formed in loess and in the underlying residuum from limestone and calcareous shale. The Nicholson soils are on ridgetops and in low positions around the head of drainageways. Slope ranges from 0 to 6 percent but is mostly 3 to 5 percent.

Nicholson soils are associated with the Crider, Vertrees, and Lawrence soils. Nicholson soils have poorer drainage than the Crider and Vertrees soils, and unlike the Crider and Vertrees soils they have a fragipan. They have better natural drainage than the Lawrence soils.

Typical pedon of Nicholson silt loam, in an area of Nicholson silt loam, 2 to 6 percent slopes, in a cultivated field 10 feet south of farm lane at a point on the lane 700 feet west of the intersection of Ky. Hwy. 251, which is 0.2 mile southeast of Burkhead School or about 2 miles west of Elizabethtown.

Ap—0 to 7 inches, brown (10YR 5/3) silt loam; weak fine granular structure; friable; common roots; slightly acid; abrupt smooth boundary.

B21t—7 to 23 inches, yellowish brown (10YR 5/4) heavy silt loam; weak medium subangular blocky structure; firm; common thin clay films; few worm casts; few roots; very strongly acid; clear smooth boundary.

Bx1—23 to 34 inches, pale brown (10YR 5/3) heavy silt loam; common large distinct strong brown (7.5YR 5/6) and light gray (5Y 6/1) mottles; moderate very coarse prismatic structure parting to moderate medium and fine subangular blocky; very firm, compact, brittle; thin almost continuous clay films; thick tongues of gray (5Y 5/1) clay; few dark brown concretions; very strongly acid; gradual smooth boundary.

Bx2—34 to 41 inches, mottled yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), gray (5Y 5/1), and pale brown (10YR 5/3) heavy silt loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm, compact, brittle; thin discontinuous clay films; common dark brown concretionary stains on peds; thick tongues of gray (5Y 5/1) clay; very strongly acid; gradual smooth boundary.

IIB22—41 to 86 inches, red (2.5YR 4/6) silty clay; common coarse mottles of pale brown (10YR 5/3) and yellowish brown (10YR 5/6); moderate medium angular blocky structure; very firm, sticky when wet; thin continuous clay films; thick tongues of gray (5Y 5/1) clay in vertical cracks; strongly acid.

Solum thickness and depth to bedrock are more than 72 inches. Depth to the fragipan ranges from about 21 to 28 inches. Coarse fragments make up 0 to 15 percent of the IIBt horizon. The reaction is strongly acid or very strongly acid in unlimed areas.

The Ap horizon has value of 4 and 5 and chroma of 2 or 3.

The B21t horizon has hue of 10YR or 7.5YR and value of 4 or 6. The texture ranges from silt loam to light silty clay loam.

The Bx horizons have hue of 10YR or 7.5YR, value of 4 and 5, and chroma of 3 to 6. Mottles with chroma of 2 or less are common to many. Texture ranges from silt loam to light silty clay loam. In some pedons the prisms part to moderate medium or coarse plates.

The IIB22 horizon has hue of 2.5YR to 10YR and value of 4 and 5. Mottles are in shades of brown, gray, and red. Texture ranges from silty clay to silty clay loam and clay.

## Nolin series

The Nolin series consists of fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts. The soils are deep, well drained and have a brown silt loam B horizon. They formed in mixed alluvium. The Nolin soils are on flood plains, in karst valleys, and in depressions on the uplands. Slope ranges from 0 to 2 percent.

Nolin soils are associated with the Lindside, Newark, Melvin, Sensabaugh, Dunning, Nolin variant, and Markland soils. They have better natural drainage than the Lindside, Newark, Melvin, and Dunning soils. They have less sand in the solum than the Nolin variant soils. They have less clay than Markland soils and do not have an argillic horizon like that of the Markland soils. Unlike the Sensabaugh soils they do not have a high percentage of coarse fragments.

Typical pedon of Nolin silt loam, 160 feet west of Rolling Fork River and 3/4 mile east of rural road, from a point on the road 1/2 mile north of its intersection with U.S. Hwy. 62, about 9 miles east of Elizabethtown.

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

B21—10 to 32 inches, brown (10YR 4/3) silt loam; weak coarse subangular blocky structure parting to moderate fine granular; friable; few worm casts; common roots; few small reddish brown concretions; neutral; gradual smooth boundary.

B22—32 to 66 inches, brown (10YR 5/3) silt loam; few medium faint pale brown (10YR 6/3) mottles; weak fine granular structure; friable; neutral.

The solum is 42 inches to more than 72 inches thick. Depth to bedrock is more than 48 inches. The content of gravel in the solum ranges from 0 to 5 percent. Reaction ranges from medium acid to neutral.

The Ap horizon has chroma of 2 or 3.

The B horizon has value of 4 and 5 and chroma of 3 or 4. In some pedons it is mottled below a depth of 24 inches in hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4.

Some pedons have a C horizon below a depth of 42 inches. Where present, it has hue of 10YR, value of 4 and 5, and chroma of 2 or 3. In places it is mottled in hue of 10YR to 2.5YR, value of 4 and 5, and chroma of 2 to 4. The content of gravel ranges from 0 to 30 percent.

## Nolin variant

The Nolin variant consists of coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts. The soils are deep, well drained and have a brown loamy fine sand and very fine sandy loam C horizon that extends from a depth of 9 to 48 inches. They formed in alluvium that was derived chiefly from sandstone and loess. The Nolin variant soils are on narrow flood plains. Slope ranges from 0 to 2 percent.

Nolin variant soils are associated with the Nolin, Lindside, and Newark soils. They have less clay and more sand throughout the solum than all of these soils, and they have better natural drainage than Lindside and Newark soils.

Typical pedon of Nolin variant fine sandy loam, located in a cultivated field 450 feet north of the Nolin River bridge at White Mills and 100 feet west of Nolin River, about 15 miles southwest of Elizabethtown.

Ap—0 to 9 inches, dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; many roots; medium acid; abrupt smooth boundary.

C1—9 to 29 inches, brown (10YR 4/3) loamy fine sand; single grained; loose; common roots; few worm casts; medium acid; abrupt smooth boundary.

C2—29 to 48 inches, dark yellowish brown (10YR 4/4) very fine sandy loam; weak fine granular structure; very friable; few small pale brown (10YR 5/3) mottles in upper 4 inches; medium acid; abrupt smooth boundary.

C3—48 to 60 inches, yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable; medium acid.

Depth to bedrock is more than 60 inches. Reaction ranges from medium acid to neutral.

The C1 horizon has chroma of 3 or 4. Texture ranges from loamy fine sand to loamy sand.

The C2 horizon ranges in texture from very fine sandy loam to loamy fine sand.

The C3 horizon has hue of 10YR or 7.5YR.

## Otwell series

The Otwell series consists of fine-silty, mixed, mesic Typic Fragiudalfs. The soils are deep, moderately well drained and have a very firm, compact, brittle horizon or fragipan at a depth of about 26 inches. They formed in mixed alluvium. The Otwell soils are on stream terraces. Slope ranges from 0 to 6 percent but is dominantly 1 to 5 percent.

Otwell soils are associated with the Elk, Lawrence, Robertsville, and Ashton soils. They have better natural drainage than the Lawrence and Robertsville soils, and they have poorer drainage than the Elk and Ashton soils and unlike the Elk and Ashton soils they have a fragipan.

Typical pedon of Otwell silt loam, in an area of Otwell silt loam, 0 to 2 percent slopes, located in a cultivated field 50 feet east of farm lane at a point on the lane 1,600 feet southeast of the Rolling Fork River bridge on Blanton Road, about 1.7 miles southeast of Athertonville or 9 miles east of Hodgenville.

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common small roots; few small pebbles; few small soft brown concretions; neutral; clear smooth boundary.

B2t—8 to 26 inches, yellowish brown (10YR 5/4) heavy silt loam; weak medium subangular blocky structure; friable; common thin clay films on ped faces and in pores; few small pebbles; few small brown soft concretions; common wormholes; dark yellowish brown (10YR 4/4) silt loam in wormholes in the upper 6 inches; few light brownish gray (10YR 6/2) spots in the lower 4 inches; few roots; slightly acid; clear smooth boundary.

Bx1—26 to 33 inches, yellowish brown (10YR 5/4) heavy silt loam; common medium distinct mottles of gray (10YR 5/1); weak very coarse prismatic structure parting to moderate medium subangular blocky; very firm, compact, brittle; common medium brown soft concretions; few small pebbles; common thin clay films; strongly acid; clear smooth boundary.

Bx2—33 to 42 inches, yellowish brown (10YR 5/4) light silty clay loam; many mottles of light brownish gray (10YR 6/2) and pale brown (10YR 6/3); weak very coarse prismatic structure parting to moderate medium subangular blocky; very firm, compact, brittle; common thin clay films on peds and few thick films in cracks; few small pebbles; common medium and large soft brown concretions; strongly acid; clear smooth boundary.

B3—42 to 64 inches, yellowish brown (10YR 5/4) silt loam; many medium light brownish gray (10YR 6/2) and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; about 10 percent small pebbles in upper part ranging to about 35 percent in the lower 6 inches; many small soft brown concretions; neutral.

The solum is more than 60 inches thick. Depth to bedrock is more than 72 inches. Depth to the fragipan ranges from 21 to 28 inches. Coarse fragments make up 0 to about 5 percent of the upper part of the solum and 0 to 15 percent of horizons below the fragipan except that some thin horizons may have up to 50 percent. Reaction ranges from strongly acid to neutral except that the reaction in the fragipan is strongly acid to very strongly acid.

The Ap horizon has value of 4 and 5 and chroma of 2 or 3.

The B2t horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 4 or 6. It is silt loam or light silty clay loam.

The Bx horizon has value of 4 to 6 and chroma of 4 or 6.

The B3 horizon has hue of 10YR to 7.5YR, value of 4 and 5, and chroma of 4 or 6. Texture is silt loam or silty clay loam.

## Pembroke series

The Pembroke series consists of fine-silty, mixed, mesic Mollic Paleudalfs. The soils are deep, well drained and have a red to dark red B2t horizon that is silty clay loam in the upper part and silty clay in the lower part. They formed in thin loess and in the underlying residuum from limestone. Pembroke soils are on karst uplands. Slope ranges from 2 to 12 percent.

Pembroke soils are associated with the Cumberland, Crider, Hagerstown, Fredonia, and Corydon soils. They are deeper to bedrock than the Hagerstown, Fredonia, and Corydon soils. They have a darker colored A horizon and a redder B2t horizon than Crider soils and less clay in the upper part of the B horizon than Cumberland soils.

Typical pedon of Pembroke silt loam, in an area of Pembroke silt loam, 2 to 6 percent slopes, located in a cultivated field 100 feet east of Ky. Hwy. 1823 at a point on the highway 0.9 mile north of the intersection with Ky. Hwy. 84, which is about 4 1/2 miles south of Star Mills or about 12 miles southeast of Elizabethtown.

Ap—0 to 7 inches, dark brown (7.5YR 3/2) silt loam; weak fine granular structure; friable; many roots; neutral; abrupt smooth boundary.

B1t—7 to 14 inches, reddish brown (5YR 4/4) silt loam; weak medium and fine subangular blocky structure; friable; few ped surfaces of yellowish red (5YR 5/6); common intrusions of dark brown (7.5YR 3/2) silt loam; many worm holes; few roots; thin discontinuous clay films; slightly acid; clear smooth boundary.

B21t—14 to 25 inches, red (2.5YR 4/6) light silty clay loam; moderate medium subangular blocky structure; friable; sticky when wet; thin discontinuous clay films; few oxide deposits; few worm holes; few roots; slightly acid; clear smooth boundary.

B22t—25 to 40 inches, dark red (2.5YR 3/6) silty clay loam; moderate medium subangular blocky structure; firm, sticky when wet; thin discontinuous clay films; few oxide deposits; medium acid; gradual smooth boundary.

B23t—40 to 66 inches, dark red (2.5YR 3/6) silty clay; moderate medium subangular blocky structure; firm, sticky when wet; thick continuous clay films; few oxide deposits; strongly acid.

Solum thickness and depth to bedrock are more than 72 inches. Coarse fragments make up 0 to 3 percent of the upper part of the B2t horizon and up to 15 percent of the B23t. Reaction ranges from medium acid to slightly acid in unlimed areas, except in horizons below a depth of about 40 inches it ranges from medium acid to strongly acid.

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

The Blt horizon has chroma of 4 or 6, and the texture is silt loam or silty clay loam.

The B21t horizon has hue of 2.5YR or 5YR and value of 3 or 4.

The B22t horizon has hue of 2.5YR or 10R and value of 3 or 4. It is silty clay loam, silty clay, or clay.

The B23t horizon has hue of 2.5YR or 10R and value of 3 or 4. It is heavy silty clay loam, silty clay, or clay.

## Ramsey series

The Ramsey series consists of loamy, siliceous, mesic Lithic Dystrochrepts. The soils are shallow, somewhat excessively drained and have a thin pale brown loam B2 horizon. They formed in residuum from acid sandstone. Ramsey soils are on hillsides. Slope ranges from 20 to 40 percent.

Ramsey soils are associated with the Frondorf, Lenberg, Wellston, Allegheny, and Steinsburg soils. They are shallower to bedrock than all of these soils.

Typical pedon of Ramsey fine sandy loam in an area of Ramsey-Steinsburg-Allegheny complex, 20 to 40 percent slopes, located in woods 200 feet south of rural road from a point on the road 1.4 miles southwest of Eastview, or about 14 miles west of Elizabethtown.

01—1 inch to 0, partially decayed leaves and twigs.

A1—0 to 2 inches, very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; very friable; many roots; very strongly acid; abrupt smooth boundary.

A2—2 to 5 inches, dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; many roots; strongly acid; clear smooth boundary.

B2—5 to 8 inches, pale brown (10YR 6/3) loam; weak fine subangular blocky structure; friable; common roots; about 5 percent sandstone fragments less than 3 inches long; strongly acid; clear smooth boundary.

B3—8 to 16 inches, light yellowish brown (10YR 6/4) loam; weak fine subangular blocky structure; friable; common roots; about 20 percent sandstone fragments less than 5 inches long; very strongly acid; gradual smooth boundary.

R—16 inches, acid sandstone.

Solum thickness and depth to sandstone bedrock range from 12 to 20 inches. Coarse fragments make up 3 to 25 percent. Reaction is strongly acid or very strongly acid.

The A1 horizon has value of 3 and 4. It is fine sandy loam or loam.

The A2 horizon has value of 4 and 5 and chroma of 2 or 3. It is fine sandy loam or loam.

The B2 horizon has value of 5 and 6. Texture ranges from loam to sandy loam.

The B3 horizon has value of 5 and 6 and chroma of 3 or 4. Texture ranges from loam to sandy loam.

## Riney series

The Riney series consists of fine-loamy, siliceous, mesic Typic Hapludults. The soils are deep, well drained and have a yellowish red to red clay loam to sandy clay loam B2t horizon. They formed in residuum from unconsolidated or weakly consolidated sandstone and shale, which in most areas probably slumped into sinkholes during an earlier cycle of karst erosion of the underlying limestone. Riney soils are on ridgetops and side slopes. Slope ranges from 6 to 30 percent but is dominantly 8 to 20 percent.

Riney soils are associated with the Sonora, Gatton, Caneyville, Waynesboro, and Vertrees soils. They are better drained than those soils, and unlike Gatton soils they do not have a fragipan. They have more sand and clay and less silt in the upper part of the B horizon than the Sonora soils. They are deeper to bedrock, more acid, and have more sand than the Caneyville soils. Riney soils have more sand throughout than the Waynesboro and Vertrees soils.

Typical profile of Riney loam in an area of Riney loam, 12 to 20 percent slopes, in a pasture 350 feet west of Ky. Hwy. 1135 from a point on the highway 825 feet south of Roundtop Baptist Church, which is about 5 miles south of Elizabethtown.

Ap—0 to 8 inches, brown (10YR 5/3) loam; weak fine and medium granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

B21t—8 to 32 inches, yellowish red (5YR 4/6) light clay loam; moderate medium and fine subangular blocky structure; firm; common fine roots; common small pores; many thin clay films; very strongly acid; gradual smooth boundary.

B22t—32 to 54 inches, red (2.5YR 4/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common thin clay films; few soft sandstone fragments; very strongly acid; gradual smooth boundary.

C—54 to 65 inches, red (2.5YR 4/6) sandy loam; common coarse distinct strong brown (7.5YR 5/6) mottles; massive; friable; few small sandy clay loam bodies; 10 percent small soft sandstone fragments; very strongly acid.

The solum ranges from 40 to 80 inches in thickness. Depth to soft reddish sandstone bedrock ranges from 48 to more than 120 inches. Quartzitic pebbles from 1/4 to 1 inch in diameter make up 0 to 10 percent of the A horizon. In the upper part of the B2t horizon, quartzitic pebbles from 1/4 to 1 inch in diameter make up 0 to 20 percent, and in the lower part quartzitic pebbles and soft sandstone fragments make up 0 to 20 percent. Soft sandstone fragments make up 0 to 20 percent of the C horizon. Reaction is strongly acid or very strongly acid in unlimed areas.

The Ap horizon has value of 4 and 5 and chroma of 2 to 4. It is loam or sandy clay loam. Pedons in uncultivated areas have an A1 horizon 1 to 4 inches thick and an A2 horizon 4 to 8 inches thick that have color and texture similar to that of the Ap horizon.

Some pedons have a thin B1 horizon or B1t horizon that has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. The horizon is loam or sandy clay loam.

The B2t horizon has hue of 5YR or 2.5YR, value of 4 and 5, and chroma of 6 or 8. In some pedons it is mottled in shades of red or brown in the lower part. Texture is clay loam or sandy clay loam.

Some pedons have a B3 horizon or B3t horizon that has colors similar to those of the B2t, and the texture is sandy clay loam, fine sandy loam, or sandy loam.

The C horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 6 or 8. It is sandy clay loam, sandy loam, fine sandy loam, or loamy sand. Some pedons have weakly consolidated sandstone fragments which easily crush to these textures.

## Robertsville series

The Robertsville series consists of fine-silty, mixed, mesic Typic Fragiaqualfs. The soils are deep, poorly drained and have a firm, brittle, compact horizon or fragipan of light gray silt loam that is mottled in shades of brown. The soils formed in mixed alluvium. Robertsville soils are on stream terraces. Slope ranges from 0 to 2 percent.

Robertsville soils are associated with the Elk, Ashton, Otwell, and Lawrence soils. They have poorer natural drainage than these soils, and they also have a fragipan which the Elk and Ashton soils lack.

Typical pedon of Robertsville silt loam located in a pasture 600 feet north of Ky. Hwy. 583 from a point on the highway 4.1 miles north of Lyons, or about 11 miles northeast of Hodgenville.

Ap—0 to 8 inches, light brownish gray (10YR 6/2) silt loam; common fine faint light gray (10YR 7/1) mottles; weak fine granular structure; friable; common roots; few oxide accumulations; very strongly acid; abrupt smooth boundary.

B2g—8 to 16 inches, light brownish gray (2.5Y 6/2) silt loam; many medium distinct yellowish brown (10YR 5/6) and pale brown (10YR 6/3) mottles; weak fine granular and subangular blocky structure; firm; slightly compact; few roots; few worm holes; few oxide accumulations; very strongly acid; clear smooth boundary.

Bx—16 and 45 inches, light gray (10YR 7/2) heavy silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle; few roots; few voids; thick gray clay films; few oxide accumulations; very strongly acid; gradual irregular boundary.

Cg—45 to 66 inches, light brownish gray (2.5Y 6/2) silty clay loam; many fine distinct light gray (5Y 7/1) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; many oxide accumulations; strongly acid.

The solum ranges from 40 to 55 inches in thickness. Depth to bedrock is more than 72 inches. Depth to the fragipan ranges from 15 to 25 inches. Reaction is strongly acid or very strongly acid in unlimed areas; in the C horizon it ranges to medium acid.

The Ap horizon has value of 4 to 6, and mottles are in shades of gray and brown. The reaction ranges from strongly acid to very strongly acid in unlimed areas.

The B2g horizon has hue of 2.5Y or 10YR, value of 5 to 7, and chroma of 1 or 2. Mottles are in shades of brown and gray. Texture is silt loam or silty clay loam.

The Bx horizon has a matrix hue of 10YR to 5Y, value of 5 to 7, and chroma of 1 or 2. Mottles are in shades of brown and gray. Texture is silt loam or silty clay loam.

The C horizon has matrix and mottle colors in shades of gray and brown, or it is evenly mottled. It is silt loam, silty clay loam, or silty clay.

## Sadler series

The Sadler series consists of fine-silty, mixed, mesic Glossic Fragiudalfs. The soils are deep and moderately well drained and have a strong brown loam, very firm, compact, brittle horizon or fragipan at a depth of about 28 inches. It is mottled in shades of gray. The soils formed in loess and in the underlying residuum from acid sandstone, shale, and siltstone. Sadler soils are mainly on ridgetops. Slope ranges from 0 to 12 percent but is dominantly 2 to 6 percent.

Sadler soils are associated with the Wellston, Frondorf, Lenberg, and Lawrence soils. They have poorer drainage than the Wellston, Frondorf, and Lenberg soils; and unlike these soils, the Sadler soils have a fragipan. They are deeper to bedrock than Frondorf and Lenberg soils and have less clay in the B horizon than Lenberg soils. They are better drained than the somewhat poorly drained Lawrence soils.

Typical pedon of Sadler silt loam in an area of Sadler silt loam, 0 to 2 percent slopes, located in a cultivated field 75 feet east of Ky. Hwy. 347 from a point on the highway 0.2 mile south of the intersection of Ky. Hwy. 920, about 8 miles west of Eastview or 22 miles west of Elizabethtown.

Ap—0 to 10 inches, dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; few fine and medium spots of yellowish brown (10YR 5/6) B horizon material; few roots; neutral; abrupt smooth boundary.

B2t—10 to 24 inches, yellowish brown (10YR 5/6) heavy silt loam; moderate medium subangular blocky structure; friable; few thin clay films; few thin silt coatings; few roots; very strongly acid; clear smooth boundary.

A2 and B2t—24 to 28 inches, pale brown (10YR 6/3), very pale brown (10YR 8/3) when dry, and coatings of light brownish gray (10YR 6/2) silt loam from the A horizon that are 2 to 6 millimeters thick on yellowish brown (10YR 5/6) silt loam peds of the B2t horizon; weak medium subangular blocky structure; friable; few roots; strongly acid; clear smooth boundary.

IIBx—28 to 51 inches, strong brown (7.5YR 5/6) loam; common medium prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; prisms coated with light gray silty clay loam 1 to 3 centimeters thick; very firm, compact, brittle; very strongly acid; gradual smooth boundary.

IIC—51 to 64 inches, mottled yellowish brown (10YR 5/6) and light gray (10YR 6/1) silt loam; massive; firm; visible very fine sand; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock ranges from 48 to 84 inches. Depth to the fragipan ranges from 20 to 28 inches. Fragments of sandstone and shale make up 0 to 25 percent of the IIC horizon. Reaction is strongly acid or very strongly acid in unlimed areas.

The Ap horizon has value of 4 and 5 and chroma of 2 or 3.

Some pedons have a B1t horizon 4 to 9 inches thick that has hue of 10YR or 7.5YR, value of 5, and chroma of 6. The texture is silt loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 5 and 6, and chroma of 4 to 6. It is silt loam or light silty clay loam.

The A2 and B2t horizon is 3 to 9 inches thick.

The Bx horizon has matrix and mottle colors in hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 1 to 6. It is loam, silt loam, or silty clay loam and has more sand than the B2t horizon.

The IIC horizon has matrix and mottle colors similar to the Bx horizon. It is silt loam, loam, fine sandy loam, silty clay loam, or silty clay and has more sand than the B2t horizon.

## Sensabaugh series

The Sensabaugh series consists of fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts. The soils are deep, well drained and have a brown silt loam B horizon and a gravelly silt loam C horizon below a depth of about 27 inches. Sensabaugh soils are on narrow flood plains. Slope ranges from 0 to 2 percent.

Sensabaugh soils are associated with the Nolin and McGary soils. They have more coarse fragments in the profile below a depth of 27 inches than Nolin soils. They have less clay and are better drained than McGary soils, which have argillic horizons.

Typical pedon of Sensabaugh silt loam located in a pasture on Youngers Creek 40 feet west of rural road from a point on the road 1.2 miles west of the intersection of Ky. Hwy. 583, about 9 miles east of Elizabethtown.

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

B—8 to 27 inches, brown (10YR 4/3) silt loam; weak coarse subangular blocky structure parting to weak fine granular; friable; common small roots; about 4 percent pebbles 2 millimeters to 25.4 millimeters in diameter; neutral; clear smooth boundary.

C—27 to 60 inches, brown (10YR 4/3) gravelly silt loam; single grain; 60 percent pebbles 2 millimeters to about 76 millimeters in diameter; neutral.

The solum ranges from 24 to 36 inches in thickness. Depth to bedrock ranges from 42 to 72 inches. Content of rock fragments ranges from 0 to 10 percent in the A horizon, from 0 to 20 percent in the B horizon, and from 40 to 70 percent in the C horizon. Reaction ranges from medium acid to mildly alkaline.

The B horizon has value of 4 and 5 and chroma of 3 or 4. It is silt loam or light silty clay loam.

The C horizon fine earth fraction ranges from silt loam to sandy loam.

## Sonora series

The Sonora series consists of fine-loamy, mixed, mesic Typic Paleudalfs. The soils are deep, well drained and have a strong brown to yellowish red silt loam B2t horizon and a dark red sandy clay IIIB2t horizon. They formed in 18 to 36 inches of silt loam and residuum from the underlying unconsolidated and weakly consolidated sandstone and shale. The underlying material probably slumped into sinkholes during an earlier cycle of karst erosion. The Sonora soils are on ridgetops and side slopes. Slope ranges from 2 to 12 percent.

Sonora soils are associated with the Gatton, Riney, Waynesboro, and Vertrees soils. They are better drained than Gatton soils, and unlike Gatton soils they do not have a fragipan. They have less sand and clay in the upper horizons than the Riney and Waynesboro soils, and they have less clay throughout than Vertrees soils.

Typical pedon of Sonora silt loam, in an area of Sonora silt loam, 6 to 12 percent slopes, in a pasture 200 feet east of Ky. Hwy. 1031 from a point on the highway 0.3 mile north of the intersection of Ky. Hwy. 222, about 2.5 miles east of Glendale and 7 miles south of Elizabethtown.

Ap—0 to 9 inches, brown (10YR 4/3) silt loam; few fine faint dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) mottles; weak fine and medium granular structure; very friable; many fine roots; medium acid; clear smooth boundary.

B21t—9 to 15 inches, strong brown (7.5YR 5/6) silt loam; weak fine and medium subangular blocky structure; very friable; common fine roots; few clay films; common thin silt coatings; strongly acid; clear smooth boundary.

B22t—15 to 25 inches, yellowish red (5YR 4/6) silt loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; common clay films; strongly acid; gradual smooth boundary.

IIB23t—25 to 39 inches, reddish brown (5YR 4/4) loam; weak medium subangular blocky structure; friable; few fine roots; common clay films; many medium faint red (2.5YR 4/6) and few fine distinct light brownish gray (10YR 6/2) mottles in lower 5 inches; strongly acid; clear smooth boundary.

IIIB24t—39 to 71 inches, dark red (10R 3/6) sandy clay; few fine distinct strong brown (7.5YR 5/6) and the pale brown (10YR 6/3) mottles; moderate fine and medium angular blocky structure; firm; few fine roots in upper 12 inches; many clay films; strongly acid.

Solum thickness and depth to bedrock are more than 60 inches. Coarse fragments make up 0 to 5 percent of the IIIB2t horizon. Reaction is strongly acid or very strongly acid in unlimed areas.

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

Some pedons have a thin B1 horizon in hue of 10YR or 7.5YR, value of 4 and 5, and chroma of 4 or 6. This horizon is silt loam or silty clay loam.

The B2t horizon has hue of 7.5YR to 5YR, value of 4 and 5, and chroma of 4 or 6. It is silt loam or light silty clay loam.

The IIB2t horizon has hue of 5YR to 10YR, value of 4 and 5, and chroma of 4 or 6. Some pedons are mottled in shades of brown or red, and some in shades of gray in the lower half. Texture is loam, sandy clay loam, or fine sandy loam.

The IIIB2t horizon has hue of 10R to 5YR and value of 3 to 5. Mottles are in shades of brown or gray, or the horizon is evenly mottled in shades of brown, red, and gray. Textures include sandy clay loam, sandy clay, clay loam, and clay, and the content of sand is commonly more than 35 percent.

## Steinsburg series

The Steinsburg series consists of coarse-loamy, mixed, mesic Typic Dystrochrepts. The soils are moderately deep, well drained and have a brown sandy loam B horizon. They formed in residuum from acid sandstone. The Steinsburg soils are on hillsides. Slope ranges from 20 to 40 percent but is dominantly 25 to 35 percent.

Steinsburg soils are associated with the Frondorf, Lenberg, Wellston, Allegheny, and Ramsey soils. They have more sand and less clay in the B horizon than Frondorf and Lenberg soils which have an argillic horizon. They are shallower to bedrock and have more sand in the solum than Wellston and Allegheny soils, and they are deeper to sandstone bedrock than Ramsey soils.

Typical pedon of Steinsburg fine sandy loam in an area of Ramsey-Steinsburg-Allegheny complex, 20 to 40 percent slopes, located in woods 150 feet west of rural road at a point on the road 2.8 miles south of the intersection of Ky. Hwy. 86, 3/4 mile west of Howe Valley or about 13 miles west of Elizabethtown.

01 & 02—1 inch to 0, partially decayed leaves and twigs.

A1—0 to 1 inch, dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

A2—1 to 7 inches, brown (10YR 5/3) fine sandy loam; weak fine granular structure; very friable; common fine roots; few small sandstone fragments; strongly acid; clear smooth boundary.

B—7 to 18 inches, brown (7.5YR 5/4) sandy loam; weak medium and fine subangular blocky structure; very friable, nonsticky; common fine and medium roots; 10 percent sandstone fragments; strongly acid; gradual smooth boundary.

C—18 to 35 inches, yellowish brown (10YR 5/4) channery sandy loam; massive; friable; common medium and large roots; few strong brown and yellowish brown weathered remnants of sandstone; 25 percent sandstone fragments with percentage increasing to 50 percent in lower 5 inches; strongly acid; gradual wavy boundary.

R—35 inches, sandstone conglomerate.

The solum ranges from 12 to 20 inches in thickness. Depth to sandstone bedrock ranges from 20 to 40 inches. Content of sandstone fragments that are 2 to about 254 millimeters in size ranges from 0 to 20 percent in the A horizon, from 5 to 20 percent in the B horizon, and from 20 to 50 percent in the C horizon. Reaction is strongly acid or very strongly acid in unlimed areas.

The A1 horizon has chroma of 1 to 3. The A2 horizon has value of 5 and 6 and chroma of 2 or 3. Some pedons in cultivated areas have an Ap horizon that has hue of 10YR, value of 5 and 6, and chroma of 2 or 3. Texture of the A horizon ranges from fine sandy loam to loam and sandy loam.

The B horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 or 6. It is sandy loam or fine sandy loam.

The C horizon has value of 5 and 6 and chroma of 4 or 6. The fine earth fraction ranges from sandy loam to loamy sand.

## Vertrees series

The Vertrees series consists of fine, mixed, mesic Typic Paleudalfs. The soils are deep and well drained and have a yellowish red to red clay B2t horizon. They formed in residuum from limestone that was interbedded with shale and siltstone. The Vertrees soils are on narrow ridgetops and hillsides and in karst areas. Slope ranges from 6 to 30 percent but is dominantly 6 to 20 percent.

Vertrees soils are associated with the Garmon, Caneyville, Crider, Nicholson, Hagerstown, Riney, Waynesboro, and Sonora soils. They are deeper to bedrock than Garmon and Caneyville soils and have more clay in the B horizon than Garmon soils. They have more clay in the upper part of the B2t horizon than Crider and Sonora soils and less sand in the lower horizons than Sonora soils. Vertrees soils are better drained and have more clay in the upper part of the Bt horizon than Nicholson soils. They have a thicker solum and are deeper to bedrock than Hagerstown soils. They contain less sand than the Riney and Waynesboro soils.

Typical pedon of Vertrees silt loam in an area of Vertrees silt loam, 12 to 20 percent slopes, located in a field 10 feet north of Cecil Ridge Road from a point on the road 4.5 miles northwest of Athertonville and about 7 miles northeast of Hodgenville.

Ap—0 to 7 inches, dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; many roots; 10 percent fragments of chert; neutral; abrupt smooth boundary.

B21t—7 to 24 inches, yellowish red (5YR 5/8) clay; strong fine and very fine angular blocky structure; firm; common roots; continuous thin clay films; 2 percent fragments of chert; very strongly acid; gradual smooth boundary.

B22t—24 to 51 inches, red (2.5YR 4/6) clay; many medium distinct yellowish brown (10YR 5/6) mottles; strong fine and medium angular blocky structure; firm; few roots; continuous thin yellowish red (5YR 5/6) clay films; 2 percent fragments of chert; very strongly acid; gradual smooth boundary.

B23t—51 to 70 inches, red (2.5YR 4/6) clay; many medium distinct yellowish brown (10YR 5/6) mottles; strong fine and medium angular blocky structure; firm; few roots; continuous thin yellowish red (5YR 5/6) clay films; 2 percent fragments of chert; 10 percent soft shale fragments; medium acid.

Solum thickness and depth to bedrock are more than 60 inches. Chert fragments make up 0 to 25 percent of the A horizon. They make up 0 to 20 percent of the upper part of the B2t horizon, but the average is less than 15 percent. They make up 0 to 35 percent of the lower part of the B2t horizon. Reaction in the upper horizons is strongly acid or very strongly acid in unlimed areas, and it ranges from strongly acid to neutral below a depth of about 51 inches.

The Ap horizon has hue of 10YR to 5YR, value of 4 and 5, and chroma of 2 to 4. It is silt loam or silty clay loam. Pedons in uncultivated areas have a thin A1 horizon that has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 or 3, and they have an A2 horizon that is 4 to 8 inches thick and has hue of 7.5YR or 10YR, value of 5 and 6, and chroma of 3 or 4.

Some pedons have a B1 horizon or B1t horizon in hue of 10YR to 5YR, value of 4 and 5, and chroma of 4 or 6. They are loam, silt loam, or silty clay loam and their cherty analogs.

The B21t horizon has hue of 5YR or 2.5YR and value of 4 and 5. It is mottled in shades of brown and red in some pedons. Texture is clay or silty clay.

The B22t horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 6 or 8. It is mottled in shades of brown, red, or yellow, and, in some pedons at a depth of more than 30 inches, in shades of gray. Texture is silty clay or clay.

The B23t horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 6 to 8. It is mottled in shades of brown, red, yellow, and gray. It is silty clay or clay.

In some pedons the B23t has a few small black or dark brown concretions or black stains and ped coatings.

Some pedons have a B3t horizon below a depth of about 50 inches that has color, texture, and reaction similar to the B23t horizon. The B3t horizon has platy or relict shale structure in some places.

## Waynesboro series

The Waynesboro series consists of clayey, kaolinitic, thermic Typic Paleudalfs. The soils are deep, well drained and have a yellowish red, reddish brown, and red B2t horizon that is clay loam in the upper part and clay in the lower part. They formed in residuum from unconsolidated sandstone and shale which in most areas slumped into sinkholes and mixed with limestone probably during an earlier cycle of erosion of the underlying limestone. In this survey area, Waynesboro soils are a taxadjunct because they are a few degrees cooler than the range that is defined for the Waynesboro series. The Waynesboro soils are on narrow ridgetops and hillsides and in karst areas. Slope ranges from 6 to 30 percent but is dominantly 6 to 20 percent.

Waynesboro soils are associated with the Sonora, Riney, Gatton, Vertrees, Garmon, and Caneyville soils. They have more sand in the upper part of the Bt horizon than Sonora and Vertrees soils and less sand and more clay in all horizons than Riney soils. They are better drained; and unlike the Gatton soils they do not have a fragipan. They are deeper to bedrock than Caneyville and Garmon soils, have more sand and clay in the B horizon than Garmon soils, and have more sand in the B horizon than Caneyville soils.

Typical pedon of Waynesboro loam in an area of Waynesboro loam, 6 to 12 percent slopes, located in woods 300 feet east of rural road from a point on the road 0.6 mile north of the intersection of the Western Kentucky Parkway, which is 0.7 mile east of Ky. Hwy. 904 and about 4 miles southwest of Elizabethtown.

01—2 inches to 0, partially decayed leaves and twigs.

A1—0 to 2 inches, dark gray (10YR 4/1) loam; weak fine granular structure; very friable; many roots; slightly acid; clear smooth boundary.

A2—2 to 8 inches, brown (10YR 5/3) loam; weak medium granular structure; very friable; many roots; root channels filled with A1 horizon material; medium acid; clear smooth boundary.

A3—8 to 12 inches, strong brown (7.5YR 5/6) loam; weak fine subangular blocky structure; very friable; many roots; strongly acid; clear smooth boundary.

B21t—12 to 18 inches, yellowish-red (5YR 4/6) clay loam; moderate fine and medium subangular blocky structure; firm; slightly sticky when wet; common roots; thin continuous clay films on ped surfaces; strongly acid; clear smooth boundary.

B22t—18 to 30 inches, reddish-brown (2.5YR 4/4) clay loam; common fine distinct mottles of light reddish-brown (5YR 6/4); moderate medium subangular blocky structure; firm; sticky when wet; thin continuous clay films on peds and in pores; common roots; very strongly acid; gradual smooth boundary.

B23t—30 to 60 inches, red (2.5YR 4/6) clay; common fine and medium strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; very sticky when wet; dark red clay films on peds and in pores; few roots; very strongly acid.

Solum thickness and depth to bedrock are more than 60 inches. Chert and sandstone fragments make up 0 to 10 percent of the solum. Reaction is strongly acid or very strongly acid in unlimed areas.

The A1 horizon has chroma of 1 or 2. The A2 horizon has value of 4 and 5 and chroma of 3 or 4. The A3 horizon has hue of 10YR or 7.5YR, value of 4 and 5, and chroma of 4 or 6. Pedons in cultivated areas have an Ap horizon that has hue of 10YR to 5YR, value of 4 and 5, and chroma of 3 to 6. Texture of the A1, A2, A3, and Ap horizons is loam, except in severely eroded areas where the Ap horizon is clay loam.

Some pedons have a thin B1 horizon that has hue of 5YR to 2.5YR, value of 4 and 5, and chroma of 4 or 6. It is clay loam or sandy clay loam.

The B2t horizon has hue of 5YR or 2.5YR and value of 4 or 6, and the redder hue are common in the lower part. Texture ranges from clay loam to sandy clay loam and clay that has more than 20 percent sand.

## Wellston series

The Wellston series consists of fine-silty, mixed, mesic Ultic Hapludalfs. The soils are deep, well drained and have a strong brown light silty clay loam B2t horizon. They formed in 25 to 40 inches of loess or siltstone or a combination of these materials and the underlying residuum or in colluvium from siltstone, shale, and sandstone. The Wellston soils are on ridgetops and side slopes and on foot slopes in the eastern part of the survey area. Slope ranges from 2 to 12 percent but is dominantly 6 to 12 percent.

Wellston soils are associated with the Sadler, Frondorf, Lenberg, Ramsey, Steinsburg, and Allegheny soils. They are better drained; and unlike the Sadler soils, they do not have a fragipan. They are deeper to bedrock than the Frondorf, Lenberg, Ramsey, and Steinsburg soils and have less clay than Lenberg soils and less sand than Ramsey and Steinsburg soils. They have less sand and clay and more silt in the upper part of the B horizon than Allegheny soils.

Typical pedon of Wellston silt loam, in an area of Wellston silt loam, 2 to 6 percent slopes, in a cultivated field 300 feet north of rural road from a point on the road 1.5 miles southwest of Eastview, or about 14 miles west of Elizabethtown.

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

B1—8 to 12 inches, yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common roots; strongly acid; clear smooth boundary.

B2t—12 to 30 inches, strong brown (7.5YR 5/6) light silty clay loam; moderate medium subangular blocky structure; firm; thin discontinuous clay films on ped surfaces; common roots; strongly acid; clear smooth boundary.

IIB3—30 to 42 inches, yellowish brown (10YR 5/6) loam; few medium distinct mottles of pale brown (10YR 6/3); moderate medium subangular blocky structure; firm; few roots; strongly acid; gradual smooth boundary.

IIC—42 to 50 inches, strong brown (7.5YR 5/6) sandy clay loam; yellowish red (5YR 5/6), red (2.5YR 4/6), and light yellowish brown (10YR 6/4) mottles; massive; firm; few strong brown sandstone fragments; strongly acid.

The solum ranges from 36 to 50 inches in thickness. Depth to sandstone or gray, soft, acid shale bedrock ranges from 42 to 60 inches. Coarse fragments make up 1 to 35 percent of the IIB3 horizon and C horizon. Reaction is strongly acid or very strongly acid in unlimed areas.

The Ap horizon has value of 4 and 5 and chroma of 2 to 4. Pedons in uncultivated areas have a thin A1 horizon that has hue of 10YR, value of 2, and chroma of 2 and an A2 horizon that has hue of 10YR, value of 5 and 6, and chroma of 3 or 4.

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

The B2t horizon has hue of 7.5YR or 10YR, value of 4 and 5, and chroma of 4 or 6. It is light silty clay loam or silt loam.

The IIB3 horizon has hue of 7.5YR to 2.5Y. Mottles are in shades of brown. It is loam, sandy clay loam, silty clay loam, sandy loam, or silt loam. The IIC horizon has hue of 7.5YR or 10YR and chroma of 4 or 6. Mottles are in shades of red and brown. Texture ranges from sandy clay loam to loam and silt loam.

# Formation and classification of the soils

In this section the factors of soil formation are discussed and related to the soils in the survey area. In addition, the current system of classifying soils is explained, and the soils in the survey area are placed in that system.

## Factors of soil formation

In this section, the five major factors of soil formation and their effects on the soils in Hardin and Larue Counties are discussed.

Soils are formed by weathering and other processes that act on the parent material. The properties of the soil depend on the combination of the following factors: physical and chemical composition of the parent material, climate, plant and animal life, relief, and time (*4*). These factors of soil formation are so closely interrelated that few generalizations can be made about the effects of any one of them. The influence of a particular factor differs from place to place, and each factor modifies the effect of the other four. For example, the effects of climate and plant and animal life are modified by relief and the nature of the parent material. In some places the influence of one factor is dominant.

In the following pages, the five major factors of soil formation are discussed in relation to their effects on the soils in Hardin and Larue Counties.

### Parent material

Parent material is the unconsolidated mass in which a soil forms. In the early stage of soil development, properties inherited from parent material are most evident. Later these properties are modified, and the soil acquires characteristics of its own. The kind of parent material, however, affects the texture and mineral composition of the soil.

Soils in the survey area developed from (1) material that weathered in place from rocks similar to those of the present bedrock; (2) materials that were deposited by streams; (3) a thin to moderately thick mantle of windblown silt, called loess, that was deposited over material that weathered from the underlying rocks; and (4) material that was washed or moved by gravity from hillsides and accumulated on the foot slopes. A few soils on the uplands developed chiefly in material that overlies the limestone formations and that moved by gravity or that probably slumped into sinkholes and caverns in the underlying limestone during an earlier cycle of geologic erosion.

All of the rock formations in the area are sedimentary rocks of the Mississippian, Devonian, and Silurian Periods. Rocks of the Devonian and Silurian Periods occur on the lowest elevations along the eastern boundary of the area. They are commonly covered with alluvium or colluvium and have contributed only small amounts of parent material. The rocks occur mostly in nearly level beds.

Many of the soils on the uplands developed chiefly in material that weathered from limestone, dolomite, and calcareous shale. Examples are the Vertrees, Cumberland, Hagerstown, Fredonia, Caneyville, and Corydon soils, all of which have a clayey subsoil that is like the parent material. The Garmon soils developed in material that weathered from limestone, calcareous siltstone, and shale. They have a higher content of silt and a higher pH than the Lenberg soils. The acid shale parent material contributed the strong acidity and the high clay content of the Lenberg soils. The Steinsburg and Ramsey soils, which developed in parent material derived chiefly from sandstone, are sandy and acid throughout, which reflects the nature of the parent material.

A mantle of material that has a high content of particles of silt size has influenced many of the soils on the uplands. It is believed that the silty material was carried to its present location by the wind. Examples are the Crider, Pembroke, and Nicholson soils, which are underlain by clayey material derived chiefly from limestone, but the upper part of the solum of these soils has a high content of silt which was presumably carried by the wind. Other soils in Hardin and Larue Counties that have a significant amount of silt that is believed to have been carried by the wind are the Wellston, Sadler, and Frondorf soils. These soils also have more bases than is normal for soils that developed in acid sandstone and shale because of the higher content of bases in the loess.

The Sonora and Gatton soils also have a high content of silt-size particles in the upper part of the profile, but the origin of the silt is obscure because it is mixed with a considerable amount of sand. The lower part of the profile of these soils formed in materials that weathered from unconsolidated and weakly consolidated sandstone and shale that overlies limestone formations. These materials moved by gravity or probably slumped into sinkholes and caverns in the underlying limestone during an earlier cycle of geologic erosion. The loamy upper part of the profile in Sonora and Gatton soils and the high content of sand and clay in the lower part result from the combination of materials in which these soils formed.

Soils on the flood plains and stream terraces formed in alluvium that washed from soils on many landforms that were derived from limestone, shale, siltstone, sandstone, and loess. The materials were sorted to some extent when they were deposited. For example, the Otwell soils have a layer of gravel in horizons below the fragipan, and the Lindside, Newark, Melvin, Lawrence, and Robertsville soils commonly are finer textured (silty clay loam) in the lower part of the solum and in the C horizon than the Nolin and Ashton soils. The Nolin variant fine sandy loam formed near bends of stream channels in coarser textured sediment (fine sandy loam and loamy fine sand) than Nolin silt loam. The McGary and Markland soils formed almost entirely in clayey alluvium that probably settled from slack water. These soils are clayey except for the silt loam texture of the A horizon of McGary soils, which is attributed at least in part to deposits of more recent loamy alluvium over the older clayey material.

Soils on the flood plains and stream terraces of the small streams and soils that formed in karst valleys and depressions developed in alluvium more local in origin than that of soils in the broader valleys. For example, the Huntington soils formed in loamy (silt loam) material that washed chiefly from adjacent soils that derived principally from loess and limestone. Another example is the Sensabaugh soils. These soils formed in stratified silt, sand, and gravel that washed from soils on nearby hillsides that derived from limestone, shale, siltstone, sandstone, and loess. They have a profile that has a high percentage of gravel in the lower part, and the texture of the fine earth fraction has particles mainly of silt and sand size with a smaller quantity of clay sized particles.

In Hardin and Larue Counties, the soils that formed in recent alluvium on flood plains are commonly medium acid to mildly alkaline and are high in bases because of the amount of limestone in the drainage area.

A few soils in Hardin and Larue Counties formed, at least in part, in colluvium that washed or moved by gravity from soils on hillsides and that accumulated on the foot slopes. The Allegheny soils, for example, formed in a mixture of materials that derived chiefly from sandstone, shale, and siltstone that accumulated near the base of the slopes. They are high in content of sand, have some clay and silt, and have fragments of sandstone, shale, and siltstone in the profile.

### Climate

Climate affects the physical, chemical, and biological properties of soil mostly through the influence of rainfall and temperature. Water supports biological activity; it dissolves and transports minerals and organic residue through the soil profile, weathers rocks and minerals, and removes and deposits soil material. The amount of water that moves through the soil profile is determined by rainfall, relative humidity, and temperature; it is also determined by the degree of slope, the rate of infiltration, and the permeability of the soil. Temperature influences the kinds and amounts of plants, the kinds of animals and their activities, and the rate of chemical and physical processes that affect the weathering of parent materials and the formation of soils.

The soils in Hardin and Larue Counties formed in a temperate, moist climate that probably was similar to that of the present time. Winters are fairly short, and there are only short periods of extremely low temperatures. Periods of high temperature are fairly brief in summer. The average annual temperature is about 57 degrees. The average annual precipitation is about 44 inches and precipitation is fairly evenly distributed throughout the year.

Temperature and rainfall have favored almost continuous weathering of rocks and minerals, leaching of soluble materials and fine particles, and removal and deposition of materials by water. Soluble bases, including calcium and magnesium, and clay minerals have been moved into the lower horizons or removed from the soils completely. As a result, many of the soils that developed in parent materials high in carbonates and clay minerals have an acid reaction, loamy surface layers, and an accumulation of clay in the subsoil. Examples are the Vertrees and Cumberland soils. In some soils, the soluble bases have been largely removed from the profile; as a result these soils are low in percent of base saturation. An example is the Riney soils. Because the supply of air in water-logged soils is low, iron compounds are in a more soluble form. As a result, the compounds are leached out and the amount of iron in the soil is decreased. An example is the poorly drained Robertsville soils.

### Plant and animal life

The native vegetation in Hardin and Larue Counties was mostly a forest of mixed hardwood trees, but there were probably some canebrakes and grassy areas.

Most of the soils formed under hardwood forest. Such soils, if they have remained in woodland, have a thin, dark-colored surface layer that is lower in organic-matter content than soils that formed under grass. Where they are plowed, the soils, for example, the Vertrees, Crider, and Sonora soils, have the dark-colored layer mixed with the lighter colored layer below it.

The Pembroke, Cumberland, and Fredonia soils have a thicker, somewhat darker colored surface layer than is typical for soils that formed under forest. Probably these soils formed partly under canes and grass. Dunning soils have a thick, dark-colored surface layer as a result of the accumulation of organic matter. They formed under dense marsh vegetation, and the organic matter did not oxidize.

Earthworms, insects, and other small animals mix soil material and add organic matter. Bacteria, fungi, and other micro-organisms break down plant and animal residues. Trees and other plants transport plant nutrients from the lower part of the solum to the upper layers, add organic matter, provide protective cover that retards erosion, and influence soil temperature. Soil material is also mixed by root channeling and by uprooted and fallen trees. The organic matter added by plants and animals alters the chemical processes in the soil and forms humus.

Soil changes that are caused by man are evident mainly in soils that have been eroded, drained, excavated, or filled. Cultivation, drainage, irrigation, fertilization, the introduction of new plants, and major land-forming operations further influence soil development by changing the nature and properties of the soils. Most of these changes, except for major landforming, occur slowly.

### Relief

Relief affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. Relief varies widely and accounts for many differences in the soils in Hardin and Larue Counties. Some nearly level soils on flood plains and stream terraces had an excess of water during formation. A gray subsoil is characteristic and is the result of a lack of oxidation. The Melvin soils are an example. A fragipan may form under certain conditions, as in the Otwell soils.

Gently sloping and sloping soils commonly show more clearly the influence of all soil-forming factors. Excess water runs off, but erosion is not excessive, and a normal soil profile is developed. The Crider, Cumberland, Sonora, and Wellston soils are examples.

Some steep soils are shallow and show slight development because geologic erosion proceeds almost as rapidly as the formation of parent material and soil development. Ramsey soils are an example. Some steep soils are deep or moderately deep because parent material slowly moves down and accumulates on the lower part of the slope and because weathering of the underlying rock proceeds at a faster rate than geologic erosion. Allegheny, Steinsburg, and Garmon soils are examples.

Soil temperature and plant cover differ slightly on north- and south-facing slopes, but the differences are not enough to significantly affect soil development.

### Time

The time required for a soil to form depends on the other soil forming factors. Less time is required for a soil to form in a warm, moist climate than in a cool, dry climate. Also, some parent material is more resistant to the soil-forming processes than others. For example, quartz sand may change very little even if it is exposed for centuries. The relative degree of profile development, rather than the number of years a soil has been in the process of forming, determines the age of the soil.

When soils begin to form in loose material, they have characteristics almost identical to those of the parent material. Such soils are said to be immature. Among the immature soils in Hardin and Larue Counties are the Nolin soils. These soils are on flood plains where alluvium still accumulates. They have indistinct soil horizons and little other evidence of soil development. Steep soils, for example, the Ramsey soils, do not have a well defined profile because erosion removes soil material almost as rapidly as it forms.

A soil is generally said to be mature when it has acquired well developed profile characteristics. Examples of mature soils in Hardin and Larue Counties are the Pembroke and Sonora soils. These soils are deep to bedrock and have distinct horizons, and their soil aggregates have a definite pattern of arrangement.

## Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Fluvaquents (*Fluv*, meaning recent alluvium), plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names of the soil properties used as family differentiae. An example is fine-silty, mixed, nonacid, mesic, Typic Fluvaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

# References


(1) McFarlan, Arthur C. 1943. Geology of Kentucky. Univ. Ky., Lexington. 531 pp., illus.

(2) Portland Cement Association. 1962. PCA soil primer. 52 pp., illus.

(3) Soil Conservation Service. 1970. Kentucky soil and water conservation needs inventory. U.S. Dep. Agric., Soil Conserv. Serv., Lexington, Ky.

(4) United States Department of Agriculture. 1938. Soils and men. U.S. Dep. Agric. Yearb., 1,232 pp., illus.

(5) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962]

(6) United States Department of Agriculture. 1960. Soil classification, a comprehensive system, 7th approximation. Soil Conserv. Serv., 265 pp., illus. [Supplements issued March 1967, September 1968, April 1969.]

(7) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(8) Wildlife Management Institute. 1963. Rating northeastern soils for their suitability for wildlife habitat. Trans. 28th North Am. Wildl. & Nat. Resour. Conf. Washington, D.C., pp. 247-261, illus.


# Glossary

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Area reclaim.** An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Association, soil.** A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single mapping unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

| | *Inches* |
|---|---|
| Very low | 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 base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bottom land.** The normal flood plain of a stream, subject to frequent flooding.

**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 coat, clay skin.

**Coarse fragments.** Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

**Colluvium.** Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the bases of steep slopes.

**Complex slope.** Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on such slopes is difficult.

**Complex, soil.** A mapping unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

**Compressible.** Excessive decrease in volume of soft soil under load.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Contour stripcropping (or contour farming).** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**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.** Delaying the use of an area for grazing until pasture plants have reached a specified stage of growth. Deferred grazing increases the vigor of forage and allows desirable plants to produce seed.

**Depth to rock.** Bedrock at a depth that adversely affects the specified use.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Drainage class** (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

*Somewhat excessively drained.*—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

*Well drained.*—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

*Moderately well drained.*—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

*Somewhat poorly drained.*—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils 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, as for example in "hillpeats" and "climatic moors."

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Erosion.** The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

**Excess fines.** Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

**Favorable.** Favorable soil features for the specified use.

**Flooding.** The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Foot slope.** The inclined surface at the base of a hill.

**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.

**Gleyed soil.** A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

**Green manure** (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**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.

**Habitat.** The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

*O horizon.*—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

*A horizon.*—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

*A2 horizon.*—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

*B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

*R layer.*—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Karst** (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

**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.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by wind.

**Low strength.** Inadequate strength for supporting loads.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous areas.** Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

**Munsell notation.** A designation of color by degrees of the three single variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3.

**Parent material.** The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percs slowly.** The slow movement of water through the soil adversely affecting the specified use.

**Permeability.** The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

**Phase, soil.** A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

**pH value.** (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

**Piping.** Moving water of subsurface tunnels or pipelike cavities in the soil.

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from a semisolid to a plastic state.

**Poorly graded.** Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Reaction, soil.** The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

| | *pH* |
|---|---|
| Extremely acid | Below 4.5 |
| Very strongly acid | 4.5 to 5.0 |
| Strongly acid | 5.1 to 5.5 |
| Medium acid | 5.6 to 6.0 |
| Slightly acid | 6.1 to 6.5 |
| Neutral | 6.6 to 7.3 |
| Mildly alkaline | 7.4 to 7.8 |
| Moderately alkaline | 7.9 to 8.4 |
| Strongly alkaline | 8.5 to 9.0 |
| Very strongly alkaline | 9.1 and higher |

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Rooting depth.** Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Runoff.** The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-size particles.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Seepage.** The rapid movement of water through the soil. Seepage adversely affects the specified use.

**Series, soil.** A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

**Shale.** Sedimentary rock formed by the hardening of a clay deposit.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.

**Sinkhole.** A depression in a landscape where limestone has been locally dissolved.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

**Soil.** A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.005 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

**Stratified.** Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil, or partly worked into the soil, to provide protection from soil blowing 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 content of organic matter than the overlying surface layer.

**Surface soil.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

**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 or management.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer.** Otherwise suitable soil material too thin for the specified use.

**Tilth, soil.** The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

**Topsoil** (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

**Trace elements.** The chemical elements in soils, in only extremely small amounts, essential to plant growth. Examples are zinc, cobalt, manganese, copper, and iron.

**Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Variant, soil.** A soil having properties sufficiently different from those of other known soils to justify a new series name, but the limited geographic soil area does not justify creation of a new series.

**Water table.** The upper limit of the soil or underlying rock material that is wholly saturated with water.

*Water table, apparent.* A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

*Water table, artesian.* A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

*Water table, perched.* A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

# Illustrations

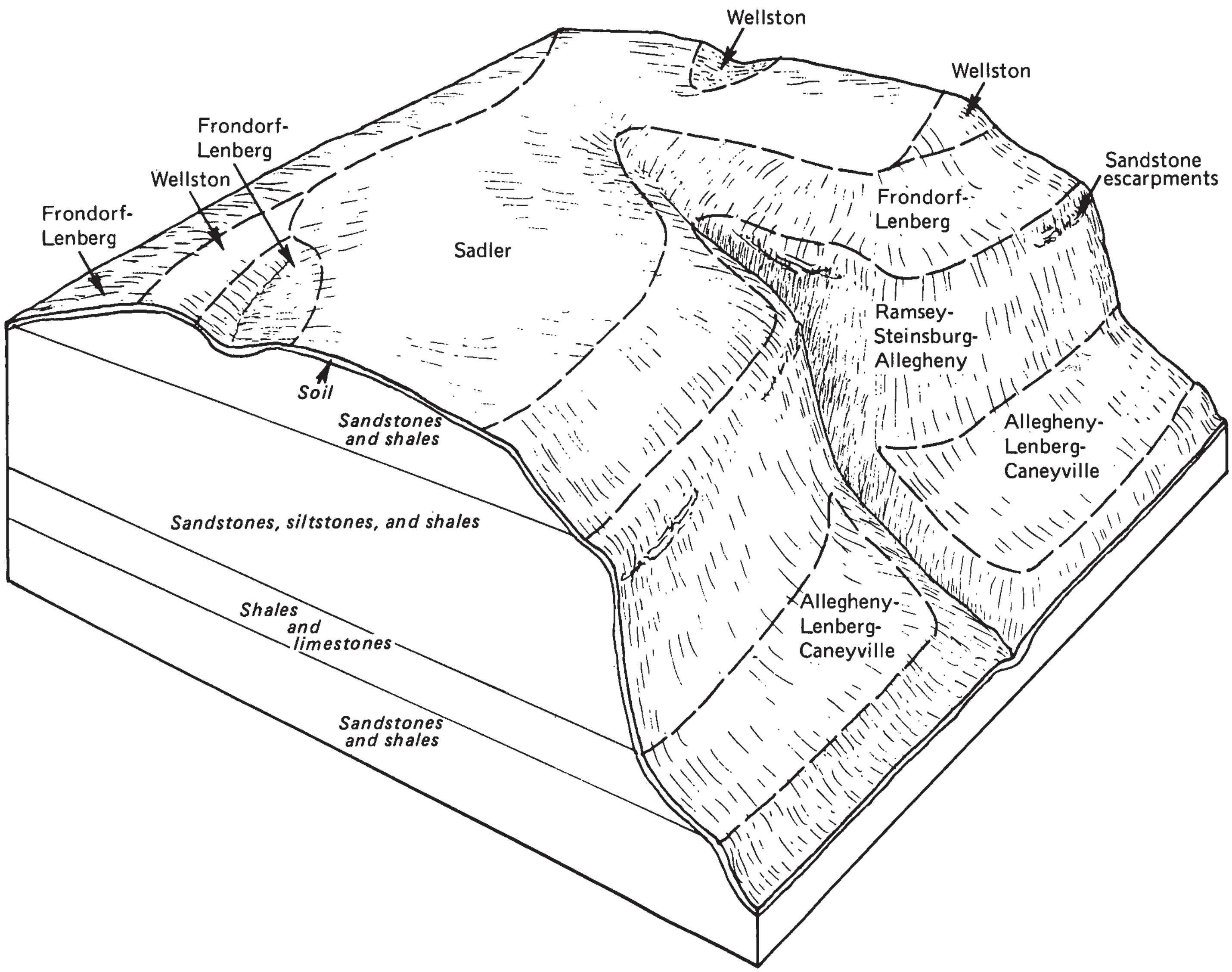


*Figure 1.*—Typical pattern of soils and parent material in the Frondorf-Sadler-Ramsey association.

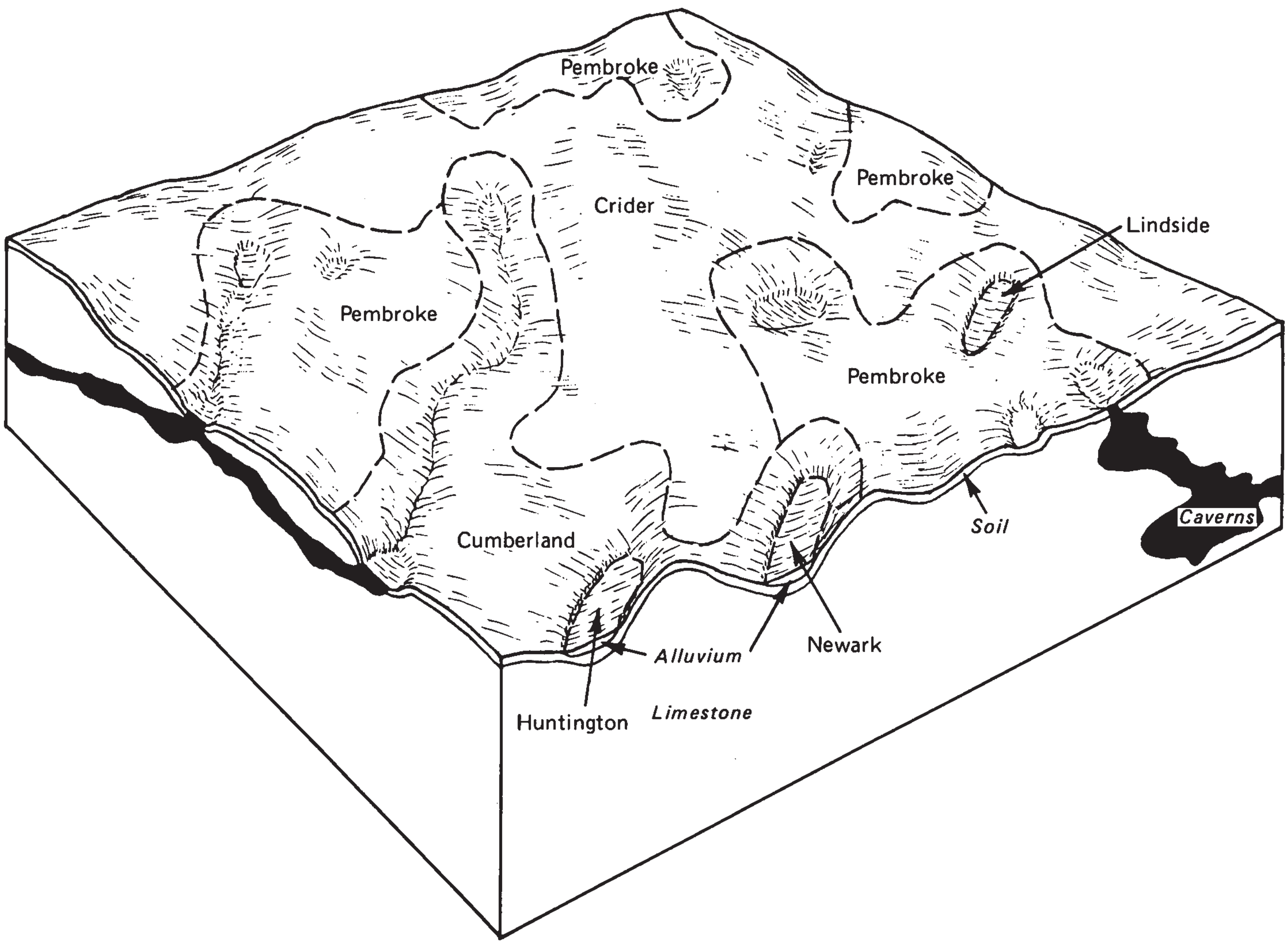


*Figure 2.*—Typical pattern of soils and parent material in the Crider-Pembroke-Cumberland association.

*Figure 3.*—Typical landscape in the Caneyville-Hagerstown association. Caneyville-Rock outcrop complex, 6 to 20 percent slopes, is in the foreground.

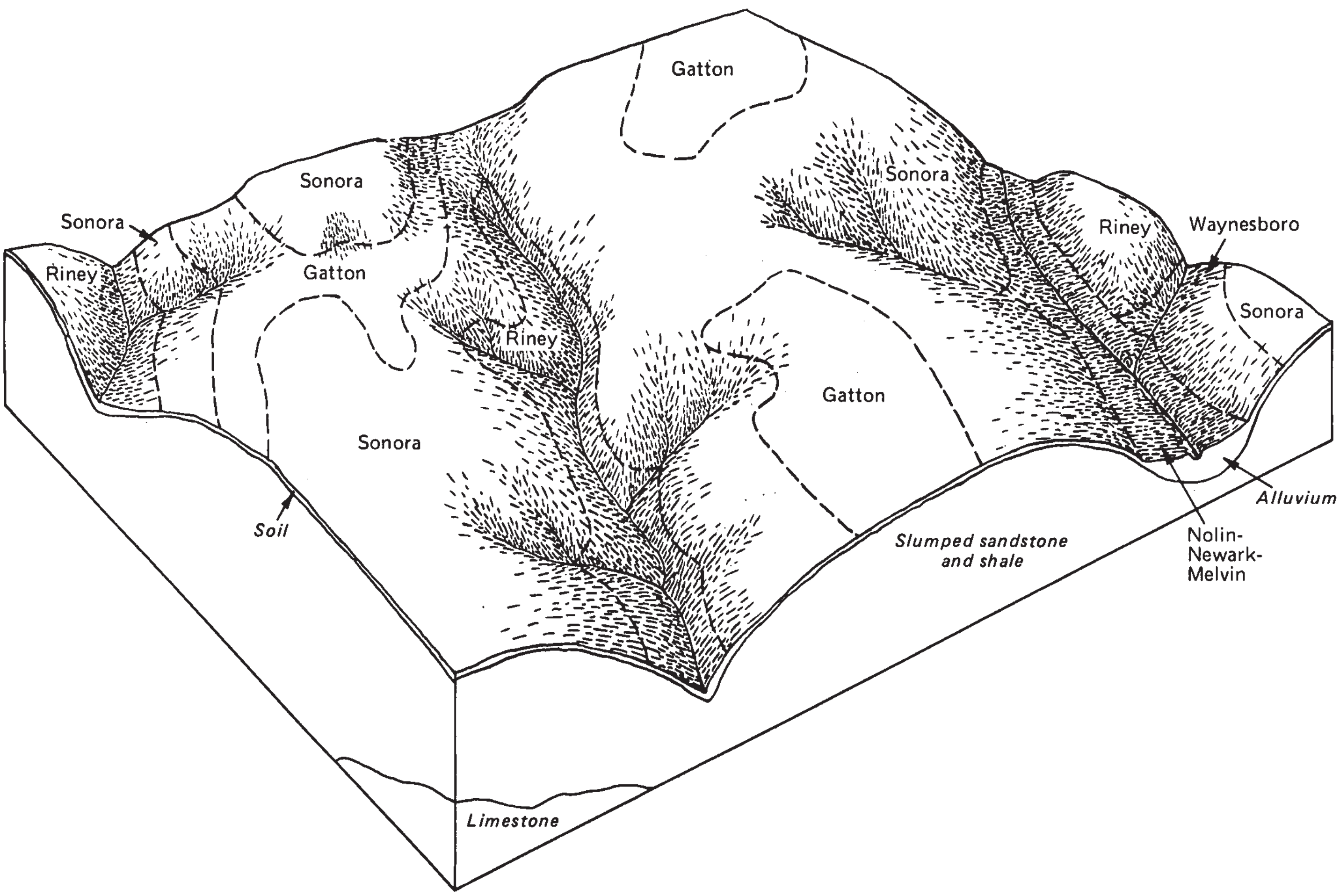


*Figure 4*.—Typical pattern of soils and parent material in the Sonora-Gatton-Riney association.

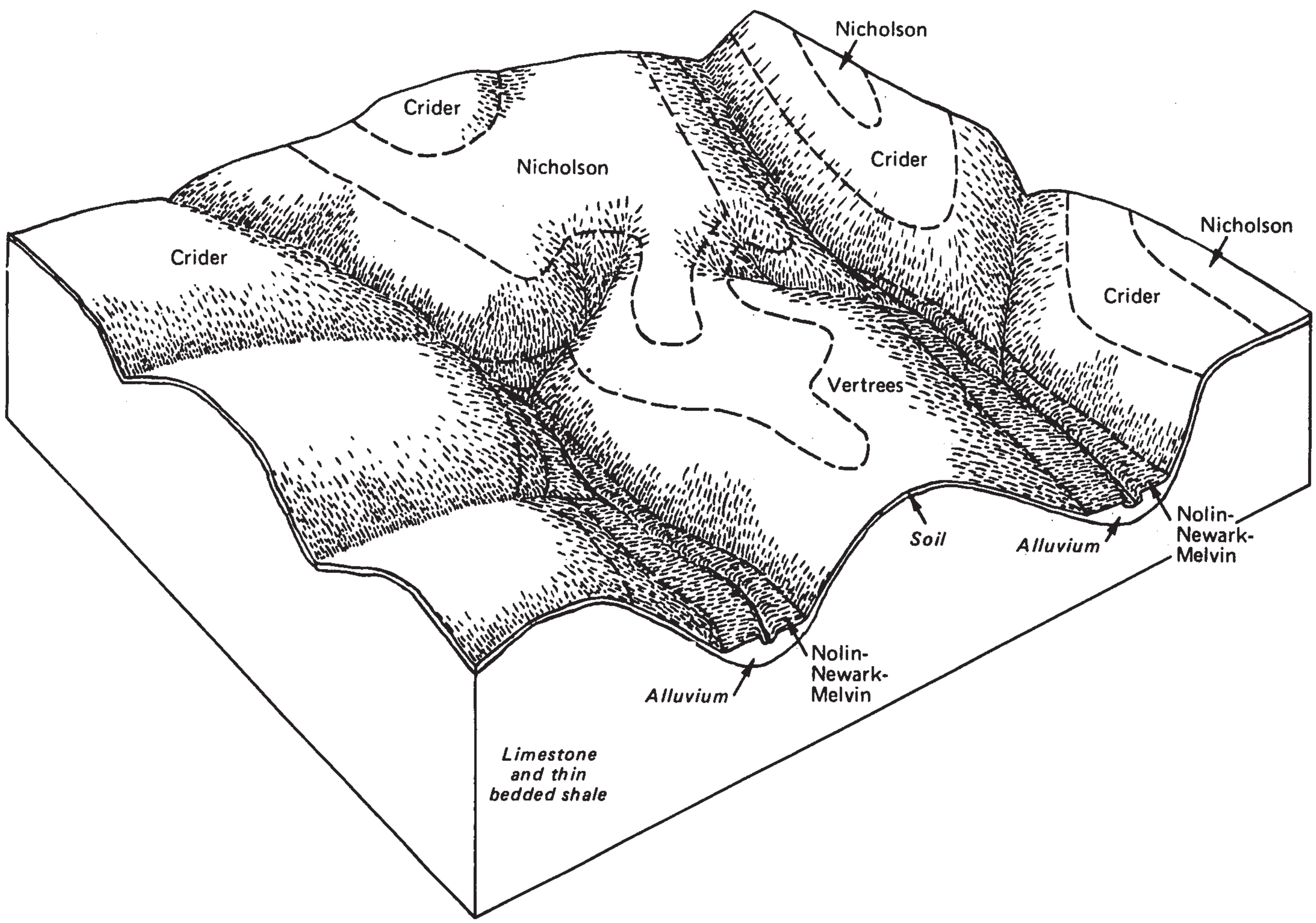


*Figure 5.*—Typical pattern of soils and parent material in the Crider-Vertrees-Nicholson association.

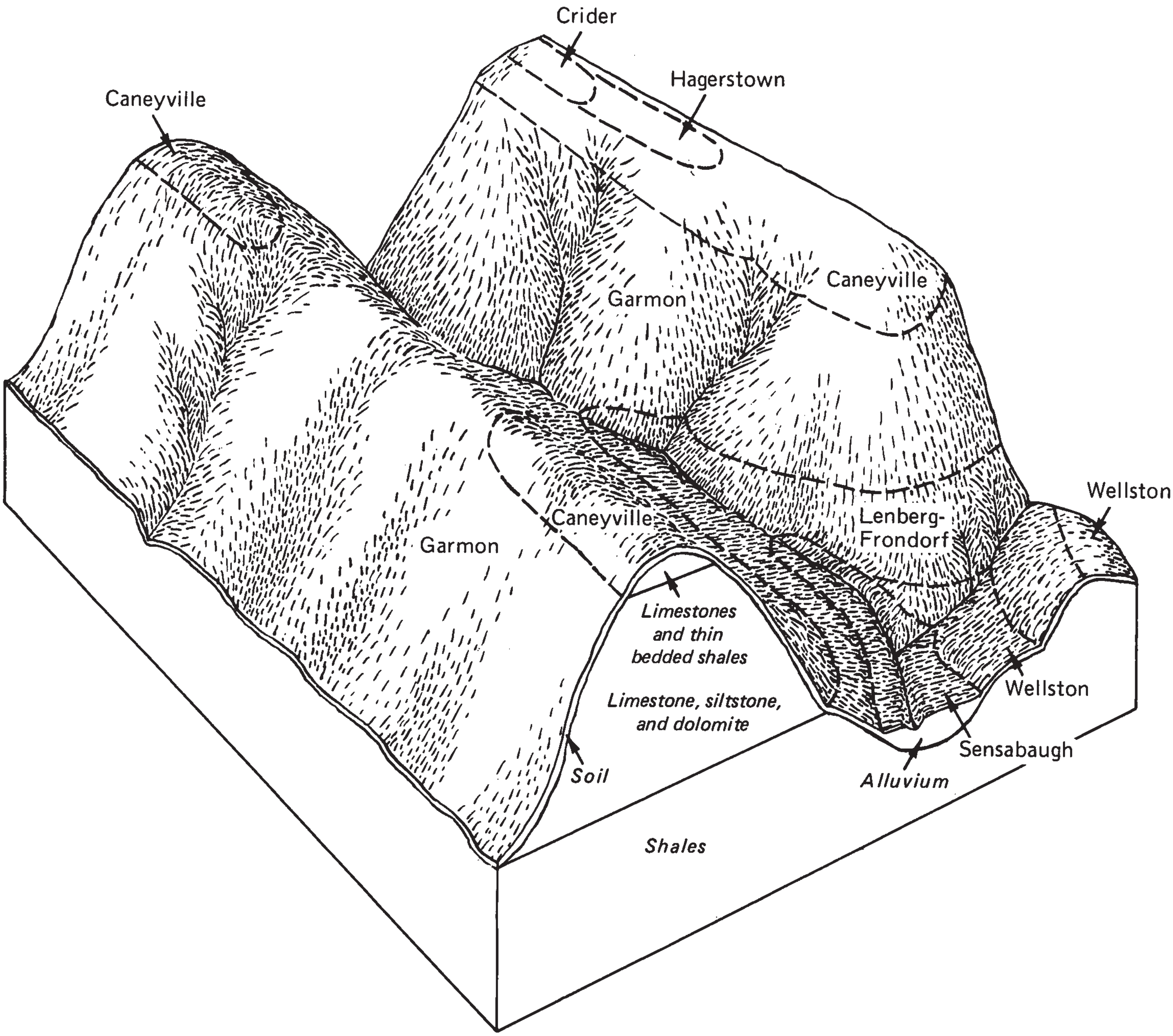


*Figure 6.*—Typical pattern of soils and parent material in the Garmon-Caneyville-Lenberg association.

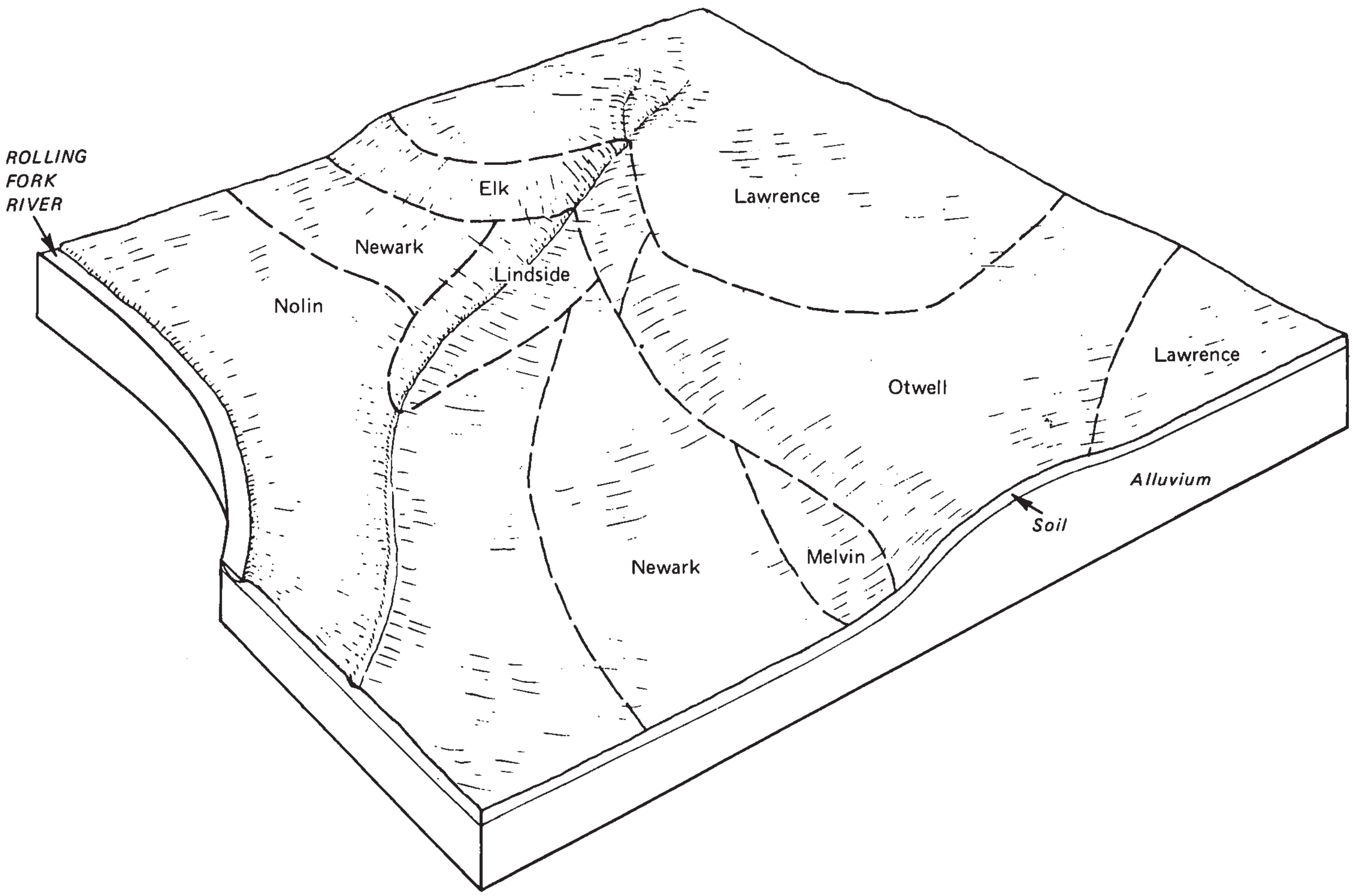


*Figure 7.*—Typical pattern of soils and parent material in the Lawrence-Nolin-Otwell association.

*Figure 8.*—Soybeans on Crider silt loam, 2 to 6 percent slopes, in an area of the Crider-Pembroke-Cumberland association.

*Figure 9.*—Wheat and hay in an area of Crider silt loam, 6 to 12 percent slopes. Nicholson silt loam, 2 to 6 percent slopes, is on the ridgetop in the background.

*Figure 10.*—An area of Cumberland silt loam, 6 to 12 percent slopes. Water has collected in the depression because the drainage outlet is clogged.

*Figure 11.*—Burley tobacco in an area of Hagerstown silt loam, 2 to 6 percent slopes. In the background, pasture and trees in an area of Caneyville-Rock outcrop complex, 6 to 20 percent slopes.

*Figure 12.*—Kentucky 31 fescue, burley tobacco (upper left), and trees in an area of Nicholson silt loam, 2 to 6 percent slopes.

*Figure 13.*—Wheat in an area of Pembroke silt loam, 6 to 12 percent slopes, and Pembroke silt loam, 2 to 6 percent slopes (at right).

# Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

| Month | Temperature[1] | | | | | | Precipitation[1] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average daily maximum | Average daily minimum | Average | 2 years in 10 will have-- Maximum temperature higher than-- | 2 years in 10 will have-- Minimum temperature lower than-- | Average number of growing degree days[2] | Average | 2 years in 10 will have-- Less than-- | 2 years in 10 will have-- More than-- | Average number of days with 0.10 inch or more | Average snowfall |
| | F | F | F | F | F | Units | In | In | In | | In |
| January---- | 43.8 | 25.6 | 34.7 | 70 | -6 | 8 | 3.83 | 1.95 | 5.35 | 7 | 4.0 |
| February--- | 47.6 | 27.6 | 37.6 | 72 | -1 | 19 | 3.81 | 1.99 | 5.29 | 7 | 3.5 |
| March------ | 56.5 | 35.0 | 45.8 | 82 | 13 | 93 | 4.88 | 2.94 | 6.61 | 9 | 2.8 |
| April------ | 69.2 | 45.9 | 57.5 | 87 | 26 | 245 | 4.16 | 2.54 | 5.61 | 8 | .0 |
| May-------- | 77.6 | 53.9 | 65.8 | 92 | 33 | 490 | 4.50 | 2.52 | 6.10 | 7 | .0 |
| June------- | 84.8 | 62.2 | 73.5 | 96 | 45 | 705 | 4.17 | 2.17 | 5.79 | 6 | .0 |
| July------- | 87.9 | 65.9 | 76.9 | 99 | 52 | 834 | 4.38 | 2.44 | 5.95 | 7 | .0 |
| August----- | 87.4 | 64.4 | 75.9 | 98 | 51 | 803 | 3.21 | 1.52 | 4.58 | 5 | .0 |
| September-- | 81.4 | 58.1 | 69.8 | 96 | 39 | 594 | 3.14 | 1.30 | 4.63 | 5 | .0 |
| October---- | 70.7 | 46.5 | 58.6 | 87 | 27 | 284 | 2.56 | 1.14 | 3.71 | 5 | .0 |
| November--- | 56.6 | 36.2 | 46.4 | 80 | 14 | 32 | 4.01 | 2.00 | 5.65 | 7 | .9 |
| December--- | 46.7 | 29.0 | 37.9 | 71 | 2 | 25 | 4.10 | 2.07 | 5.76 | 7 | 1.9 |
| Year----- | 67.5 | 45.9 | 56.7 | 100 | -9 | 4,132 | 46.75 | 38.81 | 54.31 | 80 | 13.1 |

[1]Recorded in the period 1951-74 at Leitchfield, Ky.

[2]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

| Probability | Minimum temperature[1] | | |
|---|---|---|---|
| | 24° F or lower | 28° F or lower | 32° F or lower |
| Last freezing temperature in spring: | | | |
| 1 year in 10 later than-- | April 6 | April 13 | April 30 |
| 2 years in 10 later than-- | March 31 | April 9 | April 24 |
| 5 years in 10 later than-- | March 21 | April 2 | April 14 |
| First freezing temperature in fall: | | | |
| 1 year in 10 earlier than-- | October 27 | October 19 | October 11 |
| 2 years in 10 earlier than-- | November 1 | October 24 | October 15 |
| 5 years in 10 earlier than-- | November 11 | November 2 | October 24 |

[1]Recorded in the period 1951-74 at Leitchfield, Ky.

TABLE 3.--GROWING SEASON LENGTH

| Probability | Daily minimum temperature during growing season[1] | | |
|---|---|---|---|
| | Higher than 24° F | Higher than 28° F | Higher than 32° F |
| | Days | Days | Days |
| 9 years in 10 | 210 | 196 | 174 |
| 8 years in 10 | 218 | 202 | 181 |
| 5 years in 10 | 235 | 213 | 193 |
| 2 years in 10 | 251 | 224 | 204 |
| 1 year in 10 | 259 | 230 | 211 |

[1]Recorded in the period 1951-74 at Leitchfield, Ky.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

| Map symbol | Soil name | Hardin County | Larue County | Total-- Area | Extent |
|---|---|---|---|---|---|
| | | Acres | Acres | Acres | Pct |
| AlD | Allegheny-Lenberg-Caneyville complex, 12 to 20 percent slopes | 4,740 | 0 | 4,740 | 0.8 |
| As | Ashton silt loam | 795 | 235 | 1,030 | 0.2 |
| CnD | Caneyville-Rock outcrop complex, 6 to 20 percent slopes | 18,690 | 4,255 | 22,945 | 4.1 |
| CnE | Caneyville-Rock outcrop complex, 20 to 30 percent slopes | 9,735 | 4,590 | 14,325 | 2.6 |
| CrB | Crider silt loam, 2 to 6 percent slopes | 39,305 | 19,570 | 58,875 | 10.5 |
| CrC | Crider silt loam, 6 to 12 percent slopes | 30,380 | 15,210 | 45,590 | 8.1 |
| CrD | Crider silt loam, 12 to 20 percent slopes | 950 | 0 | 950 | 0.2 |
| CsC | Cumberland silt loam, 6 to 12 percent slopes | 8,355 | 3,670 | 12,025 | 2.1 |
| CsD | Cumberland silt loam, 12 to 20 percent slopes | 2,020 | 2,000 | 4,020 | 0.7 |
| CtC3 | Cumberland silty clay loam, 6 to 12 percent slopes, severely eroded | 3,665 | 395 | 4,060 | 0.7 |
| CtD3 | Cumberland silty clay loam, 12 to 20 percent slopes, severely eroded | 1,065 | 275 | 1,340 | 0.2 |
| Dn | Dunning silty clay loam | 445 | 55 | 500 | 0.1 |
| ElB | Elk silt loam, 2 to 6 percent slopes | 3,780 | 2,200 | 5,980 | 1.1 |
| ElC | Elk silt loam, 6 to 12 percent slopes | 1,065 | 625 | 1,690 | 0.3 |
| FdC | Fredonia-Rock outcrop complex, 6 to 20 percent slopes | 8,490 | 110 | 8,600 | 1.5 |
| FrC | Frondorf-Lenberg silt loams, 6 to 12 percent slopes | 12,280 | 0 | 12,280 | 2.2 |
| FrD | Frondorf-Lenberg silt loams, 12 to 20 percent slopes | 8,015 | 865 | 8,880 | 1.6 |
| GmE | Garmon silt loam, 25 to 60 percent slopes | 14,280 | 13,390 | 27,670 | 4.9 |
| GnB | Gatton silt loam, 2 to 6 percent slopes | 3,870 | 5,890 | 9,760 | 1.7 |
| Gu | Gullied land | 2,050 | 50 | 2,100 | 0.4 |
| HnB | Hagerstown silt loam, 2 to 6 percent slopes | 2,730 | 1,080 | 3,810 | 0.7 |
| HnC | Hagerstown silt loam, 6 to 12 percent slopes | 16,250 | 3,490 | 19,740 | 3.5 |
| HnD | Hagerstown silt loam, 12 to 20 percent slopes | 1,500 | 120 | 1,620 | 0.3 |
| Hu | Huntington silt loam | 1,640 | 100 | 1,740 | 0.3 |
| Lc | Lawrence silt loam | 3,650 | 2,430 | 6,080 | 1.1 |
| LfE | Lenberg-Frondorf complex, 20 to 30 percent slopes | 2,720 | 3,320 | 6,040 | 1.1 |
| Ln | Lindside silt loam | 1,600 | 1,140 | 2,740 | 0.5 |
| MdC3 | Markland silty clay, 6 to 12 percent slopes, severely eroded | 3,140 | 0 | 3,140 | 0.6 |
| Mr | McGary silt loam | 4,780 | 0 | 4,780 | 0.9 |
| Mv | Melvin silt loam | 2,520 | 1,950 | 4,470 | 0.8 |
| Nb | Newark silt loam | 7,500 | 5,180 | 12,680 | 2.3 |
| NcA | Nicholson silt loam, 0 to 2 percent slopes | 2,200 | 1,820 | 4,020 | 0.7 |
| NcB | Nicholson silt loam, 2 to 6 percent slopes | 15,440 | 8,880 | 24,320 | 4.3 |
| No | Nolin silt loam | 14,510 | 6,460 | 20,970 | 3.7 |
| Nv | Nolin variant fine sandy loam | 850 | 470 | 1,320 | 0.2 |
| OtA | Otwell silt loam, 0 to 2 percent slopes | 2,280 | 1,590 | 3,870 | 0.7 |
| OtB | Otwell silt loam, 2 to 6 percent slopes | 2,000 | 920 | 2,920 | 0.5 |
| PmB | Pembroke silt loam, 2 to 6 percent slopes | 11,250 | 1,680 | 12,930 | 2.3 |
| PmC | Pembroke silt loam, 6 to 12 percent slopes | 8,200 | 590 | 8,790 | 1.6 |
| RaE | Ramsey-Steinsburg-Allegheny complex, 20 to 40 percent slopes | 14,580 | 0 | 14,580 | 2.6 |
| RbC | Riney loam, 6 to 12 percent slopes | 960 | 2,480 | 3,440 | 0.6 |
| RbD | Riney loam, 12 to 20 percent slopes | 2,030 | 1,770 | 3,800 | 0.7 |
| RbE | Riney loam, 20 to 30 percent slopes | 370 | 890 | 1,260 | 0.2 |
| RcD3 | Riney sandy clay loam, 6 to 20 percent slopes, severely eroded | 3,850 | 880 | 4,730 | 0.8 |

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

| Map symbol | Soil name | Hardin County | Larue County | Total-- Area | Total-- Extent |
|---|---|---|---|---|---|
| | | Acres | Acres | Acres | Pct |
| Rd | Robertsville silt loam | 440 | 490 | 930 | 0.2 |
| RoE | Rock outcrop-Corydon complex, 12 to 30 percent slopes | 920 | 210 | 1,130 | 0.2 |
| SdA | Sadler silt loam, 0 to 2 percent slopes | 590 | 0 | 590 | 0.1 |
| SdB | Sadler silt loam, 2 to 6 percent slopes | 14,240 | 0 | 14,240 | 2.5 |
| SdC | Sadler silt loam, 6 to 12 percent slopes | 1,180 | 0 | 1,180 | 0.2 |
| Sg | Sensabaugh silt loam | 2,650 | 1,430 | 4,080 | 0.7 |
| SnB | Sonora silt loam, 2 to 6 percent slopes | 12,270 | 7,990 | 20,260 | 3.6 |
| SnC | Sonora silt loam, 6 to 12 percent slopes | 7,180 | 6,560 | 13,740 | 2.5 |
| SnC3 | Sonora silt loam, 6 to 12 percent slopes, severely eroded | 2,490 | 1,190 | 3,680 | 0.7 |
| VrC | Vertrees silt loam, 6 to 12 percent slopes | 9,320 | 6,660 | 15,980 | 2.9 |
| VrD | Vertrees silt loam, 12 to 20 percent slopes | 9,650 | 8,450 | 18,100 | 3.2 |
| VrE | Vertrees silt loam, 20 to 30 percent slopes | 2,460 | 2,540 | 5,000 | 0.9 |
| VtD3 | Vertrees silty clay loam, 6 to 20 percent slopes, severely eroded | 18,550 | 5,710 | 24,260 | 4.3 |
| WbC | Waynesboro loam, 6 to 12 percent slopes | 720 | 500 | 1,220 | 0.2 |
| WbD | Waynesboro loam, 12 to 20 percent slopes | 640 | 580 | 1,220 | 0.2 |
| WbE | Waynesboro loam, 20 to 30 percent slopes | 280 | 710 | 990 | 0.2 |
| WcC3 | Waynesboro clay loam, 6 to 12 percent slopes, severely eroded | 740 | 420 | 1,160 | 0.2 |
| WcD3 | Waynesboro clay loam, 12 to 20 percent slopes, severely eroded | 440 | 190 | 630 | 0.1 |
| WlB | Wellston silt loam, 2 to 6 percent slopes | 1,340 | 380 | 1,720 | 0.3 |
| WlC | Wellston silt loam, 6 to 12 percent slopes | 4,150 | 1,350 | 5,500 | 1.0 |
| WlC3 | Wellston silt loam, 6 to 12 percent slopes, severely eroded | 1,500 | 60 | 1,560 | 0.3 |
| | Water | 1,990 | 330 | 2,320 | 0.4 |
| | Total | 394,265 | 166,375 | 560,640 | 100.0 |

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of managment. The estimates were made in 1975. Absence of a yield figure indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

| Soil name and map symbol | Corn | Wheat | Soybeans | Tobacco | Grass-legume hay | Pasture |
|---|---|---|---|---|---|---|
| | Bu | Bu | Bu | Lb | Ton | AUM[1] |
| Allegheny: | | | | | | |
| [2]AlD | --- | --- | --- | --- | --- | 5.5 |
| Ashton: | | | | | | |
| As | 140 | 50 | 45 | 3,200 | 5.0 | 9.5 |
| Caneyville: | | | | | | |
| [2]CnD | --- | --- | --- | --- | --- | 4.0 |
| [2]CnE | --- | --- | --- | --- | --- | --- |
| Crider: | | | | | | |
| CrB | 120 | 40 | 45 | 3,200 | 5.0 | 10.5 |
| CrC | 95 | 40 | 35 | 2,900 | 4.5 | 9.5 |
| CrD | 85 | 35 | 30 | 2,600 | 4.0 | 7.5 |
| Cumberland: | | | | | | |
| CsC | 85 | 40 | 35 | 2,400 | 4.0 | 8.0 |
| CtC3 | 70 | 30 | 25 | 1,750 | 3.0 | 5.5 |
| CsD | 80 | 35 | 25 | 1,850 | 3.5 | 7.0 |
| CtD3 | --- | --- | --- | --- | --- | 5.5 |
| Dunning: | | | | | | |
| Dn | 100 | --- | 40 | --- | 4.0 | 7.5 |
| Elk: | | | | | | |
| ElB | 120 | 45 | 45 | 3,200 | 4.5 | 8.5 |
| ElC | 105 | 40 | 40 | 2,900 | 4.0 | 7.5 |
| Fredonia: | | | | | | |
| [2]FdC | --- | --- | --- | --- | --- | 4.0 |
| Frondorf: | | | | | | |
| [2]FrC | 80 | 35 | 25 | 1,800 | 3.0 | 6.0 |
| [2]FrD | --- | --- | --- | --- | --- | 5.0 |
| Garmon: | | | | | | |
| GmE | --- | --- | --- | --- | --- | --- |
| Gatton: | | | | | | |
| GnB | 90 | 35 | 35 | 2,600 | 3.5 | 6.5 |
| Gullied land: | | | | | | |
| Gu | --- | --- | --- | --- | --- | --- |
| Hagerstown: | | | | | | |
| HnB | 115 | 40 | 40 | 3,000 | 4.5 | 8.5 |
| HnC | 95 | 35 | 35 | 2,700 | 4.0 | 7.5 |
| HnD | 75 | 30 | 30 | 2,500 | 3.0 | 6.0 |
| Huntington: | | | | | | |
| Hu | 135 | --- | 45 | 3,200 | 5.0 | 9.5 |
| Lawrence: | | | | | | |
| Lc | 80 | 35 | 35 | 1,700 | 3.0 | 5.5 |
| Lenberg: | | | | | | |
| [2]LfE | --- | --- | --- | --- | --- | 3.5 |

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

| Soil name and map symbol | Corn | Wheat | Soybeans | Tobacco | Grass-legume hay | Pasture |
|---|---|---|---|---|---|---|
| | Bu | Bu | Bu | Lb | Ton | AUM[1] |
| Lindside: | | | | | | |
| Ln | 130 | --- | 45 | 2,900 | 4.5 | 8.5 |
| Markland: | | | | | | |
| MdC3 | --- | --- | --- | --- | --- | 4.0 |
| McGary: | | | | | | |
| Mr | 100 | 35 | 35 | 1,900 | 3.5 | 6.5 |
| Melvin: | | | | | | |
| Mv | 85 | --- | 30 | --- | 3.0 | 6.0 |
| Newark: | | | | | | |
| Nb | 100 | --- | 40 | 2,500 | 4.5 | 8.5 |
| Nicholson: | | | | | | |
| NcA | 90 | 40 | 40 | 2,400 | 3.5 | 6.5 |
| NcB | 90 | 40 | 40 | 2,600 | 3.5 | 6.5 |
| Nolin: | | | | | | |
| No | 135 | --- | 45 | 3,300 | 4.5 | 8.5 |
| Nolin variant: | | | | | | |
| Nv | 90 | --- | 30 | 2,400 | 3.0 | 6.0 |
| Otwell: | | | | | | |
| OtA | 95 | 40 | 40 | 2,400 | 3.5 | 6.5 |
| OtB | 95 | 40 | 40 | 2,600 | 3.5 | 6.5 |
| Pembroke: | | | | | | |
| PmB | 120 | 45 | 45 | 3,200 | 5.0 | 9.5 |
| PmC | 105 | 40 | 40 | 2,900 | 4.5 | 8.5 |
| Ramsey: | | | | | | |
| [2]RaE | --- | --- | --- | --- | --- | --- |
| Riney: | | | | | | |
| RbC | 85 | 40 | 30 | 2,600 | 3.0 | 6.0 |
| RbD | 75 | 35 | 25 | 2,400 | 2.5 | 5.0 |
| RcD3 | --- | --- | --- | --- | --- | 4.0 |
| RbE | --- | --- | --- | --- | --- | 4.5 |
| Robertsville: | | | | | | |
| Rd | 70 | --- | 30 | --- | 3.0 | 5.5 |
| Rock outcrop: | | | | | | |
| [2]RoE | --- | --- | --- | --- | --- | --- |
| Sadler: | | | | | | |
| SdA | 90 | 40 | 30 | 2,350 | 3.5 | 6.5 |
| SdB | 90 | 40 | 30 | 2,550 | 3.5 | 6.5 |
| SdC | 85 | 35 | 25 | 2,250 | 3.0 | 6.0 |
| Sensabaugh: | | | | | | |
| Sg | 100 | --- | 45 | 2,400 | 4.0 | 7.5 |
| Sonora: | | | | | | |
| SnB | 100 | 40 | 35 | 2,800 | 3.5 | 7.0 |
| SnC | 95 | 40 | 30 | 2,600 | 3.5 | 7.0 |
| SnC3 | 80 | 35 | 25 | 2,100 | 3.0 | 6.0 |

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

| Soil name and map symbol | Corn | Wheat | Soybeans | Tobacco | Grass-legume hay | Pasture |
|---|---|---|---|---|---|---|
| | Bu | Bu | Bu | Lb | Ton | AUM[1] |
| Vertrees: | | | | | | |
| VrC | 80 | 35 | 30 | 2,200 | 3.0 | 6.0 |
| VrD, VtD3 | 70 | 30 | 25 | 1,700 | 2.5 | 5.0 |
| VrE | --- | --- | --- | --- | --- | 4.0 |
| Waynesboro: | | | | | | |
| WbC | 85 | 45 | 40 | 2,600 | 3.5 | 6.5 |
| WcC3 | 70 | 35 | 30 | 2,200 | 3.0 | 6.0 |
| WbD | 70 | 40 | 25 | 1,850 | 3.0 | 6.0 |
| WcD3 | --- | --- | --- | --- | --- | 5.5 |
| WbE | --- | --- | --- | --- | --- | 5.0 |
| Wellston: | | | | | | |
| WlB | 105 | 40 | 40 | 2,800 | 4.5 | 7.5 |
| WlC | 100 | 40 | 35 | 2,400 | 4.5 | 7.5 |
| WlC3 | 90 | 35 | 25 | 1,800 | 4.0 | 7.0 |

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.
[2]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior characteristics of the mapping unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Dashes indicate no acreage]

| Class | Total acreage | Major management concerns (subclass) | | | |
|---|---|---|---|---|---|
| | | Erosion (e) | Wetness (w) | Soil problem (s) | Climate (c) |
| | | Acres | Acres | Acres | Acres |
| I | 26,480 | --- | --- | --- | --- |
| II | 181,375 | 154,815 | 21,160 | 5,400 | --- |
| III | 144,725 | 128,895 | 15,830 | --- | --- |
| IV | 53,380 | 52,450 | 930 | --- | --- |
| V | --- | --- | --- | --- | --- |
| VI | 92,545 | 61,000 | --- | 31,545 | --- |
| VII | 59,815 | 42,250 | --- | 17,565 | --- |
| VIII | --- | --- | --- | --- | --- |

TABLE 7.--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]

| Soil name and map symbol | Ordination symbol | Management concerns: Erosion hazard | Management concerns: Equipment limitation | Management concerns: Seedling mortality | Management concerns: Plant competition | Potential productivity: Important trees | Potential productivity: Site index | Trees to plant |
|---|---|---|---|---|---|---|---|---|
| Allegheny: | | | | | | | | |
| [1]AlD: | | | | | | | | |
| Allegheny part | 2r | Moderate | Moderate | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Virginia pine<br>Eastern white pine<br>Shortleaf pine | 80<br>90<br>75<br>90<br>75 | Eastern white pine, shortleaf pine, yellow-poplar, black walnut, loblolly pine, white ash. |
| Lenberg part | 3c | Severe | Moderate | Slight | Moderate | Northern red oak | 70 | Eastern white pine, shortleaf pine, Virginia pine, loblolly pine. |
| Caneyville part | 3c | Severe | Severe | Slight | Slight | Northern red oak<br>Yellow-poplar<br>Eastern redcedar | 69<br>80<br>45 | Eastern redcedar, Virginia pine. |
| Ashton: | | | | | | | | |
| As | 1o | Slight | Slight | Slight | Moderate | Northern red oak<br>Pin oak<br>Yellow-poplar<br>Sweetgum<br>Shumard oak | 85<br>103<br>95<br>95<br>94 | Eastern white pine, yellow-poplar, black walnut, sweetgum, cherrybark oak. |
| Caneyville: | | | | | | | | |
| [1]CnD: | | | | | | | | |
| Caneyville part | 3c | Moderate | Slight | Slight | Slight | Northern red oak<br>Yellow-poplar<br>Eastern redcedar | 69<br>80<br>45 | Eastern redcedar, Virginia pine. |
| Rock outcrop part. | | | | | | | | |
| [1]CnE: | | | | | | | | |
| Caneyville part | 3c | Severe | Moderate | Slight | Slight | Northern red oak<br>Yellow-poplar<br>Eastern redcedar | 69<br>80<br>45 | Eastern redcedar, Virginia pine. |
| Rock outcrop part. | | | | | | | | |
| Crider: | | | | | | | | |
| CrB, CrC | 1o | Slight | Slight | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Virginia pine<br>Shortleaf pine | 88<br>97<br>78<br>80 | Eastern white pine, yellow-poplar, black walnut, loblolly pine, white ash. |
| CrD | 1r | Moderate | Moderate | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Virginia pine<br>Shortleaf pine | 88<br>97<br>78<br>80 | Eastern white pine, yellow-poplar, black walnut, loblolly pine, white ash. |
| Cumberland: | | | | | | | | |
| CsC | 2c | Slight | Slight | Slight | Moderate | Yellow-poplar<br>White oak<br>Shortleaf pine<br>Virginia pine<br>Loblolly pine | 90<br>70<br>70<br>70<br>80 | Yellow-poplar, black walnut, loblolly pine, shortleaf pine. |
| CsD | 2c | Moderate | Moderate | Slight | Moderate | Yellow-poplar<br>White oak<br>Shortleaf pine<br>Virginia pine<br>Loblolly pine | 90<br>70<br>70<br>70<br>80 | Yellow-poplar, black walnut, loblolly pine, shortleaf pine. |

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

| Soil name and map symbol | Ordination symbol | Management concerns: Erosion hazard | Management concerns: Equipment limitation | Management concerns: Seedling mortality | Management concerns: Plant competition | Potential productivity: Important trees | Potential productivity: Site index | Trees to plant |
|---|---|---|---|---|---|---|---|---|
| Cumberland: | | | | | | | | |
| CtC3 | 3c | Slight | Moderate | Moderate | Slight | Shortleaf pine<br>Virginia pine | 60<br>65 | Virginia pine, shortleaf pine, loblolly pine. |
| CtD3 | 3c | Moderate | Severe | Moderate | Slight | Shortleaf pine<br>Virginia pine | 60<br>65 | Virginia pine, shortleaf pine, loblolly pine. |
| Dunning: | | | | | | | | |
| Dn | 1w | Slight | Severe | Severe | Severe | Pin oak<br>Sweetgum<br>Eastern cottonwood | 95<br>95<br>100 | Loblolly pine, pin oak, sycamore, sweetgum. |
| Elk: | | | | | | | | |
| ElB, ElC | 2o | Slight | Slight | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Shortleaf pine<br>Eastern white pine | 80<br>90<br>80<br>90 | Eastern white pine, yellow-poplar, black walnut, loblolly pine. |
| Fredonia: | | | | | | | | |
| [1]FdC: | | | | | | | | |
| Fredonia part | 3c | Slight | Moderate | Slight | Slight | Northern red oak<br>Eastern redcedar | 70<br>50 | Virginia pine, eastern redcedar. |
| Rock outcrop part. | | | | | | | | |
| Frondorf: | | | | | | | | |
| [1]FrC: | | | | | | | | |
| Frondorf part | 2o | Slight | Slight | Slight | Moderate | Northern red oak | 86 | Yellow-poplar, shortleaf pine, black walnut, eastern white pine, loblolly pine. |
| Lenberg part | 3c | Moderate | Slight | Slight | Slight | Northern red oak | 70 | Eastern white pine, shortleaf pine, Virginia pine, loblolly pine. |
| [1]FrD: | | | | | | | | |
| Frondorf part | 2r | Moderate | Moderate | Slight | Moderate | Northern red oak | 86 | Yellow-poplar, shortleaf pine, black walnut, loblolly pine. |
| Lenberg part | 3c | Severe | Moderate | Slight | Slight | Northern red oak | 70 | Eastern white pine, shortleaf pine, black walnut, eastern white pine, loblolly pine. |
| Garmon: | | | | | | | | |
| GmE | 4r | Severe | Severe | Slight | Slight | Northern red oak<br>Virginia pine<br>Eastern redcedar | 59<br>65<br>38 | Shortleaf pine, Virginia pine, eastern redcedar, loblolly pine, eastern white pine. |
| Gatton: | | | | | | | | |
| GnB | 3o | Slight | Slight | Slight | Slight | Northern red oak<br>Yellow Poplar | 70<br>90 | Yellow-poplar, loblolly pine, white ash. |
| Gullied land Gu. | | | | | | | | |
| Hagerstown: | | | | | | | | |
| HnB, HnC | 1o | Slight | Slight | Slight | Moderate | Northern red oak<br>Yellow-poplar | 85<br>95 | Black walnut, yellow-poplar, eastern white pine. |

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

| Soil name and map symbol | Ordination symbol | Management concerns | | | | Potential productivity | | Trees to plant |
|---|---|---|---|---|---|---|---|---|
| | | Erosion hazard | Equipment limitation | Seedling mortality | Plant competition | Important trees | Site index | |
| Hagerstown: | | | | | | | | |
| HnD | 1r | Moderate | Moderate | Slight | Moderate | Northern red oak<br>Yellow-poplar | 85<br>95 | Black walnut, yellow-poplar, eastern white pine. |
| Huntington: | | | | | | | | |
| Hu | 1o | Slight | Slight | Slight | Severe | Yellow-poplar<br>Northern red oak | 95<br>85 | Yellow-poplar, black walnut, eastern white pine, white ash. |
| Lawrence: | | | | | | | | |
| Lc | 2w | Slight | Moderate | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Sweetgum<br>Shortleaf pine | 65<br>90<br>87<br>69 | Yellow-poplar, white ash, loblolly pine, American sycamore. |
| Lenberg: | | | | | | | | |
| [1]LfE: | | | | | | | | |
| Lenberg part | 3c | Severe | Moderate | Slight | Slight | Northern red oak | 70 | Eastern white pine, shortleaf pine, black walnut, loblolly pine. |
| Frondorf part | 2r | Moderate | Moderate | Slight | Moderate | Northern red oak | 86 | Yellow-poplar, shortleaf pine, black walnut, eastern white pine, loblolly pine. |
| Lindside: | | | | | | | | |
| Ln | 1o | Slight | Slight | Slight | Moderate | Northern red oak<br>Yellow-poplar | 85<br>95 | Eastern white pine, yellow-poplar, black cherry, black walnut. |
| Markland: | | | | | | | | |
| MdC3 | 3c | Moderate | Moderate | Moderate | Slight | White oak<br>Northern red oak | 75<br>75 | Eastern white pine, shortleaf pine, loblolly pine. |
| McGary: | | | | | | | | |
| Mr | 3w | Slight | Moderate | Slight | Moderate | White oak<br>Pin oak<br>Yellow-poplar<br>Sweetgum | 70<br>85<br>85<br>80 | Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore. |
| Melvin: | | | | | | | | |
| Mv | 1w | Slight | Severe | Severe | Severe | Pin oak<br>Eastern Cottonwood<br>Sweetgum | 101<br>96<br>92 | Pin oak, American sycamore, sweetgum, loblolly pine. |
| Newark: | | | | | | | | |
| Nb | 1w | Slight | Moderate | Slight | Severe | Pin oak<br>Eastern cottonwood<br>Northern red oak<br>Yellow-poplar<br>Sweetgum | 99<br>94<br>85<br>95<br>88 | Eastern cottonwood, sweetgum, loblolly pine, red maple, American sycamore, eastern white pine, yellow-poplar. |

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

| Soil name and map symbol | Ordination symbol | Management concerns | | | | Potential productivity | | Trees to plant |
|---|---|---|---|---|---|---|---|---|
| | | Erosion hazard | Equipment limitation | Seedling mortality | Plant competition | Important trees | Site index | |
| Nicholson: | | | | | | | | |
| NcA, NcB | 2o | Slight | Slight | Slight | Moderate | Northern red oak | 80 | Black walnut, yellow-poplar, eastern white pine, shortleaf pine, white ash. |
| Nolin: | | | | | | | | |
| No | 1o | Slight | Slight | Slight | Severe | Sweetgum<br>Yellow-poplar | 92<br>107 | Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak. |
| Nolin variant: | | | | | | | | |
| Nv | 2o | Slight | Slight | Slight | Moderate | Yellow-poplar<br>Northern red oak | 94<br>80 | Yellow-poplar, shortleaf pine, eastern cottonwood, American sycamore. |
| Otwell: | | | | | | | | |
| OtA, OtB | 3o | Slight | Slight | Slight | Slight | White oak | 72 | Eastern white pine, yellow-poplar, white ash. |
| Pembroke: | | | | | | | | |
| PmB, PmC | 1o | Slight | Slight | Slight | Severe | Northern red oak<br>Yellow-poplar<br>Virginia pine<br>Shortleaf pine | 95<br>95<br>85<br>85 | Yellow-poplar, black walnut, white ash, eastern white pine, shortleaf pine, loblolly pine. |
| Ramsey: | | | | | | | | |
| [1]RaE: | | | | | | | | |
| Ramsey part | 4d | Slight | Moderate | Severe | Slight | Black oak<br>Yellow-poplar | 71<br>91 | Shortleaf pine, eastern white pine, loblolly pine. |
| Steinsburg part | 3r | Slight | Moderate | Severe | Slight | Virginia pine | 70 | Eastern white pine, Virginia pine. |
| Allegheny part | 2r | Moderate | Moderate | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Virginia pine<br>Eastern white pine<br>Shortleaf pine | 80<br>90<br>75<br>90<br>75 | Eastern white pine, yellow-poplar, black walnut. |
| Riney: | | | | | | | | |
| RbC | 2o | Slight | Slight | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Shortleaf pine | 80<br>90<br>80 | Yellow-poplar, shortleaf pine, loblolly pine, black walnut, eastern white pine. |
| RbD, RbE | 2r | Slight | Moderate | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Shortleaf pine | 80<br>90<br>80 | Yellow-poplar, shortleaf pine, loblolly pine, black walnut, eastern white pine. |
| RcD3 | 3o | Slight | Slight | Slight | Slight | Northern red oak<br>Virginia pine<br>Shortleaf pine | 70<br>70<br>70 | Shortleaf pine, loblolly pine, Virginia pine. |
| Robertsville: | | | | | | | | |
| Rd | 1w | Slight | Severe | Severe | Severe | Pin oak<br>Yellow-poplar<br>Sweetgum<br>Northern red oak | 89<br>100<br>93<br>86 | Sweetgum, loblolly pine, American sycamore. |

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

| Soil name and map symbol | Ordi- nation symbol | Management concerns: Erosion hazard | Equip- ment limita- tion | Seedling mortal- ity | Plant competi- tion | Potential productivity: Important trees | Site index | Trees to plant |
|---|---|---|---|---|---|---|---|---|
| Rock outcrop: | | | | | | | | |
| [1]RoE: | | | | | | | | |
| Rock outcrop part. | | | | | | | | |
| Corydon part | 3d | Moderate | Severe | Moderate | Slight | Northern red oak<br>White oak<br>Yellow-poplar | 65-<br>65-<br>80- | Eastern white pine, Virginia pine, yellow-poplar. |
| Sadler: | | | | | | | | |
| SdA, SdB, SdC | 3o | Slight | Slight | Slight | Slight | Northern red oak<br>Yellow-poplar<br>Virginia pine | 70<br>90<br>70 | Eastern white pine, shortleaf pine, yellow-poplar, Virginia pine. |
| Sensabaugh: | | | | | | | | |
| Sg | 2o | Slight | Slight | Slight | Severe | Yellow-poplar<br>White oak<br>Shortleaf pine<br>Virginia pine | 100<br>80<br>80<br>75 | Yellow-poplar, black walnut, loblolly pine. |
| Sonora: | | | | | | | | |
| SnB, SnC, SnC3 | 2o | Slight | Slight | Slight | Moderate | Northern red oak<br>Yellow-poplar<br>Shortleaf pine | 70<br>90<br>70 | Yellow-poplar, shortleaf pine, loblolly pine. |
| Vertrees: | | | | | | | | |
| VrC | 2o | Slight | Slight | Slight | Moderate | Yellow-poplar<br>White oak<br>Chinkapin oak<br>Black oak<br>Northern red oak | 90<br>80<br>80<br>80<br>80 | Yellow-poplar, black walnut, white ash, Virginia pine, northern red oak. |
| VrD, VrE | 2c | Moderate | Severe | Slight | Moderate | Yellow-poplar<br>White oak<br>Chinkapin oak<br>Black oak<br>Northern red oak | 90<br>80<br>80<br>80<br>80 | Yellow-poplar, black walnut, white ash, Virginia pine, northern red oak. |
| VtD3 | 3c | Moderate | Moderate | Moderate | Slight | White oak<br>Black oak | 70<br>70 | Virginia pine, shortleaf pine, black locust. |
| Waynesboro: | | | | | | | | |
| WbC | 2o | Slight | Slight | Slight | Moderate | Yellow-poplar<br>White oak<br>Loblolly pine<br>Shortleaf pine<br>Virginia pine | 90<br>75<br>80<br>70<br>75 | Yellow-poplar, black walnut, loblolly pine, Virginia pine, shortleaf pine. |
| WbD, WbE | 2r | Slight | Moderate | Slight | Moderate | Yellow-poplar<br>White oak<br>Loblolly pine<br>Shortleaf pine<br>Virginia pine | 90<br>75<br>80<br>70<br>75 | Yellow-poplar, black walnut, loblolly pine, Virginia pine, shortleaf pine. |
| WcC3 | 3c | Slight | Slight | Moderate | Slight | Virginia pine<br>Shortleaf pine | 75<br>65 | Virginia pine, shortleaf pine, loblolly pine. |
| WcD3 | 3c | Slight | Moderate | Moderate | Slight | Virginia pine<br>Shortleaf pine | 75<br>65 | Virginia pine, shortleaf pine, loblolly pine. |
| Wellston: | | | | | | | | |
| WlB, WlC, WlC3 | 2o | Slight | Slight | Slight | Moderate | Northern red oak<br>Yellow-poplar | 71<br>90 | Eastern white pine, black walnut, yellow-poplar, shortleaf pine, white ash. |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior characteristics of the mapping unit.

TABLE 8.--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]

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| Allegheny: | | | | | |
| [1]AlD: | | | | | |
| Allegheny part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Lenberg part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Caneyville part | Severe: slope, depth to rock. | Severe: slope. | Severe: slope, depth to rock. | Severe: slope. | Severe: slope. |
| Ashton: | | | | | |
| As | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Caneyville: | | | | | |
| [1]CnD: | | | | | |
| Caneyville part | Severe: depth to rock. | Moderate: low strength, slope. | Severe: depth to rock. | Severe: slope. | Moderate: low strength, slope. |
| Rock outcrop part. | | | | | |
| [1]CnE: | | | | | |
| Caneyville part | Severe: slope, depth to rock. | Severe: slope. | Severe: slope, depth to rock. | Severe: slope. | Severe: slope. |
| Rock outcrop part. | | | | | |
| Crider: | | | | | |
| CrB | Slight | Moderate: low strength. | Moderate: shrink-swell. | Moderate: low strength. | Moderate: low strength. |
| CrC | Moderate: slope. | Moderate: low strength, slope. | Moderate: shrink-swell, slope. | Severe: slope. | Moderate: low strength, slope. |
| CrD | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Cumberland: | | | | | |
| CsC, CtC3 | Moderate: too clayey, slope. | Moderate: slope, low strength. | Moderate: slope, shrink-swell. | Severe: slope. | Moderate: low strength, slope. |
| CsD, CtD3 | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Dunning: | | | | | |
| Dn | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. |
| Elk: | | | | | |
| ElB | Severe: floods. | Severe: floods. | Severe floods. | Severe: floods. | Severe: floods. |
| ElC | Severe: floods. | Severe: floods. | Severe: floods. | Severe: slope, floods. | Severe: floods. |

See footnotes at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| Fredonia: | | | | | |
| [1]FdC: | | | | | |
| Fredonia part----- | Severe: depth to rock. | Moderate: low strength, slope. | Severe: depth to rock. | Severe: slope. | Moderate: low strength, slope, depth to rock. |
| Rock outcrop part. | | | | | |
| Frondorf: | | | | | |
| [1]FrC: | | | | | |
| Frondorf part----- | Moderate: slope, depth to rock. | Moderate: slope. | Moderate: slope, depth to rock. | Severe: slope. | Moderate: slope, depth to rock, low strength. |
| Lenberg part------ | Moderate: slope, too clayey, depth to rock. | Moderate: slope, shrink-swell, low strength. | Moderate: slope, depth to rock, shrink-swell. | Severe: slope. | Moderate: slope, low strength, depth to rock. |
| [1]FrD: | | | | | |
| Frondorf part----- | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Lenberg part------ | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Garmon: | | | | | |
| GmE---------------- | Severe: slope, depth to rock. | Severe: slope. | Severe: slope, depth to rock. | Severe: slope. | Severe: slope. |
| Gatton: | | | | | |
| GnB---------------- | Moderate: wetness. | Moderate: wetness. | Severe: wetness. | Moderate: slope, wetness. | Moderate: low strength. |
| Gullied land: | | | | | |
| Gu. | | | | | |
| Hagerstown: | | | | | |
| HnB---------------- | Moderate: depth to rock, too clayey. | Moderate: low strength. | Moderate: depth to rock, low strength. | Moderate: slope, low strength. | Moderate: low strength. |
| HnC---------------- | Moderate: slope, depth to rock, too clayey. | Moderate: slope, low strength. | Moderate: slope, depth to rock, low strength. | Severe: slope. | Moderate: low strength, slope. |
| HnD---------------- | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Huntington: | | | | | |
| Hu----------------- | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Lawrence: | | | | | |
| Lc----------------- | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods. |
| Lenberg: | | | | | |
| [1]LfE: | | | | | |
| Lenberg part------ | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Frondorf part----- | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |

See footnotes at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| Lindside: | | | | | |
| Ln | Severe: floods. | Severe: floods. | Severe: floods, wetness. | Severe: floods. | Severe: floods. |
| Markland: | | | | | |
| MdC3 | Severe: too clayey, floods. | Severe: shrink-swell, floods. | Severe: shrink-swell, floods. | Severe: shrink-swell, slope, floods. | Severe: shrink-swell, low strength, floods. |
| McGary: | | | | | |
| Mr | Severe: floods, wetness, too clayey. | Severe: floods, shrink-swell. | Severe: floods, wetness, shrink-swell. | Severe: floods, shrink-swell. | Severe: floods, shrink-swell, low strength. |
| Melvin: | | | | | |
| Mv | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. |
| Newark: | | | | | |
| Nb | Severe: floods, wetness. | Severe: floods. | Severe: floods, wetness. | Severe: floods. | Severe: floods. |
| Nicholson: | | | | | |
| NcA | Moderate: wetness. | Moderate: wetness. | Severe: wetness. | Moderate: wetness. | Moderate: low strength. |
| NcB | Moderate: wetness. | Moderate: wetness. | Severe: wetness. | Moderate: slope, wetness. | Moderate: low strength. |
| Nolin: | | | | | |
| No | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Nolin variant: | | | | | |
| Nv | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Otwell: | | | | | |
| OtA, OtB | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Pembroke: | | | | | |
| PmB | Slight | Moderate: low strength. | Moderate: low strength. | Moderate: slope, low strength. | Moderate: low strength. |
| PmC | Moderate: slope. | Moderate: slope, low strength. | Moderate: slope, low strength. | Severe: slope. | Moderate: slope, low strength. |
| Ramsey: | | | | | |
| [1]RaE: | | | | | |
| Ramsey part | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. |
| Steinsburg part | Severe: slope, depth to rock. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |

See footnotes at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

| Soil name and map symbol | Shallow excavations | Dwellings without basements | Dwellings with basements | Small commercial buildings | Local roads and streets |
|---|---|---|---|---|---|
| Ramsey: | | | | | |
| Allegheny part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Riney: | | | | | |
| RbC, RcD3 | Moderate: slope. | Moderate: slope. | Moderate: slope. | Severe: slope. | Moderate: slope, low strength. |
| RbD, RbE | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Robertsville: | | | | | |
| Rd | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. |
| Rock outcrop: | | | | | |
| [1]RoE: | | | | | |
| Rock outcrop part. | | | | | |
| Corydon part | Severe: depth to rock, slope. | Severe: depth to rock, slope. | Severe: depth to rock, slope. | Severe: depth to rock, slope. | Severe: depth to rock, slope. |
| Sadler: | | | | | |
| SdA, SdB | Moderate: wetness. | Moderate: wetness. | Severe: wetness. | Moderate: wetness. | Moderate: low strength. |
| SdC | Moderate: wetness, slope. | Moderate: wetness, slope. | Severe: wetness. | Severe: slope. | Moderate: slope, low strength. |
| Sensabaugh: | | | | | |
| Sg | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. |
| Sonora: | | | | | |
| SnB | Slight | Moderate: low strength. | Moderate: low strength. | Moderate: slope, low strength. | Moderate: low strength. |
| SnC, SnC3 | Moderate: slope. | Moderate: slope, low strength. | Moderate: slope, low strength. | Severe: slope. | Moderate: slope, low strength. |
| Vertrees: | | | | | |
| VrC, VtD3 | Severe: too clayey. | Moderate: low strength, slope. | Moderate: shrink-swell. | Severe: slope. | Moderate: low strength, slope. |
| VrD, VrE | Severe: slope, too clayey. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Waynesboro: | | | | | |
| WbC, WcC3 | Moderate: slope, too clayey. | Moderate: slope, low strength. | Moderate: slope, shrink-swell. | Severe: slope. | Moderate: slope, low strength. |
| WbD, WbE, WcD3 | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Wellston: | | | | | |
| WlB | Moderate: depth to rock. | Slight | Moderate: depth to rock. | Moderate: slope. | Slight. |
| WlC, WlC3 | Moderate: depth to rock, slope. | Moderate: slope. | Moderate: depth to rock, slope. | Severe: slope. | Moderate: slope. |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior characteristics of the mapping unit.

TABLE 9.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," and "fair." Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| Allegheny: | | | | | |
| [1]AlD: | | | | | |
| Allegheny part | Severe: slope. | Severe: slope. | Moderate: slope. | Severe: slope. | Poor: slope. |
| Lenberg part | Severe: slope, percs slowly, depth to rock. | Severe: slope, depth to rock. | Severe: depth to rock. | Severe: slope. | Poor: slope. |
| Caneyville part | Severe: slope, depth to rock, percs slowly. | Severe: slope, depth to rock. | Severe: depth to rock. | Severe: slope. | Poor: slope. |
| Ashton: | | | | | |
| As | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| Caneyville: | | | | | |
| [1]CnD: | | | | | |
| Caneyville part | Severe: depth to rock, percs slowly. | Severe: slope, depth to rock. | Severe: depth to rock. | Severe: slope. | Poor: thin layer. |
| Rock outcrop part. | | | | | |
| [1]CnE: | | | | | |
| Caneyville part | Severe: slope, depth to rock, percs slowly. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope. | Poor: slope, thin layer. |
| Rock outcrop part. | | | | | |
| Crider: | | | | | |
| CrB | Slight | Moderate: seepage. | Slight | Slight | Good. |
| CrC | Moderate: slope. | Severe: slope. | Slight | Moderate: slope. | Fair: slope. |
| CrD | Severe: slope. | Severe: slope. | Moderate: slope. | Severe: slope. | Poor: slope. |
| Cumberland: | | | | | |
| CsC, CtC3 | Moderate: slope. | Severe: slope. | Moderate: too clayey. | Moderate: slope. | Fair: too clayey, slope. |
| CsD, CtD3 | Severe: slope. | Severe: slope. | Moderate: too clayey, slope. | Severe: slope. | Poor: slope. |
| Dunning: | | | | | |
| Dn | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Poor: wetness. |
| Elk: | | | | | |
| ElB | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| ElC | Severe: floods. | Severe: slope, floods. | Severe: floods. | Severe: floods. | Fair: slope. |

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| Fredonia: | | | | | |
| [1]FdC: | | | | | |
| Fredonia part----- | Severe: depth to rock, percs slowly. | Severe: slope, depth to rock. | Severe: depth to rock. | Moderate: slope. | Poor: thin layer. |
| Rock outcrop part. | | | | | |
| Frondorf: | | | | | |
| [1]FrC: | | | | | |
| Frondorf part----- | Severe: depth to rock. | Severe: slope, depth to rock. | Severe: depth to rock. | Moderate: slope. | Fair: slope, thin layer. |
| Lenberg part------ | Severe: percs slowly, depth to rock. | Severe: slope, depth to rock. | Severe: depth to rock. | Moderate: slope. | Fair: slope, thin layer, too clayey. |
| [1]FrD: | | | | | |
| Frondorf part----- | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: depth to rock. | Severe: slope. | Poor: slope. |
| Lenberg part------ | Severe: slope, percs slowly, depth to rock. | Severe: slope, depth to rock. | Severe: depth to rock. | Severe: slope. | Poor: slope. |
| Garmon: | | | | | |
| GmE---------------- | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock, seepage. | Severe: slope, seepage. | Poor: slope, area reclaim. |
| Gatton: | | | | | |
| GnB---------------- | Severe: percs slowly. | Moderate: slope. | Moderate: wetness. | Slight----------- | Good. |
| Gullied land: | | | | | |
| Gu. | | | | | |
| Hagerstown: | | | | | |
| HnB---------------- | Moderate: depth to rock. | Moderate: slope, seepage. | Severe: depth to rock. | Slight----------- | Fair: too clayey. |
| HnC---------------- | Moderate: slope, depth to rock. | Severe: slope. | Severe: depth to rock. | Moderate: slope. | Fair: too clayey, slope. |
| HnD---------------- | Severe: slope. | Severe: slope. | Severe: depth to rock. | Severe: slope. | Poor: slope. |
| Huntington: | | | | | |
| Hu----------------- | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| Lawrence: | | | | | |
| Lc----------------- | Severe: floods, percs slowly. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Good. |
| Lenberg: | | | | | |
| [1]LfE: | | | | | |
| Lenberg part------ | Severe: slope, percs slowly, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope. | Poor: slope, area reclaim. |

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| Lenberg: | | | | | |
| Frondorf part | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope. | Poor: slope, area reclaim. |
| Lindside: | | | | | |
| Ln | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods. | Good. |
| Markland: | | | | | |
| MdC3 | Severe: percs slowly. | Severe: slope. | Severe: too clayey. | Moderate: slope. | Poor: too clayey. |
| McGary: | | | | | |
| Mr | Severe: floods, wetness, percs slowly. | Severe: floods. | Severe: floods, too clayey, wetness. | Severe: floods. | Poor: too clayey. |
| Melvin: | | | | | |
| Mv | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Poor: wetness. |
| Newark: | | | | | |
| Nb | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Good. |
| Nicholson: | | | | | |
| NcA | Severe: percs slowly, wetness. | Slight | Moderate: wetness. | Slight | Good. |
| NcB | Severe: percs slowly, wetness. | Moderate: slope. | Moderate: wetness. | Slight | Good. |
| Nolin: | | | | | |
| No | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| Nolin variant: | | | | | |
| Nv | Severe: floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| Otwell: | | | | | |
| OtA, OtB | Severe: percs slowly, floods. | Severe: floods. | Severe: floods. | Severe: floods. | Good. |
| Pembroke: | | | | | |
| PmB | Slight | Moderate: slope, seepage. | Moderate: too clayey. | Slight | Fair: too clayey. |
| PmC | Moderate: slope. | Severe: slope. | Moderate: too clayey. | Moderate: slope. | Fair: slope, too clayey. |
| Ramsey: | | | | | |
| [1]RaE: | | | | | |
| Ramsey part | Severe: slope, depth to rock. | Severe: slope, depth to rock, seepage. | Severe: slope, depth to rock, seepage. | Severe: slope, seepage. | Poor: slope, thin layer, area reclaim. |

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| Ramsey: | | | | | |
| Steinsburg part--- | Severe: slope, depth to rock. | Severe: slope, depth to rock. | Severe: slope, depth to rock, seepage. | Severe: slope, seepage. | Poor: slope, area reclaim. |
| Allegheny part---- | Severe: slope. | Severe: slope. | Moderate: slope, seepage. | Severe: slope. | Poor: slope, area reclaim. |
| Riney: | | | | | |
| RbC, RcD3---------- | Moderate: slope. | Severe: slope, seepage. | Severe: seepage. | Severe: seepage. | Fair: slope. |
| RbD---------------- | Severe: slope. | Severe: slope, seepage. | Severe: seepage. | Severe: slope, seepage. | Poor: slope. |
| RbE---------------- | Severe: slope. | Severe: slope, seepage. | Severe: slope, seepage. | Severe: slope, seepage. | Poor: slope. |
| Robertsville: | | | | | |
| Rd----------------- | Severe: floods, wetness, percs slowly. | Severe: floods, wetness. | Severe: floods, wetness. | Severe: floods, wetness. | Poor: wetness. |
| Rock outcrop: | | | | | |
| [1]RoE: | | | | | |
| Rock outcrop part. | | | | | |
| Corydon part------ | Severe: depth to rock, slope. | Severe: depth to rock, slope. | Severe: depth to rock. | Severe: slope. | Poor: thin layer, slope. |
| Sadler: | | | | | |
| SdA---------------- | Severe: percs slowly, wetness. | Moderate: depth to rock. | Severe: depth to rock. | Slight----------- | Good. |
| SdB---------------- | Severe: percs slowly, wetness. | Moderate: slope. | Severe: depth to rock. | Slight----------- | Good. |
| SdC---------------- | Severe: percs slowly, wetness. | Severe: slope. | Severe: depth to rock. | Moderate: slope. | Fair: slope. |
| Sensabaugh: | | | | | |
| Sg----------------- | Severe: floods. | Severe: floods, seepage. | Severe: floods, seepage. | Severe floods, seepage. | Fair: small stones. |
| Sonora: | | | | | |
| SnB---------------- | Slight----------- | Moderate: slope, seepage. | Moderate: too clayey. | Slight----------- | Good. |
| SnC, SnC3---------- | Moderate: slope. | Severe: slope. | Moderate: too clayey. | Moderate: slope. | Fair: slope. |
| Vertrees: | | | | | |
| VrC, VtD3---------- | Severe: percs slowly. | Severe: slope. | Moderate: too clayey. | Moderate: slope. | Fair: too clayey. |
| VrD---------------- | Severe: slope, percs slowly. | Severe: slope. | Moderate: too clayey, slope. | Severe: slope. | Poor: slope. |

See footnotes at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

| Soil name and map symbol | Septic tank absorption fields | Sewage lagoon areas | Trench sanitary landfill | Area sanitary landfill | Daily cover for landfill |
|---|---|---|---|---|---|
| Vertrees: | | | | | |
| VrE | Severe: slope, percs slowly. | Severe: slope. | Severe: slope. | Severe: slope. | Poor: slope. |
| Waynesboro: | | | | | |
| WbC, WcC3 | Moderate: slope. | Severe: slope. | Moderate: too clayey. | Moderate: slope. | Fair: too clayey, slope. |
| WbD, WcD3 | Severe: slope. | Severe: slope. | Moderate: too clayey, slope. | Severe: slope. | Poor: slope. |
| WbE | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. | Poor: slope. |
| Wellston: | | | | | |
| WlB | Moderate: depth to rock. | Moderate: seepage, depth to rock. | Severe: depth to rock. | Slight | Good. |
| WlC, WlC3 | Moderate: depth to rock, slope. | Severe: slope. | Severe: depth to rock. | Moderate: slope. | Fair: slope. |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior characteristics of the mapping unit.

TABLE 10.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| Allegheny: | | | | |
| [1]AlD: | | | | |
| Allegheny part | Fair: slope, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| Lenberg part | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| Caneyville part | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, too clayey. |
| Ashton: | | | | |
| As | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Caneyville: | | | | |
| [1]CnD: | | | | |
| Caneyville part | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: too clayey, slope. |
| Rock outcrop part. | | | | |
| [1]CnE: | | | | |
| Caneyville part | Poor: slope, low strength, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, too clayey, area reclaim. |
| Rock outcrop part. | | | | |
| Crider: | | | | |
| CrB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| CrC | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope. |
| CrD | Fair: low strength, slope. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| Cumberland: | | | | |
| CsC, CtC3 | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: thin layer, too clayey, slope. |
| CsD, CtD3 | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| Dunning: | | | | |
| Dn | Poor: wetness, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: wetness, too clayey. |
| Elk: | | | | |
| ElB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: too clayey. |
| ElC | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope, too clayey. |

See footnotes at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| Fredonia: | | | | |
| [1]FdC: | | | | |
| Fredonia part | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: too clayey. |
| Rock outcrop part. | | | | |
| Frondorf: | | | | |
| [1]FrC: | | | | |
| Frondorf part | Fair: thin layer, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope. |
| Lenberg part | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: too clayey. |
| [1]FrD: | | | | |
| Frondorf part | Fair: slope, thin layer, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| Lenberg part | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, too clayey. |
| Garmon: | | | | |
| GmE | Poor: slope, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, small stones, area reclaim. |
| Gatton: | | | | |
| GnB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Gullied land: | | | | |
| Gu. | | | | |
| Hagerstown: | | | | |
| HnB | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: thin layer. |
| HnC | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope, thin layer. |
| HnD | Poor: slope, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| Huntington: | | | | |
| Hu | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Lawrence: | | | | |
| Lc | Fair: wetness, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: too clayey. |
| Lenberg: | | | | |
| [1]LfE: | | | | |
| Lenberg part | Poor: slope, low strength, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, area reclaim, too clayey. |
| Frondorf part | Poor: slope, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, area reclaim. |

See footnotes at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| Lindside: | | | | |
| Ln | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Markland: | | | | |
| MdC3 | Poor: shrink-swell, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: too clayey. |
| McGary: | | | | |
| Mr | Poor: shrink-swell, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: too clayey. |
| Melvin: | | | | |
| Mv | Poor: wetness. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: wetness. |
| Newark: | | | | |
| Nb | Fair: low strength, wetness. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Nicholson: | | | | |
| NcA, NcB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Nolin: | | | | |
| No | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Nolin variant: | | | | |
| Nv | Good | Poor: excess fines. | Unsuited: excess fines. | Fair: too sandy. |
| Otwell: | | | | |
| OtA, OtB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| Pembroke: | | | | |
| PmB | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: thin layer. |
| PmC | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope, thin layer. |
| Ramsey: | | | | |
| [1]RaE: | | | | |
| Ramsey part | Poor: slope, thin layer, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, depth to rock, area reclaim. |
| Steinsburg part | Poor: slope, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, small stones, area reclaim. |
| Allegheny part | Poor: slope, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, area reclaim. |
| Riney: | | | | |
| RbC, RcD3 | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope, too clayey. |
| RbD | Fair: slope, low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |

See footnotes at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

| Soil name and map symbol | Roadfill | Sand | Gravel | Topsoil |
|---|---|---|---|---|
| Riney: | | | | |
| RbE | Poor: slope. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| Robertsville: | | | | |
| Rd | Poor: wetness. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: wetness. |
| Rock outcrop: | | | | |
| [1]RoE: | | | | |
| Rock outcrop part. | | | | |
| Corydon part | Poor: thin layer, slope, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, area reclaim, thin layer. |
| Sadler: | | | | |
| SdA, SdB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| SdC | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope. |
| Sensabaugh: | | | | |
| Sg | Good | Unsuited: excess fines. | Poor: excess fines. | Fair: small stones. |
| Sonora: | | | | |
| SnB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| SnC, SnC3 | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope. |
| Vertrees: | | | | |
| VrC, VtD3 | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: too clayey. |
| VrD | Poor: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, too clayey. |
| VrE | Poor: slope, low strength, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, area reclaim, too clayey. |
| Waynesboro: | | | | |
| WbC, WcC3 | Fair: low strength, shrink-swell. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope, too clayey. |
| WbD, WcD3 | Fair: slope, low strength, shrink-swell. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope. |
| WbE | Poor: slope, area reclaim. | Unsuited: excess fines. | Unsuited: excess fines. | Poor: slope, area reclaim. |
| Wellston: | | | | |
| WlB | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Good. |
| WlC, WlC3 | Fair: low strength. | Unsuited: excess fines. | Unsuited: excess fines. | Fair: slope. |

[1]This mapping unit is made up of two or more dominant kinds of soil. See mapping unit description for the composition and behavior characteristics of the mapping unit.

TABLE 11.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

| Soil name and map symbol | Pond reservoir areas | Embankments, dikes, and levees | Drainage | Terraces and diversions | Grassed waterways |
|---|---|---|---|---|---|
| Allegheny: | | | | | |
| [1]AlD: | | | | | |
| Allegheny part | Slope, seepage. | Piping, low strength. | Not needed | Slope, piping. | Slope. |
| Lenberg part | Slope | Low strength, shrink-swell. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Caneyville part | Depth to rock, slope. | Low strength, thin layer, compressible. | Not needed | Depth to rock, slope. | Slope, erodes easily, rooting depth. |
| Ashton: | | | | | |
| As | Seepage | Hard to pack, piping, low strength. | Not needed | Not needed | Favorable. |
| Caneyville: | | | | | |
| [1]CnD: | | | | | |
| Caneyville part | Depth to rock, slope. | Low strength, thin layer, compressible. | Not needed | Depth to rock, slope. | Slope, erodes easily, rooting depth. |
| Rock outcrop part. | | | | | |
| [1]CnE: | | | | | |
| Caneyville part | Depth to rock, slope. | Low strength, thin layer, compressible. | Not needed | Depth to rock, slope. | Slope, erodes easily, rooting depth. |
| Rock outcrop part. | | | | | |
| Crider: | | | | | |
| CrB, CrC, CrD | Slope, seepage. | Low strength, compressible, hard to pack. | Not needed | Slope, erodes easily. | Erodes easily, slope. |
| Cumberland: | | | | | |
| CsC, CsD, CtC3, CtD3 | Seepage, slope. | Hard to pack | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Dunning: | | | | | |
| Dn | Wetness | Low strength | Wetness, floods, poor outlets. | Not needed | Wetness. |
| Elk: | | | | | |
| ElB, ElC | Seepage | Low strength, piping. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Fredonia: | | | | | |
| [1]FdC: | | | | | |
| Fredonia part | Depth to rock, seepage, slope. | Low strength, thin layer, compressible. | Not needed | Depth to rock, slope, erodes easily. | Slope, erodes easily, rooting depth. |
| Rock outcrop part. | | | | | |
| Frondorf: | | | | | |
| [1]FrC: | | | | | |
| Frondorf part | Slope, seepage, depth to rock. | Thin layer, piping, hard to pack. | Not needed | Depth to rock, erodes easily. | Slope, erodes easily. |
| Lenberg part | Slope | Low strength, shrink-swell. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| [1]FrD: | | | | | |
| Frondorf part | Slope, seepage, depth to rock. | Thin layer, piping, hard to pack. | Not needed | Depth to rock, erodes easily. | Slope, erodes easily. |

See footnotes at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Pond reservoir areas | Embankments, dikes, and levees | Drainage | Terraces and diversions | Grassed waterways |
|---|---|---|---|---|---|
| Frondorf: | | | | | |
| Lenberg part | Slope | Low strength, shrink-swell. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Garmon: | | | | | |
| GmE | Slope, seepage, depth to rock. | Thin layer, low strength. | Not needed | Slope, depth to rock. | Slope. |
| Gatton: | | | | | |
| GnB | Favorable | Low strength, hard to pack. | Percs slowly | Erodes easily, percs slowly. | Erodes easily, percs slowly. |
| Gullied land: | | | | | |
| Gu. | | | | | |
| Hagerstown: | | | | | |
| HnB, HnC, HnD | Seepage, slope. | Compressible, hard to pack. | Not needed | Slope | Slope. |
| Huntington: | | | | | |
| Hu | Seepage | Low strength, compressible, piping. | Not needed | Not needed | Favorable. |
| Lawrence: | | | | | |
| Lc | Favorable | Low strength, compressible, piping. | Percs slowly, wetness, floods. | Not needed | Percs slowly, wetness, rooting depth. |
| Lenberg: | | | | | |
| [1]LfE: | | | | | |
| Lenberg part | Slope | Low strength, shrink-swell. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Frondorf part | Slope, seepage, depth to rock. | Thin layer, piping, hard to pack. | Not needed | Depth to rock, erodes easily. | Slope, erodes easily. |
| Lindside: | | | | | |
| Ln | Seepage | Piping, low strength, compressible. | Floods | Not needed | Wetness. |
| Markland: | | | | | |
| MdC3 | Favorable | Low strength, compressible, shrink-swell. | Not needed | Complex slope, erodes easily, percs slowly. | Slope, erodes easily, percs slowly. |
| McGary: | | | | | |
| Mr | Favorable | Shrink-swell, low strength. | Percs slowly, poor outlets. | Percs slowly, wetness. | Percs slowly, wetness. |
| Melvin: | | | | | |
| Mv | Seepage | Low strength, piping. | Wetness, floods, poor outlets. | Not needed | Wetness. |
| Newark: | | | | | |
| Nb | Seepage | Low strength, piping. | Wetness, floods, poor outlets. | Not needed | Wetness. |
| Nicholson: | | | | | |
| NcA, NcB | Favorable | Compressible, hard to pack, piping. | Percs slowly | Percs slowly, erodes easily. | Percs slowly, erodes easily. |
| Nolin: | | | | | |
| No | Seepage | Piping, low strength. | Not needed | Not needed | Favorable. |

See footnotes at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

| Soil name and map symbol | Pond reservoir areas | Embankments, dikes, and levees | Drainage | Terraces and diversions | Grassed waterways |
|---|---|---|---|---|---|
| Nolin variant: | | | | | |
| Nv | Seepage | Seepage, piping, hard to pack. | Not needed | Not needed | Erodes easily. |
| Otwell: | | | | | |
| OtA, OtB | Favorable | Low strength | Percs slowly | Erodes easily, percs slowly. | Erodes easily, percs slowly. |
| Pembroke: | | | | | |
| PmB, PmC | Seepage, slope. | Low strength, compressible, hard to pack. | Not needed | Slope, erodes easily. | Erodes easily, slope. |
| Ramsey: | | | | | |
| [1]RaE: | | | | | |
| Ramsey part | Depth to rock, slope. | Thin layer, piping. | Not needed | Slope, depth to rock. | Depth to rock, slope, droughty. |
| Steinsburg part | Depth to rock, slope, seepage. | Piping, low strength. | Not needed | Slope, depth to rock, rooting depth. | Droughty, slope. |
| Allegheny part | Slope, seepage. | Piping, low strength. | Not needed | Slope, piping. | Slope. |
| Riney: | | | | | |
| RbC, RbD, RbE, RcD3 | Seepage, slope. | Low strength, hard to pack, seepage. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Robertsville: | | | | | |
| Rd | Favorable | Low strength, compressible. | Wetness, percs slowly, floods. | Not needed | Wetness, percs slowly. |
| Rock outcrop: | | | | | |
| [1]RoE: | | | | | |
| Rock outcrop part. | | | | | |
| Corydon part | Depth to rock, slope, seepage. | Thin layer | Not needed | Complex slope, depth to rock. | Slope, rooting depth. |
| Sadler: | | | | | |
| SdA, SdB, SdC | Slope | Compressible, hard to pack, piping. | Percs slowly, slope. | Percs slowly, erodes easily, slope. | Percs slowly, erodes easily, slope. |
| Sensabaugh: | | | | | |
| Sg | Seepage | Piping, hard to pack. | Not needed | Not needed. | Favorable. |
| Sonora: | | | | | |
| SnB, SnC, SnC3 | Seepage, slope. | Seepage, low strength. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Vertrees: | | | | | |
| VrC, VrD, VrE, VtD3 | Slope | Low strength, compressible. | Not needed | Slope, erodes easily. | Slope, erodes easily. |
| Waynesboro: | | | | | |
| WbC, WbD, WbE, WcC3, WcD3 | Seepage, slope. | Low strength, compressible. | Not needed | Slope | Slope. |
| Wellston: | | | | | |
| WlB, WlC, WlC3 | Seepage, depth to rock, slope. | Piping, hard to pack, erodes easily. | Not needed | Erodes easily, slope. | Erodes easily, slope. |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior of the whole mapping unit.

TABLE 12.--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]

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| Allegheny: | | | | |
| [1]AlD: | | | | |
| Allegheny part | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Lenberg part | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Caneyville part | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Ashton: | | | | |
| As | Severe: floods. | Moderate: floods. | Moderate: floods. | Slight. |
| Caneyville: | | | | |
| [1]CnD: | | | | |
| Caneyville part | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Rock outcrop part. | | | | |
| [1]CnE: | | | | |
| Caneyville part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Rock outcrop part. | | | | |
| Crider: | | | | |
| CrB | Slight | Slight | Moderate: slope. | Slight. |
| CrC | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| CrD | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Cumberland: | | | | |
| CsC | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| CsD, CtD3 | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| CtC3 | Moderate: slope, too clayey. | Moderate: slope, too clayey. | Severe: slope. | Moderate: too clayey. |
| Dunning: | | | | |
| Dn | Severe: floods, wetness. | Severe: wetness. | Severe: floods, wetness. | Severe: wetness. |
| Elk: | | | | |
| ElB | Severe: floods. | Moderate: floods. | Moderate: slope, floods. | Slight. |
| ElC | Severe: floods. | Moderate: slope, floods. | Severe: slope. | Slight. |
| Fredonia: | | | | |
| [1]FdC: | | | | |
| Fredonia part | Moderate: slope, percs slowly. | Moderate: slope. | Severe: slope. | Slight. |
| Rock outcrop parat. | | | | |

See footnotes at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| Frondorf: | | | | |
| [1]FrC: | | | | |
| Frondorf part | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| Lenberg part | Moderate: slope, percs slowly. | Moderate: slope. | Severe: slope. | Slight. |
| [1]FrD: | | | | |
| Frondorf part | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Lenberg part | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Garmon: | | | | |
| GmE | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Gatton: | | | | |
| GnB | Moderate: percs slowly. | Slight | Moderate: slope, percs slowly. | Slight. |
| Gullied land: | | | | |
| Gu. | | | | |
| Hagerstown: | | | | |
| HnB | Slight | Slight | Moderate: slope. | Slight. |
| HnC | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| HnD | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| Huntington: | | | | |
| Hu | Severe: floods. | Moderate: floods. | Severe: floods. | Slight. |
| Lawrence: | | | | |
| Lc | Severe: floods, percs slowly. | Moderate: wetness, floods. | Moderate: wetness, percs slowly, floods. | Moderate: wetness. |
| Lenberg: | | | | |
| [1]LfE: | | | | |
| Lenberg part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Frondorf part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Lindside: | | | | |
| Ln | Severe: floods. | Moderate: floods, wetness. | Severe: floods. | Slight. |
| Markland: | | | | |
| MdC3 | Severe: floods, too clayey. | Severe: too clayey. | Severe: slope, too clayey. | Severe: too clayey. |
| McGary: | | | | |
| Mr | Severe: floods. | Moderate: floods, wetness. | Moderate: floods, wetness, percs slowly. | Moderate: wetness. |

See footnotes at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| Melvin: | | | | |
| Mv | Severe: floods, wetness. | Severe: wetness. | Severe: floods, wetness. | Severe: wetness. |
| Newark: | | | | |
| Nb | Severe: floods, wetness. | Moderate: floods, wetness. | Severe: floods, wetness. | Moderate: wetness. |
| Nicholson: | | | | |
| NcA | Moderate: percs slowly. | Slight | Moderate: percs slowly. | Slight. |
| NcB | Moderate: percs slowly. | Slight | Moderate: slope, percs slowly. | Slight. |
| Nolin: | | | | |
| No | Severe: floods. | Moderate: floods. | Severe: floods. | Slight. |
| Nolin variant: | | | | |
| Nv | Severe: floods. | Moderate: floods. | Severe: floods. | Slight. |
| Otwell: | | | | |
| OtA, OtB | Severe: floods, percs slowly. | Moderate: floods. | Moderate: floods, percs slowly. | Slight. |
| Pembroke: | | | | |
| PmB | Slight | Slight | Moderate: slope. | Slight. |
| PmC | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| Ramsey: | | | | |
| [1]RaE: | | | | |
| Ramsey part | Severe: slope. | Severe: slope. | Severe: slope, depth to rock. | Severe: slope. |
| Steinsburg part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Allegheny part | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Riney: | | | | |
| RbC, RcD3 | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| RbD | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| RbE | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Robertsville: | | | | |
| Rd | Severe: wetness, floods. | Severe: wetness. | Severe: wetness. | Severe: wetness. |
| Rock outcrop: | | | | |
| [1]RoE: | | | | |
| Rock outcrop part. | | | | |

See footnotes at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

| Soil name and map symbol | Camp areas | Picnic areas | Playgrounds | Paths and trails |
|---|---|---|---|---|
| Rock outcrop: | | | | |
| Corydon part | Severe: slope. | Severe: slope. | Severe: slope, depth to rock. | Moderate: slope. |
| Sadler: | | | | |
| SdA | Moderate: percs slowly. | Slight | Moderate: percs slowly. | Slight. |
| SdB | Moderate: percs slowly. | Slight | Moderate: slope, percs slowly. | Slight. |
| SdC | Moderate: slope, percs slowly. | Moderate: slope. | Severe: slope. | Slight. |
| Sensabaugh: | | | | |
| Sg | Severe: floods. | Moderate: floods. | Severe: floods. | Slight. |
| Sonora: | | | | |
| SnB | Slight | Slight | Moderate: slope. | Slight. |
| SnC, SnC3 | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| Vertrees: | | | | |
| VrC, VtD3 | Moderate: slope, percs slowly. | Moderate: slope. | Severe: slope. | Slight. |
| VrD | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| VrE | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Waynesboro: | | | | |
| WbC, WcC3 | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |
| WbD, WcD3 | Severe: slope. | Severe: slope. | Severe: slope. | Moderate: slope. |
| WbE | Severe: slope. | Severe: slope. | Severe: slope. | Severe: slope. |
| Wellston: | | | | |
| WlB | Slight | Slight | Moderate: slope. | Slight. |
| WlC, WlC3 | Moderate: slope. | Moderate: slope. | Severe: slope. | Slight. |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior of the whole mapping unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

| Soil name and map symbol | Potential for habitat elements | | | | | | | Potential as habitat for-- | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Wetland plants | Shallow water areas | Openland wildlife | Woodland wildlife | Wetland wildlife |
| Allegheny: | | | | | | | | | | |
| [1]AlD: | | | | | | | | | | |
| Allegheny part--- | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Lenberg part----- | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Caneyville part-- | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Ashton: | | | | | | | | | | |
| As--------------- | Good | Good | Good | Good | Good | Poor | Poor | Good | Good | Poor. |
| Caneyville: | | | | | | | | | | |
| [1]CnD: | | | | | | | | | | |
| Caneyville part-- | Poor | Poor | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Rock outcrop part. | | | | | | | | | | |
| [1]CnE: | | | | | | | | | | |
| Caneyville part-- | Very poor. | Very poor. | Good | Good | Good | Very poor. | Very poor. | Poor | Fair | Very poor. |
| Rock outcrop part. | | | | | | | | | | |
| Crider: | | | | | | | | | | |
| CrB-------------- | Good | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| CrC-------------- | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| CrD-------------- | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Cumberland: | | | | | | | | | | |
| CsC, CtC3-------- | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| CsD, CtD3-------- | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Dunning: | | | | | | | | | | |
| Dn--------------- | Very poor. | Poor | Poor | Poor | Poor | Good | Good | Poor | Poor | Good. |
| Elk: | | | | | | | | | | |
| ElB-------------- | Good | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| ElC-------------- | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| Fredonia: | | | | | | | | | | |
| [1]FdC: | | | | | | | | | | |
| Fredonia part---- | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| Rock outcrop part. | | | | | | | | | | |
| Frondorf: | | | | | | | | | | |
| [1]FrC: | | | | | | | | | | |
| Frondorf part---- | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| Lenberg part----- | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| [1]FrD: | | | | | | | | | | |
| Frondorf part---- | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |

See footnotes at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

| Soil name and map symbol | Potential for habitat elements: Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Wetland plants | Shallow water areas | Potential as habitat for--: Openland wildlife | Woodland wildlife | Wetland wildlife |
|---|---|---|---|---|---|---|---|---|---|---|
| Frondorf: | | | | | | | | | | |
| Lenberg part | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Garmon: | | | | | | | | | | |
| GmE | Very poor. | Very poor. | Good | Good | Good | Very poor. | Very poor. | Poor | Fair | Very poor. |
| Gatton: | | | | | | | | | | |
| GnB | Fair | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| Gullied land: | | | | | | | | | | |
| Gu. | | | | | | | | | | |
| Hagerstown: | | | | | | | | | | |
| HnB | Good | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| HnC | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| HnD | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Huntington: | | | | | | | | | | |
| Hu | Poor | Fair | Fair | Good | Good | Poor | Very poor. | Fair | Good | Very poor. |
| Lawrence: | | | | | | | | | | |
| Lc | Fair | Good | Good | Good | Good | Fair | Fair | Good | Good | Fair. |
| Lenberg: | | | | | | | | | | |
| [1]LfE: | | | | | | | | | | |
| Lenberg part | Very poor. | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Frondorf part | Very poor. | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Lindside: | | | | | | | | | | |
| Ln | Poor | Fair | Fair | Good | Good | Poor | Poor | Fair | Good | Poor. |
| Markland: | | | | | | | | | | |
| MdC3 | Fair | Fair | Fair | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| McGary: | | | | | | | | | | |
| Mr | Fair | Good | Good | Good | Good | Fair | Fair | Good | Good | Fair. |
| Melvin: | | | | | | | | | | |
| Mv | Poor | Fair | Fair | Fair | Fair | Good | Fair | Fair | Fair | Fair. |
| Newark: | | | | | | | | | | |
| Nb | Poor | Fair | Fair | Good | Good | Fair | Fair | Fair | Good | Fair. |
| Nicholson: | | | | | | | | | | |
| NcA | Fair | Good | Good | Good | Good | Poor | Poor | Good | Good | Poor. |
| NcB | Fair | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| Nolin: | | | | | | | | | | |
| No | Poor | Fair | Fair | Good | Good | Poor | Very poor. | Fair | Good | Very poor. |
| Nolin variant: | | | | | | | | | | |
| Nv | Poor | Fair | Fair | Good | Good | Poor | Very poor. | Fair | Good | Very poor. |

See footnotes at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

| Soil name and map symbol | Potential for habitat elements | | | | | | | Potential as habitat for-- | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Wetland plants | Shallow water areas | Openland wildlife | Woodland wildlife | Wetland wildlife |
| Otwell: | | | | | | | | | | |
| OtA | Fair | Good | Good | Good | Good | Poor | Poor | Good | Good | Poor. |
| OtB | Fair | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| Pembroke: | | | | | | | | | | |
| PmB | Good | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| PmC | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| Ramsey: | | | | | | | | | | |
| [1]RaE: | | | | | | | | | | |
| Ramsey part | Very poor. | Poor | Poor | Very poor. | Very poor. | Very poor. | Very poor. | Very poor. | Very poor. | Very poor. |
| Steinsburg part | Very poor. | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Allegheny part | Very poor. | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Riney: | | | | | | | | | | |
| RbC, RcD3 | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| RbD | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| RbE | Very poor. | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Robertsville: | | | | | | | | | | |
| Rd | Poor | Poor | Fair | Fair | Fair | Good | Good | Poor | Fair | Good. |
| Rock outcrop: | | | | | | | | | | |
| [1]RoE: | | | | | | | | | | |
| Rock outcrop part. | | | | | | | | | | |
| Corydon part | Poor | Poor | Fair | Poor | Poor | Very poor. | Very poor. | Poor | Poor | Very poor. |
| Sadler: | | | | | | | | | | |
| SdA | Fair | Good | Good | Good | Good | Poor | Poor | Good | Good | Poor. |
| SdB | Fair | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| SdC | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| Sensabaugh: | | | | | | | | | | |
| Sg | Poor | Poor | Fair | Good | Good | Very poor. | Very poor. | Fair | Fair | Very poor. |
| Sonora: | | | | | | | | | | |
| SnB | Good | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| SnC, SnC3 | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| Vertrees: | | | | | | | | | | |
| VrC, VtD3 | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |

See footnotes at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

| Soil name and map symbol | Potential for habitat elements | | | | | | | Potential as habitat for-- | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous plants | Hardwood trees | Coniferous plants | Wetland plants | Shallow water areas | Openland wildlife | Woodland wildlife | Wetland wildlife |
| Vertrees: | | | | | | | | | | |
| VrD, VrE | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Waynesboro: | | | | | | | | | | |
| WbC, WcC3 | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| WbD, WcD3 | Poor | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |
| WbE | Poor | Fair | Good | Good | Good | Very poor. | Very poor. | Fair | Good | Very poor. |
| Wellston: | | | | | | | | | | |
| WlB | Good | Good | Good | Good | Good | Poor | Very poor. | Good | Good | Very poor. |
| WlC, WlC3 | Fair | Good | Good | Good | Good | Very poor. | Very poor. | Good | Good | Very poor. |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior characteristics of the mapping unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry means data were not estimated]

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Fragments > 3 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| Allegheny: | | | | | | | | | | | |
| [1]AlD: | | | | | | | | | | | |
| Allegheny part--- | 0-6 | Loam------------- | ML, CL | A-4 | 0 | 90-100 | 75-100 | 65-100 | 50-90 | <35 | NP-10 |
| | 6-33 | Clay loam, loam, sandy clay loam. | ML, CL, SM, SC | A-4, A-6 | 0 | 90-100 | 75-100 | 65-95 | 45-80 | <35 | NP-15 |
| | 33-50 | Sandy loam, loam, gravelly sandy loam. | SM, SC, ML | A-4, A-6, A-2, A-1 | 0-5 | 65-100 | 50-100 | 35-95 | 20-75 | <35 | NP-15 |
| | 50 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lenberg part----- | 0-11 | Silt loam-------- | ML, CL | A-4, A-6 | 0-15 | 75-100 | 70-100 | 70-95 | 56-90 | 20-40 | 4-12 |
| | 11-25 | Silty clay, clay | CL, CH | A-7 | 0-15 | 75-100 | 70-100 | 75-95 | 60-90 | 45-70 | 20-40 |
| | 25-34 | Channery silty clay, clay, silty clay. | CL, CH, SC | A-7 | 5-40 | 60-95 | 40-95 | 40-95 | 36-90 | 45-70 | 20-40 |
| | 34 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Caneyville part-- | 0-6 | Silt loam-------- | ML, CL | A-4, A-6 | 0-3 | 90-100 | 85-100 | 75-100 | 60-95 | 25-35 | 2-12 |
| | 6-31 | Silty clay, clay, silty clay loam. | CH, CL | A-7 | 0-3 | 90-100 | 85-100 | 75-100 | 65-100 | 40-60 | 20-40 |
| | 31 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Ashton: | | | | | | | | | | | |
| As---------------- | 0-10 | Silt loam-------- | ML, CL | A-4 | 0 | 95-100 | 90-100 | 85-100 | 65-95 | 25-35 | 2-10 |
| | 10-66 | Silt loam, silty clay loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 90-100 | 85-100 | 75-100 | 25-40 | 5-20 |
| Caneyville: | | | | | | | | | | | |
| [1]CnD: | | | | | | | | | | | |
| Caneyville part- | 0-5 | Silt loam-------- | ML, CL | A-4, A-6 | 0-3 | 90-100 | 85-100 | 75-100 | 60-95 | 20-35 | 2-12 |
| | 5-34 | Silty clay, clay, silty clay loam. | CH, CL | A-7 | 0-3 | 90-100 | 85-100 | 75-100 | 65-100 | 45-70 | 25-45 |
| | 34 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop part. | | | | | | | | | | | |
| [1]CnE: | | | | | | | | | | | |
| Caneyville part-- | 0-5 | Silt loam-------- | ML, CL | A-4, A-6 | 0-3 | 90-100 | 85-100 | 75-100 | 60-95 | 25-35 | 2-12 |
| | 5-34 | Silty clay, clay, silty clay loam. | CH, CL | A-7 | 0-3 | 90-100 | 85-100 | 75-100 | 65-100 | 40-60 | 20-40 |
| | 34 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop part. | | | | | | | | | | | |
| Crider: | | | | | | | | | | | |
| CrB, CrC, CrD----- | 0-8 | Silt loam-------- | ML, CL | A-4, A-6, A-7 | 0 | 100 | 95-100 | 90-100 | 85-100 | 25-42 | 3-20 |
| | 8-48 | Silt loam, silty clay loam, gravelly silt loam. | CL, ML | A-7, A-6, A-4 | 0 | 80-100 | 70-100 | 70-100 | 60-100 | 30-45 | 8-25 |
| | 48-62 | Silty clay, clay, silty clay loam. | CL, CH, MH | A-7, A-6 | 0-5 | 85-100 | 75-100 | 70-100 | 60-100 | 35-65 | 15-45 |
| Cumberland: | | | | | | | | | | | |
| CsC, CsD---------- | 0-5 | Silt loam-------- | ML, CL | A-4, A-6 | 0-5 | 90-100 | 85-100 | 80-100 | 55-80 | 21-33 | 3-12 |
| | 5-11 | Silty clay loam | CL, ML | A-6, A-7 | 0-5 | 90-100 | 85-100 | 80-100 | 75-95 | 30-41 | 15-22 |
| | 11-65 | Clay, silty clay | MH, CH, CL | A-7 | 0-5 | 90-100 | 85-100 | 80-100 | 65-90 | 41-68 | 20-40 |

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| Cumberland: | | | | | | | | | | | |
| CtC3, CtD3 | 0-6 | Silty clay loam | CL, ML | A-6, A-7 | 0-5 | 90-100 | 85-100 | 80-100 | 75-95 | 30-41 | 15-22 |
| | 6-66 | Clay, silty clay | MH, CH, CL | A-7 | 0-5 | 90-100 | 85-100 | 80-100 | 65-90 | 41-68 | 20-40 |
| Dunning: | | | | | | | | | | | |
| Dn | 0-7 | Silty clay loam | ML, CL | A-6, A-7 | 0 | 100 | 95-100 | 90-100 | 85-100 | 30-42 | 15-22 |
| | 7-60 | Silty clay, clay, silty clay loam. | CH, MH, CL | A-7 | 0 | 95-100 | 95-100 | 90-100 | 85-100 | 40-70 | 20-45 |
| Elk: | | | | | | | | | | | |
| ElB, ElC | 0-9 | Silt loam | ML, CL | A-4 | 0 | 95-100 | 95-100 | 85-100 | 70-95 | 25-35 | 3-10 |
| | 9-26 | Silty clay loam, silt loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 90-100 | 85-100 | 75-100 | 25-40 | 5-15 |
| | 26-60 | Silty clay loam, silt loam. | ML, CL | A-4, A-6 | 0 | 80-100 | 75-100 | 70-100 | 55-95 | 25-40 | 5-15 |
| Fredonia: | | | | | | | | | | | |
| [1]FdC: | | | | | | | | | | | |
| Fredonia part | 0-10 | Silt loam | ML, CL | A-6, A-4 | 0-5 | 95-100 | 90-100 | 85-100 | 75-100 | 25-40 | 4-15 |
| | 10-28 | Silty clay, clay | CH, MH, CL | A-7 | 0-5 | 95-100 | 90-100 | 85-100 | 80-100 | 45-75 | 20-45 |
| | 28 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rock outcrop part. | | | | | | | | | | | |
| Frondorf: | | | | | | | | | | | |
| [1]FrC: | | | | | | | | | | | |
| Frondorf part | 0-20 | Silt loam | ML, CL | A-4, A-6 | 0-5 | 90-100 | 80-95 | 75-90 | 65-85 | 25-40 | 4-20 |
| | 20-33 | Gravelly silt loam, channery silty clay, channery clay loam. | ML, CL, GM, GC | A-4, A-6, A-7 | 10-30 | 55-90 | 50-85 | 45-80 | 45-75 | 25-50 | 4-25 |
| | 33 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lenberg part | 0-11 | Silt loam | ML, CL | A-4, A-6, A-7 | 0-15 | 75-100 | 70-100 | 70-95 | 56-90 | 20-40 | 4-12 |
| | 11-25 | Silty clay, clay | CL, CH | A-7 | 0-15 | 75-100 | 70-100 | 75-95 | 60-90 | 45-70 | 20-40 |
| | 25-37 | Channery silty clay, clay, silty clay. | CL, CH, SC | A-7 | 5-40 | 60-95 | 40-95 | 40-95 | 35-90 | 45-70 | 20-40 |
| | 37 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1]FrD: | | | | | | | | | | | |
| Frondorf part | 0-20 | Silt loam | ML, CL, CL-ML | A-4, A-6 | 0-5 | 90-100 | 90-100 | 85-100 | 75-100 | <40 | NP-20 |
| | 20-33 | Channery silty clay loam, gravelly silt loam, channery loam. | ML, CL, GM, GC | A-4, A-6, A-2, A-7 | 10-40 | 55-90 | 50-85 | 40-80 | 30-75 | <45 | NP-25 |
| | 33 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| Frondorf: | | | | | | | | | | | |
| Lenberg part----- | 0-11 | Silt loam-------- | ML, CL | A-4, A-6, A-7 | 0-15 | 75-100 | 70-100 | 70-95 | 56-90 | 20-40 | 4-12 |
| | 11-25 | Silty clay, clay | CL, CH | A-7 | 0-15 | 75-100 | 70-100 | 75-95 | 60-90 | 45-70 | 20-40 |
| | 25-37 | Channery silty clay, clay, silty clay. | CL, CH, SC | A-7 | 5-40 | 60-95 | 40-95 | 40-95 | 35-90 | 45-70 | 20-40 |
| | 37 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Garmon: | | | | | | | | | | | |
| GmE---------------- | 0-10 | Silt loam-------- | ML, CL | A-4, A-6 | 0 | 75-95 | 75-95 | 65-95 | 55-90 | 20-35 | 5-15 |
| | 10-32 | Shaly silt loam, shaly silty clay loam. | GM, GC, ML, CL | A-2, A-4, A-6 | 0-15 | 50-80 | 40-75 | 40-75 | 30-70 | 20-40 | 5-20 |
| | 32 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Gatton: | | | | | | | | | | | |
| GnB---------------- | 0-6 | Silt loam-------- | ML, CL | A-4 | 0 | 95-100 | 95-100 | 90-100 | 70-90 | 25-35 | 4-10 |
| | 6-22 | Silt loam, silty clay loam, loam. | ML, CL | A-4, A-6, A-7 | 0 | 95-100 | 95-100 | 90-100 | 70-90 | 25-42 | 4-22 |
| | 22-42 | Fine sandy loam, loam, sandy clay loam. | ML, SM, SC, CL | A-4 | 0 | 95-100 | 90-100 | 75-100 | 40-70 | <30 | NP-10 |
| | 42-65 | Sandy clay, clay, clay loam. | CL, SC, ML, CH | A-6, A-7 | 0 | 85-100 | 85-100 | 75-95 | 40-80 | 25-60 | 11-35 |
| Gullied land: Gu. | | | | | | | | | | | |
| Hagerstown: | | | | | | | | | | | |
| HnB, HnC, HnD----- | 0-6 | Silt loam-------- | ML, CL | A-4, | 0-5 | 85-100 | 90-100 | 80-100 | 70-95 | 25-35 | 4-10 |
| | 6-13 | Silty clay loam | CL, CH, MH | A-4, A-6 | 0-5 | 90-100 | 90-100 | 80-100 | 65-95 | 25-40 | 5-22 |
| | 13-48 | Clay, silty clay | CH, MH, CL | A-7, | 0-5 | 85-100 | 80-100 | 75-100 | 75-95 | 45-70 | 20-40 |
| | 48 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Huntington: | | | | | | | | | | | |
| Hu----------------- | 0-6 | Silt loam-------- | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 85-100 | 70-95 | 25-35 | 5-15 |
| | 6-50 | Silt loam, silty clay loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 85-100 | 70-95 | 25-40 | 5-27 |
| Lawrence: | | | | | | | | | | | |
| Lc----------------- | 0-8 | Silt loam-------- | ML, CL | A-4 | 0 | 100 | 95-100 | 90-100 | 80-100 | 25-35 | 2-10 |
| | 8-17 | Silty clay loam, silt loam. | ML, CL | A-4, A-6 | 0 | 100 | 95-100 | 90-100 | 80-100 | 25-40 | 5-20 |
| | 17-44 | Silty clay loam, silt loam. | ML, CL | A-4, A-6, A-7 | 0 | 100 | 95-100 | 90-100 | 80-100 | 25-45 | 5-20 |
| | 44-64 | Silty clay, silty clay loam, silt loam. | ML, CL, MH, CH | A-4, A-6, A-7 | 0 | 95-100 | 90-100 | 85-100 | 75-100 | 25-55 | 5-30 |

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification: Unified | Classification: AASHTO | Fragments > 3 inches | Percentage passing sieve number--: 4 | 10 | 40 | 200 | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| Lenberg: | | | | | | | | | | | |
| [1]LfE: | | | | | | | | | | | |
| Lenberg part----- | 0-9 | Silt loam-------- | ML, CL | A-4, A-6, A-7 | 0-15 | 75-100 | 70-100 | 70-95 | 55-90 | 20-40 | 4-12 |
| | 9-25 | Silty clay, clay | CL, CH | A-7 | 0-15 | 75-100 | 70-100 | 75-95 | 60-90 | 45-70 | 20-40 |
| | 25-37 | Channery silty clay, clay, silty clay. | CL, CH, SC | A-7 | 5-40 | 60-95 | 40-95 | 40-95 | 36-90 | 45-70 | 20-40 |
| | 37 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Frondorf part---- | 0-21 | Silt loam-------- | ML, CL | A-4, A-6 | 0-5 | 90-100 | 80-95 | 75-90 | 65-85 | 25-40 | 4-20 |
| | 21-32 | Gravelly silt loam, channery silty clay, channery clay loam. | ML, CL, GM, GC | A-4, A-6, A-7 | 10-30 | 55-90 | 50-85 | 45-80 | 45-75 | 25-50 | 4-25 |
| | 32 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lindside: | | | | | | | | | | | |
| Ln---------------- | 0-66 | Silt loam-------- | ML, CL | A-4, A-6 | 0 | 100 | 95-100 | 85-100 | 60-95 | 25-40 | 2-20 |
| Markland: | | | | | | | | | | | |
| MdC3-------------- | 0-5 | Silty clay------- | CL, CH, MH | A-7 | 0 | 100 | 100 | 95-100 | 85-95 | 45-55 | 20-27 |
| | 5-40 | Silty clay, clay | CL, CH, MH | A-7 | 0 | 100 | 100 | 95-100 | 90-95 | 45-60 | 25-35 |
| | 40-70 | Silty clay loam, silty clay. | CL, CH, MH | A-6, A-7 | 0 | 100 | 100 | 95-100 | 75-95 | 35-60 | 15-27 |
| McGary: | | | | | | | | | | | |
| Mr---------------- | 0-6 | Silt loam-------- | CL, ML | A-4 | 0 | 100 | 100 | 90-100 | 70-95 | 25-35 | 4-10 |
| | 6-29 | Silty clay loam, silty clay. | CL, CH, MH | A-7, A-6 | 0 | 100 | 100 | 95-100 | 90-95 | 35-60 | 15-27 |
| | 29-70 | Clay, silty clay | CL, CH, MH | A-7 | 0 | 100 | 100 | 95-100 | 85-95 | 45-70 | 20-40 |
| Melvin: | | | | | | | | | | | |
| Mv---------------- | 0-8 | Silt loam-------- | ML, CL | A-4 | 0 | 95-100 | 95-100 | 85-100 | 65-95 | 25-35 | 5-10 |
| | 8-50 | Silt loam, silty clay loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 85-100 | 65-95 | 25-40 | 5-20 |
| Newark: | | | | | | | | | | | |
| Nb---------------- | 0-10 | Silt loam-------- | ML, CL | A-4 | 0 | 95-100 | 95-100 | 85-100 | 55-95 | 25-35 | 5-10 |
| | 10-50 | Silt loam, silty clay loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 85-100 | 70-95 | 25-40 | 5-20 |
| Nicholson: | | | | | | | | | | | |
| NcA, NcB---------- | 0-7 | Silt loam-------- | ML, CL | A-4 | 0 | 95-100 | 95-100 | 85-100 | 80-95 | 25-35 | 5-10 |
| | 7-23 | Silty clay loam, silt loam. | CL, ML | A-6, A-4, A-7 | 0 | 95-100 | 95-100 | 85-100 | 80-100 | 25-45 | 7-20 |
| | 23-41 | Silty clay loam, silt loam. | CL, ML | A-6, A-4, A-7 | 0 | 95-100 | 90-100 | 80-100 | 75-95 | 25-45 | 7-20 |
| | 41-66 | Silty clay, clay, silty clay loam. | CH, MH, CL | A-7, A-6 | 0-10 | 85-100 | 85-100 | 80-100 | 75-95 | 35-70 | 20-40 |
| Nolin: | | | | | | | | | | | |
| No---------------- | 0-10 | Silt loam-------- | ML, CL | A-4 | 0 | 100 | 95-100 | 90-100 | 80-100 | 25-40 | 5-10 |
| | 10-66 | Silt loam-------- | ML, CL | A-4, A-6 | 0 | 100 | 95-100 | 85-100 | 75-100 | 25-40 | 5-15 |

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| Nolin variant: | | | | | | | | | | | |
| Nv------------------ | 0-9 | Fine sandy loam | SM, ML | A-4 | 0 | 100 | 100 | 70-85 | 40-55 | <15 | NP-5 |
| | 9-48 | Loamy fine sand, loamy sand. | SM | A-2, A-4 | 0 | 100 | 100 | 50-85 | 15-45 | --- | NP |
| | 48-60 | Very fine sandy loam, loamy fine sand, silt loam. | SM, ML, CL | A-2, A-4 | 0 | 100 | 100 | 70-100 | 25-90 | <35 | NP-10 |
| Otwell: | | | | | | | | | | | |
| OtA, OtB------------ | 0-26 | Silt loam-------- | CL, ML | A-4 | 0 | 100 | 95-100 | 85-100 | 65-95 | 25-35 | 5-10 |
| | 26-42 | Silty clay loam, silt loam. | CL, ML | A-4, A-6 | 0 | 100 | 95-100 | 85-100 | 65-95 | 25-40 | 5-20 |
| | 42-64 | Silt loam, silty clay loam. | CL, ML | A-4, A-6 | 0 | 95-100 | 85-100 | 75-100 | 65-95 | 25-40 | 5-25 |
| Pembroke: | | | | | | | | | | | |
| PmB, PmC------------ | 0-7 | Silt loam-------- | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 85-100 | 70-100 | 25-35 | 5-10 |
| | 7-40 | Silt loam, silty clay loam. | CL, ML | A-6, A-7 | 0 | 95-100 | 95-100 | 85-100 | 75-100 | 30-45 | 11-25 |
| | 40-66 | Silty clay loam, silty clay, clay. | CH, MH, CL | A-7 | 0 | 90-100 | 85-100 | 75-100 | 65-100 | 41-65 | 20-45 |
| Ramsey: | | | | | | | | | | | |
| [1]RaE: | | | | | | | | | | | |
| Ramsey part------- | 0-16 | Fine sandy loam, loam. | SM, SC, ML, CL | A-4, A-2 | 0-10 | 85-100 | 75-95 | 65-80 | 30-65 | <30 | NP-8 |
| | 16 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Steinsburg part-- | 0-7 | Fine sandy loam | SC-CM, ML, SM | A-4, A-2 | 0-5 | 85-100 | 70-100 | 55-90 | 30-55 | <15 | N-5 |
| | 7-18 | Sandy loam, gravelly sandy loam, fine sandy loam. | SM, SC-SM | A-2, A-4 | 0-10 | 75-95 | 70-90 | 40-70 | 20-45 | <15 | NP-5 |
| | 18-35 | Channery sandy loam, very gravelly loamy sand. | SM, GM | A-2 | 10-40 | 45-85 | 40-80 | 35-60 | 15-35 | --- | NP |
| | 35 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Allegheny part--- | 0-6 | Loam------------- | ML, CL | A-4 | 0 | 90-100 | 75-100 | 65-100 | 50-90 | <35 | NP-10 |
| | 6-33 | Clay loam, loam, sandy clay loam. | ML, CL, SM, SC | A-4, A-6 | 0 | 90-100 | 75-100 | 65-95 | 45-80 | <35 | NP-15 |
| | 33-50 | Sandy loam, loam, gravelly sandy loam. | SM, SC, ML | A-4, A-6, A-2, A-1 | 0-5 | 65-100 | 50-100 | 35-95 | 20-75 | <35 | NP-15 |
| | 50 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Riney: | | | | | | | | | | | |
| RbC, RbD, RbE------ | 0-8 | Loam------------- | CL, ML, | A-4 | 0 | 90-100 | 85-100 | 75-90 | 55-75 | <30 | NP-10 |
| | 8-54 | Clay loam, sandy clay loam, sandy loam. | ML,CL, SC, SM | A-6, A-2, A-4 | 0 | 80-100 | 70-100 | 50-95 | 25-75 | <35 | NP-15 |
| | 54-65 | Sandy loam, sandy clay loam, loamy sand. | SC, SM, ML, CL | A-4, A-6, A-2, | 0 | 85-100 | 80-100 | 50-100 | 25-55 | <35 | NP-20 |

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification | | Fragments > 3 inches | Percentage passing sieve number-- | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | In | | | | Pct | | | | | Pct | |
| Riney: | | | | | | | | | | | |
| RcD3 | 0-6 | Sandy clay loam | CL, ML, SM, SC | A-4 | 0 | 90-100 | 80-100 | 65-80 | 35-55 | 20-30 | 2-10 |
| | 6-50 | Clay loam, sandy clay loam, sandy loam. | ML, CL, SC, SM | A-6, A-2, A-4 | 0 | 80-100 | 70-100 | 50-95 | 25-75 | <35 | NP-15 |
| | 50-64 | Sandy loam, sandy clay loam, loamy sand. | SC, SM, ML, CL | A-4, A-6, A-2 | 0 | 85-100 | 80-100 | 50-80 | 25-55 | <35 | NP-20 |
| Robertsville: | | | | | | | | | | | |
| Rd | 0-8 | Silt loam | ML, CL | A-4 | 0 | 95-100 | 95-100 | 85-100 | 75-100 | 25-35 | 2-10 |
| | 8-16 | Silt loam, silty clay loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 90-100 | 80-100 | 25-40 | 5-20 |
| | 16-45 | Silty clay loam, silt loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 90-100 | 80-100 | 25-40 | 5-20 |
| | 45-66 | Silty clay loam, silty clay, silt loam. | ML, CL, MH, CH | A-6, A-7, A-4 | 0 | 95-100 | 95-100 | 85-100 | 80-100 | 30-55 | 5-30 |
| Rock outcrop: | | | | | | | | | | | |
| [1]RoE: | | | | | | | | | | | |
| Rock outcrop part. | | | | | | | | | | | |
| Corydon part | 0-5 | Silty clay loam | CL, ML | A-7, A-4 | 0-2 | 90-100 | 90-100 | 85-100 | 75-95 | 34-42 | 5-22 |
| | 5-16 | Silty clay loam, clay, silty clay. | CL, CH, MH | A-6, A-7 | 0-2 | 90-100 | 90-100 | 80-100 | 75-95 | 35-60 | 20-35 |
| | 16 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sadler: | | | | | | | | | | | |
| SdA, SdB, SdC | 0-10 | Silt loam | ML, CL | A-4 | 0 | 95-100 | 95-100 | 85-100 | 70-100 | 25-35 | 2-10 |
| | 10-28 | Silt loam, silty clay loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 85-100 | 75-100 | 25-40 | 5-20 |
| | 28-51 | Silt loam, silty clay loam, loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 95-100 | 80-100 | 60-95 | 20-40 | 2-20 |
| | 51-64 | Silty clay loam, gravelly loam, silt loam. | ML, CL, SM, GC | A-4, A-6, | 0-20 | 65-100 | 60-100 | 50-95 | 35-90 | 20-40 | 2-20 |
| Sensabaugh: | | | | | | | | | | | |
| Sg | 0-27 | Silt loam | ML | A-4 | 0-5 | 90-100 | 70-95 | 65-85 | 55-75 | 25-35 | 3-9 |
| | 27-60 | Gravelly loam, gravelly silt loam, gravelly sandy loam. | GM, SM, SC | A-4, A-2 | 2-18 | 40-60 | 20-45 | 15-45 | 12-40 | <35 | NP-10 |

See footnotes at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

| Soil name and map symbol | Depth | USDA texture | Classification Unified | Classification AASHTO | Fragments > 3 inches | Percentage passing sieve number-- 4 | 10 | 40 | 200 | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | In | | | | Pct | | | | | Pct | |
| Sonora: | | | | | | | | | | | |
| SnB, SnC3, SnC | 0-9 | Silt loam | CL, ML | A-4 | 0 | 100 | 100 | 90-100 | 80-90 | 25-35 | 4-10 |
| | 9-25 | Silt loam, silty clay loam. | CL, ML | A-4, A-6, A-7 | 0 | 100 | 100 | 90-100 | 70-95 | 25-42 | 4-25 |
| | 25-39 | Loam, sandy clay loam, fine sandy loam. | CL, ML, SC, SM | A-4 | 0 | 90-100 | 90-100 | 70-90 | 40-60 | <30 | NP-10 |
| | 39-71 | Sandy clay, sandy clay loam, clay. | CL, SC, CH, MH | A-4, A-6, A-7 | 0 | 90-100 | 90-100 | 75-100 | 40-80 | 25-60 | 5-40 |
| Vertrees: | | | | | | | | | | | |
| VrC, VrD, VrE | 0-7 | Silt loam | ML, CL | A-4 | 0-2 | 85-100 | 60-100 | 55-95 | 50-90 | 20-35 | 4-10 |
| | 7-51 | Clay, silty clay | CH, CL, MH | A-7 | 0-2 | 85-100 | 70-100 | 70-95 | 65-90 | 41-70 | 25-45 |
| | 51-70 | Clay, cherty clay, silty clay. | CH, GC, CL, MH | A-7 | 0-10 | 60-95 | 45-100 | 40-90 | 35-80 | 41-70 | 25-45 |
| VtD3 | 0-6 | Silty clay loam | ML, CL | A-6 | 0-2 | 85-100 | 60-100 | 60-95 | 55-90 | 20-40 | 15-22 |
| | 6-51 | Clay, silty clay | CH, CL, MH | A-7 | 0-2 | 85-100 | 70-100 | 70-95 | 65-90 | 41-70 | 25-45 |
| | 51-70 | Clay, cherty clay, silty clay. | CH, GC, CL, MH | A-7 | 0-10 | 60-95 | 60-100 | 55-90 | 45-80 | 41-70 | 25-45 |
| Waynesboro: | | | | | | | | | | | |
| WbC, WbD, WbE | 0-12 | Loam | ML, CL | A-4 | 0-5 | 90-100 | 85-100 | 75-95 | 55-70 | 20-30 | 1-7 |
| | 12-30 | Clay loam, sandy clay loam. | CL, ML, SC, SM | A-4, A-6 | 0-5 | 90-100 | 85-100 | 75-95 | 45-75 | 20-35 | 1-15 |
| | 30-60 | Clay loam, clay, sandy clay loam. | MH, CL, CH, SM-SC | A-4, A-6, A-7 | 0-5 | 90-100 | 85-100 | 70-98 | 45-85 | 25-68 | 5-40 |
| WcC3, WcD3 | 0-8 | Clay loam | ML, CL | A-4, A-6 | 0-5 | 90-100 | 85-100 | 80-95 | 65-80 | 25-35 | 5-15 |
| | 8-30 | Clay loam, sandy clay loam. | CL, ML, SC, SM | A-4, A-6, | 0-5 | 90-100 | 85-100 | 75-95 | 45-75 | 20-35 | 2-15 |
| | 30-60 | Clay loam, clay, sandy clay loam. | MH, CL, CH, SM-SC | A-4, A-6, A-7 | 0-5 | 90-100 | 85-100 | 70-98 | 45-85 | 25-68 | 5-40 |
| Wellston: | | | | | | | | | | | |
| WlB, WlC, WlC3 | 0-12 | Silt loam | ML | A-4 | 0 | 95-100 | 95-100 | 85-100 | 70-90 | 26-34 | 4-10 |
| | 12-30 | Silt loam, silty clay loam. | CL, ML | A-6, A-4 | 0 | 95-100 | 95-100 | 90-95 | 70-90 | 25-40 | 5-18 |
| | 30-50 | Loam, gravelly sandy loam, silty clay loam. | ML, CL, SM | A-4, A-6, A-2, A-1 | 0-10 | 65-90 | 55-90 | 35-90 | 20-85 | 20-35 | 5-14 |

[1]This mapping unit is made up of two or more dominant kinds of soil. See descriptions of the mapping unit for the composition and behavior of the whole mapping unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry indicates that data were not estimated]

| Soil name and map symbol | Depth | Permea-bility | Available water capacity | Soil reaction | Shrink-swell potential | Risk of corrosion | | Erosion factors | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Uncoated steel | Concrete | K | T |
| | In | In/hr | In/in | pH | | | | | |
| Allegheny: | | | | | | | | | |
| [1]AlD: | | | | | | | | | |
| Allegheny part--- | 0-6 | 0.6-2.0 | 0.12-0.22 | 4.5-7.3 | Low-------- | Low-------- | High------ | 0.32 | 4 |
| | 6-33 | 0.6-2.0 | 0.13-0.18 | 4.5-5.5 | Low-------- | Low-------- | High------ | 0.28 | |
| | 33-50 | 0.6-2.0 | 0.08-0.17 | 4.5-5.5 | Low-------- | Low-------- | High------ | 0.28 | |
| | 50 | --- | --- | --- | ---------- | ---------- | ---------- | --- | |
| Lenberg part----- | 0-11 | 0.6-2.0 | 0.17-0.23 | 4.5-7.3 | Low-------- | Moderate | Moderate | 0.43 | 3 |
| | 11-25 | 0.2-0.6 | 0.11-0.18 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.37 | |
| | 25-34 | 0.2-0.6 | 0.10-0.16 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.28 | |
| | 34 | --- | --- | --- | ---------- | ---------- | ---------- | --- | |
| Caneyville part-- | 0-6 | 0.6-2.0 | 0.15-0.22 | 5.1-7.3 | Low-------- | Moderate | Moderate | 0.43 | 3 |
| | 6-31 | 0.2-0.6 | 0.12-0.18 | 4.5-6.5 | Moderate | High------ | Moderate | 0.28 | |
| | 31 | --- | --- | --- | ---------- | ---------- | ---------- | --- | |
| Ashton: | | | | | | | | | |
| As---------------- | 0-10 | 0.6-2.0 | 0.16-0.23 | 5.6-7.3 | Low-------- | Low-------- | Low-------- | 0.28 | 4 |
| | 10-66 | 0.6-2.0 | 0.18-0.23 | 5.6-7.3 | Low-------- | Low-------- | Low-------- | 0.43 | |
| Caneyville: | | | | | | | | | |
| [1]CnD: | | | | | | | | | |
| Caneyville part-- | 0-5 | 0.6-2.0 | 0.15-0.22 | 4.5-6.0 | Low-------- | Moderate | Moderate | 0.43 | 3 |
| | 5-34 | 0.2-0.6 | 0.12-0.18 | 4.5-6.0 | Moderate | High------ | Moderate | 0.28 | |
| | 34 | --- | --- | --- | ---------- | ---------- | ---------- | --- | |
| Rock outcrop part. | | | | | | | | | |
| [1]CnE: | | | | | | | | | |
| Caneyville part-- | 0-5 | 0.6-2.0 | 0.15-0.22 | 5.1-7.3 | Low-------- | Moderate | Moderate | 0.43 | 3 |
| | 5-34 | 0.2-0.6 | 0.12-0.18 | 4.5-6.5 | Moderate | High------ | Moderate | 0.28 | |
| | 34 | --- | --- | --- | ---------- | ---------- | ---------- | --- | |
| Rock outcrop part. | | | | | | | | | |
| Crider: | | | | | | | | | |
| CrB, CrC, CrD----- | 0-8 | 0.6-2.0 | 0.19-0.23 | 5.1-7.3 | Low-------- | Moderate | Moderate | 0.32 | 4 |
| | 8-48 | 0.6-2.0 | 0.18-0.23 | 5.1-6.5 | Low-------- | Moderate | Moderate | 0.28 | |
| | 48-62 | 0.6-2.0 | 0.12-0.18 | 5.1-6.0 | Moderate | Moderate | Moderate | 0.28 | |
| Cumberland: | | | | | | | | | |
| CsC, CsD---------- | 0-5 | 0.6-2.0 | 0.18-0.20 | 5.1-7.3 | Low-------- | High------ | Moderate | 0.37 | 5 |
| | 5-11 | 0.6-2.0 | 0.16-0.19 | 5.1-6.0 | Low-------- | High------ | Moderate | 0.37 | |
| | 11-65 | 0.6-2.0 | 0.14-0.17 | 5.1-6.0 | Moderate | High------ | Moderate | 0.24 | |
| CtC3, CtD3-------- | 0-6 | 0.6-2.0 | 0.16-0.19 | 5.1-7.3 | Low-------- | High------ | Moderate | 0.37 | 5 |
| | 6-66 | 0.6-2.0 | 0.14-0.17 | 5.1-6.0 | Moderate | High------ | Moderate | 0.24 | |
| Dunning: | | | | | | | | | |
| Dn---------------- | 0-7 | 0.6-2.0 | 0.19-0.23 | 6.1-7.8 | Moderate | High------ | Moderate | 0.37 | --- |
| | 7-60 | 0.06-0.2 | 0.14-0.18 | 6.1-7.8 | Moderate | High------ | Moderate | 0.28 | |
| Elk: | | | | | | | | | |
| ElB, ElC---------- | 0-9 | 0.6-2.0 | 0.18-0.23 | 5.1-7.3 | Low-------- | Moderate | Moderate | 0.32 | 4 |
| | 9-26 | 0.6-2.0 | 0.18-0.22 | 5.1-6.0 | Low-------- | Moderate | Moderate | 0.28 | |
| | 26-60 | 0.6-2.0 | 0.14-0.20 | 5.1-6.0 | Low-------- | Moderate | Moderate | 0.28 | |
| Fredonia: | | | | | | | | | |
| [1]FdC: | | | | | | | | | |
| Fredonia part---- | 0-10 | 0.6-2.0 | 0.18-0.22 | 5.6-7.8 | Low-------- | High------ | Moderate | 0.37 | 3 |
| | 10-28 | 0.2-0.6 | 0.13-0.18 | 5.6-7.8 | Moderate | High------ | Moderate | 0.28 | |
| | 28 | --- | --- | --- | ---------- | ---------- | ---------- | 0.28 | |
| Rock outcrop part. | | | | | | | | | |

See footnotes at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

| Soil name and map symbol | Depth | Permea-bility | Available water capacity | Soil reaction | Shrink-swell potential | Risk of corrosion | | Erosion factors | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Uncoated steel | Concrete | K | T |
| | In | In/hr | In/in | pH | | | | | |
| Frondorf: | | | | | | | | | |
| [1]FrC: | | | | | | | | | |
| Frondorf part---- | 0-20 | 0.6-2.0 | 0.18-0.23 | 4.5-7.3 | Low-------- | Moderate | High------ | 0.32 | 3-2 |
| | 20-33 | 0.6-2.0 | 0.08-0.16 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.17 | |
| | 33 | --- | --- | --- | --------- | --------- | --------- | --- | |
| Lenberg part----- | 0-11 | 0.6-2.0 | 0.17-0.23 | 4.5-7.3 | Low-------- | Moderate | Moderate | 0.43 | 3 |
| | 11-25 | 0.2-0.6 | 0.11-0.18 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.37 | |
| | 25-37 | 0.2-0.6 | 0.10-0.16 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.28 | |
| | 37 | --- | --- | --- | --------- | --------- | --------- | --- | |
| [1]FrD: | | | | | | | | | |
| Frondorf part---- | 0-20 | 0.6-2.0 | 0.18-0.23 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.32 | 3-2 |
| | 20-33 | 0.6-2.0 | 0.08-0.16 | 4.5-5.5 | Low-------- | Moderate | High------ | --- | |
| | 33 | --- | --- | --- | --------- | --------- | --------- | --- | |
| Lenberg part----- | 0-11 | 0.6-2.0 | 0.17-0.23 | 4.5-7.3 | Low-------- | Moderate | Moderate | 0.43 | 3 |
| | 11-25 | 0.2-0.6 | 0.11-0.18 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.37 | |
| | 25-37 | 0.2-0.6 | 0.10-0.16 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.28 | |
| | 37 | --- | --- | --- | --------- | --------- | --------- | --- | |
| Garmon: | | | | | | | | | |
| GmE--------------- | 0-10 | 2.0-6.0 | 0.14-0.20 | 5.6-7.3 | Low-------- | Low-------- | Moderate | 0.28 | 3-2 |
| | 10-32 | 2.0-6.0 | 0.10-0.19 | 5.6-7.3 | Low-------- | Low-------- | Moderate | 0.28 | |
| | 32 | --- | --- | --- | --------- | --------- | --------- | --- | |
| Gatton: | | | | | | | | | |
| GnB--------------- | 0-6 | 0.6-2.0 | 0.19-0.23 | 4.5-7.3 | Low-------- | Moderate | Moderate | 0.37 | 3 |
| | 6-22 | 0.6-2.0 | 0.18-0.23 | 4.5-6.5 | Low-------- | Moderate | Moderate | 0.43 | |
| | 22-42 | 0.06-0.2 | 0.07-0.12 | 4.5-5.5 | Low-------- | Moderate | Moderate | 0.37 | |
| | 42-65 | 0.6-2.0 | 0.07-0.12 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.28 | |
| Gullied land: | | | | | | | | | |
| Gu. | | | | | | | | | |
| Hagerstown: | | | | | | | | | |
| HnB, HnC, HnD----- | 0-6 | 0.6-6.0 | 0.16-0.22 | 5.1-7.3 | Low-------- | Moderate | Low-------- | 0.32 | 4 |
| | 6-13 | 0.6-2.0 | 0.10-0.18 | 5.1-7.3 | Moderate | Moderate | Low-------- | 0.28 | |
| | 13-48 | 0.6-2.0 | 0.10-0.18 | 5.1-7.3 | Moderate | Moderate | Low-------- | 0.28 | |
| | 48 | --- | --- | --- | --------- | --------- | --------- | --- | |
| Huntington: | | | | | | | | | |
| Hu---------------- | 0-11 | 0.6-2.0 | 0.18-0.23 | 5.6-7.3 | Low-------- | Low-------- | Moderate | --- | --- |
| | 11-50 | 0.6-2.0 | 0.10-0.16 | 5.6-7.3 | Low-------- | Low-------- | Moderate | --- | |
| Lawrence: | | | | | | | | | |
| Lc---------------- | 0-8 | 0.6-2.0 | 0.19-0.23 | 4.5-7.3 | Low-------- | High------ | High------ | 0.43 | 3 |
| | 8-17 | 0.6-2.0 | 0.18-0.22 | 4.5-5.5 | Low-------- | High------ | High------ | 0.37 | |
| | 17-44 | 0.06-0.2 | 0.08-0.12 | 4.5-5.5 | Low-------- | High------ | High------ | 0.43 | |
| | 44-64 | 0.06-0.6 | 0.08-0.12 | 4.5-5.5 | Low-------- | High------ | High------ | 0.37 | |
| Lenberg: | | | | | | | | | |
| [1]LfE: | | | | | | | | | |
| Lenberg part----- | 0-9 | 0.6-2.0 | 0.17-0.23 | 4.5-7.3 | Low-------- | Moderate | Moderate | 0.43 | 3 |
| | 9-25 | 0.2-0.6 | 0.11-0.18 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.37 | |
| | 25-37 | 0.2-0.6 | 0.10-0.16 | 4.5-5.5 | Moderate | Moderate | Moderate | 0.28 | |
| | 37 | --- | --- | --- | --------- | --------- | --------- | --- | |
| Frondorf part---- | 0-21 | 0.6-2.0 | 0.18-0.23 | 4.5-7.3 | Low-------- | Moderate | High------ | 0.32 | 3-2 |
| | 21-32 | 0.6-2.0 | 0.08-0.16 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.17 | |
| | 32 | --- | --- | --- | --------- | --------- | --------- | --- | |
| Lindside: | | | | | | | | | |
| Ln---------------- | 0-66 | 0.6-2.0 | 0.18-0.26 | 5.6-7.3 | Low-------- | Moderate | Low-------- | --- | --- |

See footnotes at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

| Soil name and map symbol | Depth | Permea-bility | Available water capacity | Soil reaction | Shrink-swell potential | Risk of corrosion | | Erosion factors | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Uncoated steel | Concrete | K | T |
| | In | In/hr | In/in | pH | | | | | |
| Markland: | | | | | | | | | |
| MdC3 | 0-5 | 0.6-2.0 | 0.14-0.18 | 5.1-7.3 | Moderate | Low | Moderate | 0.49 | 3 |
| | 5-40 | 0.06-0.2 | 0.13-0.18 | 5.1-6.5 | High | High | Moderate | 0.32 | |
| | 40-70 | 0.06-0.2 | 0.13-0.18 | 6.1-7.8 | High | High | Low | 0.32 | |
| McGary: | | | | | | | | | |
| Mr | 0-6 | 0.6-2.0 | 0.18-0.23 | 5.1-7.3 | Low | High | Low | 0.49 | 3-2 |
| | 6-29 | 0.06-0.2 | 0.14-0.18 | 4.5-5.5 | High | High | Low | 0.32 | |
| | 29-70 | 0.06-0.2 | 0.14-0.18 | 4.5-8.4 | High | High | Low | 0.32 | |
| Melvin: | | | | | | | | | |
| Mv | 0-8 | 0.6-2.0 | 0.18-0.23 | 5.6-7.8 | Low | High | Low | 0.43 | --- |
| | 8-50 | 0.6-2.0 | 0.18-0.23 | 5.6-7.8 | Low | High | Low | 0.43 | |
| Newark: | | | | | | | | | |
| Nb | 0-10 | 0.6-2.0 | 0.15-0.23 | 5.6-7.8 | Low | High | Low | 0.43 | --- |
| | 10-50 | 0.6-2.0 | 0.18-0.23 | 5.6-7.8 | Low | High | Low | 0.43 | |
| Nicholson: | | | | | | | | | |
| NcA, NcB | 0-7 | 0.6-2.0 | 0.19-0.23 | 4.5-7.3 | Low | Moderate | Moderate | 0.43 | 3-2 |
| | 7-23 | 0.6-2.0 | 0.18-0.22 | 4.5-6.0 | Low | Moderate | Moderate | 0.43 | |
| | 23-41 | 0.06-0.2 | 0.07-0.12 | 4.5-5.5 | Low | Moderate | Moderate | 0.43 | |
| | 41-66 | 0.06-0.6 | 0.07-0.12 | 4.5-5.5 | Moderate | High | Moderate | 0.37 | |
| Nolin: | | | | | | | | | |
| No | 0-10 | 0.6-2.0 | 0.18-0.23 | 5.6-7.3 | Low | Low | Moderate | 0.43 | --- |
| | 10-66 | 0.6-2.0 | 0.18-0.23 | 5.6-7.3 | Low | Low | Moderate | 0.43 | |
| Nolin variant: | | | | | | | | | |
| Nv | 0-9 | 2.0-6.0 | 0.14-0.18 | 5.6-7.3 | Low | Low | Moderate | 0.43 | 4 |
| | 9-48 | 2.0-6.0 | 0.06-0.11 | 5.6-7.3 | Low | Low | Moderate | 0.43 | |
| | 48-60 | 2.0-6.0 | 0.08-0.21 | 5.6-7.3 | Low | Low | Moderate | 0.43 | |
| Otwell: | | | | | | | | | |
| OtA, OtB | 0-26 | 0.6-2.0 | 0.22-0.24 | 5.1-7.3 | Low | Moderate | High | 0.43 | 3-2 |
| | 26-42 | 0.06-0.2 | 0.07-0.14 | 4.5-5.5 | Low | Moderate | High | 0.43 | |
| | 42-64 | 0.06-0.2 | 0.07-0.14 | 5.1-7.3 | Low | Moderate | High | 0.43 | |
| Pembroke: | | | | | | | | | |
| PmB, PmC | 0-7 | 0.6-2.0 | 0.18-0.23 | 4.5-7.3 | Low | Low | Moderate | 0.32 | 4 |
| | 7-40 | 0.6-2.0 | 0.18-0.22 | 5.6-6.5 | Low | Low | Moderate | 0.28 | |
| | 40-66 | 0.6-2.0 | 0.13-0.19 | 5.1-6.0 | Moderate | Moderate | Moderate | 0.28 | |
| Ramsey: | | | | | | | | | |
| [1]RaE: | | | | | | | | | |
| Ramsey part | 0-16 | 6.0-20 | 0.09-0.12 | 4.5-5.5 | Low | Low | Moderate | 0.17 | 1 |
| | 16 | --- | --- | --- | ------- | ------- | ------- | --- | |
| Steinsburg part | 0-7 | 2.0-6.0 | 0.10-0.14 | 4.5-7.3 | Low | Low | High | 0.28 | 2 |
| | 7-18 | 2.0-6.0 | 0.10-0.14 | 4.5-5.5 | Low | Low | High | --- | |
| | 18-35 | 2.0-6.0 | 0.04-0.10 | 4.5-5.5 | Low | Low | High | --- | |
| | 35 | --- | --- | --- | ------- | ------- | ------- | --- | |
| Allegheny part | 0-6 | 0.6-2.0 | 0.12-0.22 | 4.5-7.3 | Low | Low | High | 0.32 | 4 |
| | 6-33 | 0.6-2.0 | 0.13-0.18 | 4.5-5.5 | Low | Low | High | 0.28 | |
| | 33-50 | 0.6-2.0 | 0.08-0.17 | 4.5-5.5 | Low | Low | High | 0.28 | |
| | 50 | --- | --- | --- | ------- | ------- | ------- | --- | |
| Riney: | | | | | | | | | |
| RbC, RbD, RbE, RcD3 | 0-8 | 2.0-6.0 | 0.12-0.18 | 4.5-7.3 | Low | Moderate | High | 0.28 | 4 |
| | 8-54 | 2.0-6.0 | 0.13-0.17 | 4.5-5.5 | Low | Moderate | High | 0.28 | |
| | 54-65 | 2.0-6.0 | 0.05-0.14 | 4.5-5.5 | Low | Moderate | High | 0.28 | |

See footnotes at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

| Soil name and map symbol | Depth | Permea- bility | Available water capacity | Soil reaction | Shrink- swell potential | Risk of corrosion | | Erosion factors | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Uncoated steel | Concrete | K | T |
| | In | In/hr | In/in | pH | | | | | |
| Robertsville: | | | | | | | | | |
| Rd---------------- | 0-8 | 0.6-2.0 | 0.19-0.23 | 4.5-7.3 | Low-------- | High------ | High------ | 0.43 | 3 |
| | 8-16 | 0.6-2.0 | 0.18-0.22 | 4.5-5.5 | Low-------- | High------ | High------ | 0.43 | |
| | 16-45 | 0.06-0.2 | 0.08-0.12 | 4.5-5.5 | Low-------- | High------ | High------ | 0.43 | |
| | 45-66 | 0.06-0.6 | 0.08-0.12 | 4.5-5.5 | Low-------- | High------ | Moderate | 0.43 | |
| Rock outcrop: | | | | | | | | | |
| [1]RoE: | | | | | | | | | |
| Rock outcrop part. | | | | | | | | | |
| Corydon part----- | 0-5 | 0.6-2.0 | 0.18-0.22 | 6.1-7.3 | Low-------- | Low-------- | Low-------- | 0.43 | 2-1 |
| | 5-16 | 0.2-0.6 | 0.11-0.20 | 6.1-7.3 | Moderate | Moderate | Low-------- | 0.24 | |
| | 16 | --- | --- | --- | ---------- | ---------- | ---------- | --- | |
| Sadler: | | | | | | | | | |
| SdA, SdB, SdC----- | 0-10 | 0.6-2.0 | 0.19-0.23 | 4.5-7.3 | Low-------- | Moderate | High------ | 0.43 | 3 |
| | 10-28 | 0.6-2.0 | 0.18-0.22 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.43 | |
| | 28-51 | 0.06-0.2 | 0.07-0.12 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.43 | |
| | 51-64 | 0.06-0.6 | 0.07-0.12 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.43 | |
| Sensabaugh: | | | | | | | | | |
| Sg---------------- | 0-27 | 0.6-2.0 | 0.12-0.18 | 5.6-7.8 | Low-------- | Low-------- | Low-------- | 0.20 | 5 |
| | 27-60 | 0.6-6.0 | 0.10-0.16 | 5.6-7.8 | Low-------- | Low-------- | Low-------- | 0.20 | |
| Sonora: | | | | | | | | | |
| SnB, SnC, SnC3---- | 0-9 | 0.6-2.0 | 0.19-0.23 | 4.5-7.3 | Low-------- | Low-------- | Moderate | 0.32 | 4 |
| | 9-25 | 0.6-2.0 | 0.18-0.22 | 4.5-6.5 | Low-------- | Low-------- | Moderate | 0.32 | |
| | 25-39 | 0.6-2.0 | 0.12-0.18 | 4.5-5.5 | Low-------- | Low-------- | High------ | 0.32 | |
| | 39-71 | 0.6-2.0 | 0.13-0.18 | 4.5-5.5 | Moderate | High------ | High------ | 0.28 | |
| Vertrees: | | | | | | | | | |
| VrC, VrD, VrE, VtD3------------- | 0-7 | 0.6-2.0 | 0.16-0.22 | 4.5-7.3 | Low-------- | Low-------- | Low-------- | 0.37 | 4 |
| | 7-51 | 0.2-0.6 | 0.14-0.18 | 4.5-6.0 | Moderate | Moderate | Moderate | 0.28 | |
| | 51-70 | 0.2-0.6 | 0.10-0.16 | 5.1-7.3 | Moderate | Moderate | Moderate | 0.28 | |
| Waynesboro: | | | | | | | | | |
| WbC, WbD, WbE, WcCe, WcD3------- | 0-12 | 0.6-2.0 | 0.16-0.20 | 4.5-7.3 | Low-------- | Low-------- | High------ | 0.24 | 5 |
| | 12-30 | 0.6-2.0 | 0.15-0.19 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.28 | |
| | 30-60 | 0.6-2.0 | 0.12-0.16 | 4.5-5.5 | Moderate | High------ | High------ | 0.28 | |
| Wellston: | | | | | | | | | |
| WlB, WlC, WlC3---- | 0-12 | 0.6-2.0 | 0.18-0.22 | 4.5-7.3 | Low-------- | Moderate | Moderate | 0.37 | 3 |
| | 12-30 | 0.6-2.0 | 0.17-0.21 | 4.5-6.0 | Low-------- | Moderate | High------ | 0.37 | |
| | 30-50 | 0.6-2.0 | 0.12-0.17 | 4.5-5.5 | Low-------- | Moderate | High------ | 0.37 | |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior characteristics of the mapping unit.

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "frequent," "brief," "apparent," and "perched." The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

| Soil name and map symbol | Hydro-logic group | Flooding | | | High water table | | | Bedrock | |
|---|---|---|---|---|---|---|---|---|---|
| | | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness |
| | | | | | Ft | | | In | |
| Allegheny: | | | | | | | | | |
| [1]AlD: | | | | | | | | | |
| Allegheny part | B | None | --- | --- | >6.0 | --- | --- | >48 | Hard |
| Lenberg part | C | None | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| Caneyville part | C | None | --- | --- | --- | --- | --- | 20-40 | Hard |
| Ashton: | | | | | | | | | |
| As | B | Occasional | Very brief | Dec-Apr | >6.0 | --- | --- | >60 | --- |
| Caneyville: | | | | | | | | | |
| [1]CnD: | | | | | | | | | |
| Caneyville part | C | None | --- | --- | --- | --- | --- | 20-40 | Hard |
| Rock outcrop part. | | | | | | | | | |
| [1]CnE: | | | | | | | | | |
| Caneyville part | C | None | --- | --- | --- | --- | --- | 20-40 | Hard |
| Rock outcrop part. | | | | | | | | | |
| Crider: | | | | | | | | | |
| CrB, CrC, CrD | B | None | --- | --- | --- | --- | --- | >60 | Hard |
| Cumberland: | | | | | | | | | |
| CsC, CsD, CtC3, CtD3 | B | None | --- | --- | >6.0 | --- | --- | >60 | --- |
| Dunning: | | | | | | | | | |
| Dn | D | Frequent | Brief | Nov-May | 0-0.5 | Apparent | Nov-May | >48 | --- |
| Elk: | | | | | | | | | |
| ElB, ElC | B | Occasional | Very brief | Dec-Apr | >6.0 | --- | --- | >60 | --- |
| Fredonia: | | | | | | | | | |
| [1]FdC: | | | | | | | | | |
| Fredonia part | C | None | --- | --- | --- | --- | --- | 20-40 | Hard |
| Rock outcrop part. | | | | | | | | | |
| Frondorf: | | | | | | | | | |
| [1]FrC: | | | | | | | | | |
| Frondorf part | B | None | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| Lenberg part | C | None | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| [1]FrD: | | | | | | | | | |
| Frondorf part | B | None | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| Lenberg part | C | None | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| Garmon: | | | | | | | | | |
| GmE | C | None | --- | --- | >6.0 | --- | --- | 20-40 | Hard |
| Gatton: | | | | | | | | | |
| GnB | B | None | --- | --- | 1.5-2.0 | Perched | Jan-Apr | >60 | --- |
| Gullied land: | | | | | | | | | |
| Gu. | | | | | | | | | |

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydrologic group | Flooding | | | High water table | | | Bedrock | |
|---|---|---|---|---|---|---|---|---|---|
| | | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness |
| | | | | | Ft | | | In | |
| Hagerstown: HnB, HnC, HnD---- | C | None-------- | --- | --- | >6.0 | --- | --- | >40 | Hard |
| Huntington: Hu--------------- | B | Frequent---- | Brief----- | Nov-May | 4.0-6.0 | Apparent | Dec-Apr | >60 | --- |
| Lawrence: Lc--------------- | C | Occasional-- | Very brief | Dec-Apr | 0.5-1.5 | Perched | Dec-May | >60 | --- |
| Lenberg: [1]LfE: | | | | | | | | | |
| Lenberg part---- | C | None-------- | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| Frondorf part--- | B | None-------- | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| Lindside: Ln--------------- | C | Frequent---- | Brief----- | Nov-May | 1.5-3.0 | Apparent | Dec-Apr | >60 | --- |
| Markland: MdC3------------- | C | Occasional-- | Very brief | Dec-Apr | 4.0-6.0 | Perched | Jan-Apr | >60 | --- |
| McGary: Mr--------------- | C | Occasional-- | Very brief | Dec-Apr | 0.5-1.5 | Apparent | Jan-Apr | >60 | --- |
| Melvin: Mv--------------- | D | Frequent---- | Brief----- | Nov-May | <0.5 | Apparent | Nov-May | >60 | --- |
| Newark: Nb--------------- | C | Frequent---- | Brief----- | Nov-May | 0.5-1.5 | Apparent | Dec-Apr | >60 | --- |
| Nicholson: NcA, NcB--------- | C | None-------- | --- | --- | 1.5-2.0 | Perched | Jan-Apr | >60 | Hard |
| Nolin: No--------------- | B | Frequent---- | Brief----- | Nov-May | 4.0-6.0 | Apparent | Dec-Apr | >48 | Hard |
| Nolin variant: Nv--------------- | A | Frequent---- | Brief----- | Nov-May | 3.0-6.0 | Apparent | Dec-Apr | >60 | --- |
| Otwell: OtA, OtB--------- | C | Occasional-- | Very brief | Dec-Apr | 0.5-2.0 | Perched | Jan-Apr | >60 | --- |
| Pembroke: PmB, PmC--------- | B | None-------- | --- | --- | >6.0 | --- | --- | >60 | Hard |
| Ramsey: [1]RaE: | | | | | | | | | |
| Ramsey part----- | D | None-------- | --- | --- | >6.0 | --- | --- | 12-20 | Hard |
| Steinsburg part- | C | None-------- | --- | --- | >6.0 | --- | --- | 20-40 | Rippable |
| Allegheny part-- | B | None-------- | --- | --- | >6.0 | --- | --- | >48 | Hard |
| Riney: RbC, RbD, RbE, RcD3------------ | B | None-------- | --- | --- | >6.0 | --- | --- | >48 | Rippable |
| Robertsville: Rd--------------- | D | Occasional-- | Very brief | Dec-Apr | 0-1.0 | Perched | Dec-May | >60 | --- |
| Rock outcrop: [1]RoE: | | | | | | | | | |
| Rock outcrop part. | | | | | | | | | |
| Corydon part---- | C | None-------- | --- | --- | >6.0 | --- | --- | 10-20 | Hard |
| Sadler: SdA, SdB, SdC---- | C | None-------- | --- | --- | 1.5-2.0 | Perched | Jan-Apr | >48 | Hard |

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydrologic group | Flooding | | | High water table | | | Bedrock | |
|---|---|---|---|---|---|---|---|---|---|
| | | Frequency | Duration | Months | Depth | Kind | Months | Depth | Hardness |
| | | | | | Ft | | | In | |
| Sensabaugh: Sg | B | Frequent | Brief | Nov-May | 4.0-6.0 | Apparent | Jan-Apr | >42 | --- |
| Sonora: SnB, SnC, SnC3 | B | None | --- | --- | >6.0 | --- | --- | >60 | --- |
| Vertrees: VrC, VrD, VrE, VtD3 | B | None | --- | --- | >6.0 | --- | --- | >60 | --- |
| Waynesboro: WbC, WbD, WbE, WcC3, WcD3 | B | None | --- | --- | >6.0 | --- | --- | >60 | --- |
| Wellston: WlB, WlC, WlC3 | B | None | --- | --- | >6.0 | --- | --- | >42 | Hard |

[1]This mapping unit is made up of two or more dominant kinds of soil. See description of the mapping unit for the composition and behavior characteristics of the mapping unit.

TABLE 17. - ENGINEERING TEST DATA

[Tests performed by the Commonwealth of Kentucky Department of Transportation, Bureau of Highways, Division of Research, according to standard procedures of the American Association of State Highway and Transportation Officials (AASHTO)]

| Soil name and location | Parent material | Report No. | Depth | Moisture density[1]: Maximum | Moisture density[1]: Optimum | Percentage passing sieve[2]--: No. 4 | No. 10 | No. 40 | No. 200 | Percentage smaller than[2]--: 0.05 mm | 0.02 mm | 0.005 mm | 0.002 mm | Liquid limit[3] | Plasticity index[4] | Classification: AASHTO[5] | Unified[6] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | In | Lb/cu ft | Pct | | | | | | | | | Pct | | | |
| Crider silt loam (taxadjunct): Hardin County, Kentucky, 3 3/4 miles north of Hardin County Courthouse, Elizabethtown; 1/4 mile east of U.S. Highway 31-W on Pear Orchard Road; 320 yards south on drive and 30 feet west of drive. | Loess over residuum from limestone. | 47-1-2 | 7-26 | 102 | 17 | 100 | 99 | 99 | 96 | 90 | 75 | 41 | 31 | 42 | 18 | A-7-6 | CL |
| | | 47-1-3 | 26-41 | 112 | 14 | 80 | 73 | 70 | 61 | 61 | 43 | 22 | 17 | 31 | 14 | A-6 | CL |
| | | 47-1-4 | 41-66 | 99 | 24 | 99 | 90 | 90 | 87 | 87 | 80 | 59 | 48 | 65 | 43 | A-7-6 | CH |
| Gatton silt loam (modal): Larue County, Kentucky, 1/8 mile south of Mothers Mill on Kentucky Highway 357 and 1/8 mile west on rural road; 200 yards west of farm buildings. | Loess and residuum from sandstone and shale. | 62-5-2 | 7-22 | 103 | 19 | 100 | 100 | 100 | 83 | 77 | 65 | 33 | 26 | 32 | 15 | A-6 | CL |
| | | 62-5-3 | 22-35 | 114 | 13 | 100 | 100 | 99 | 67 | 61 | 53 | 26 | 23 | 26 | 5 | A-4 | CL-ML |
| | | 62-5-4 | 35-67 | 104 | 21 | 89 | 89 | 88 | 68 | 65 | 56 | 43 | 38 | 45 | 32 | A-7-6 | CL |
| Nicholson silt loam (modal): Hardin County, Kentucky, city limits of Radcliff, near road 100 feet east of N. Woodland Drive; 1/2 mile north of intersection of Central Parkway and Woodland Drive. | Loess over cherty limestone residuum. | 47-14-2 | 7-25 | 104 | 20 | 100 | 100 | 99 | 96 | 90 | 73 | 38 | 31 | 40 | 17 | A-6 | CL |
| | | 47-14-3 | 25-53 | 114 | 15 | 99 | 96 | 95 | 84 | 80 | 64 | 32 | 23 | 27 | 11 | A-6 | CL |
| | | 47-14-4 | 53-78 | 108 | 18 | 92 | 91 | 90 | 79 | 79 | 66 | 39 | 32 | 40 | 22 | A-6 | CL |
| Riney loam (modal): Hardin County, Kentucky, 2 1/2 miles south of Elizabethtown on east side of U.S. Highway 31-W; 300 yards south of Cumberland Presbyterian Church. | Residuum from limestone. | 47-18-3 | 15-38 | 116 | 14 | 96 | 93 | 92 | 26 | 24 | 24 | 22 | 21 | 29 | 9 | A-2-4 | SC |
| | | 47-18-5 | 44-69 | 115 | 14 | 99 | 99 | 99 | 49 | 49 | 45 | 37 | 33 | 35 | 18 | A-6 | SC |

See footnotes at end of table.

TABLE 17. - ENGINEERING TEST DATA--Continued

| Soil name and location | Parent material | Report No. | Depth | Moisture density[1]: Maximum | Moisture density[1]: Optimum | Percentage passing sieve[2]--: No. 4 | No. 10 | No. 40 | No. 200 | Percentage smaller than[2]--: 0.05 mm | 0.02 mm | 0.005 mm | 0.002 mm | Liquid limit[3] | Plasticity index[4] | Classification: AASHTO[5] | Unified[6] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | In | Lb/cu ft | Pct | | | | | | | | | Pct | | | |
| Sonora silt loam (modal): | | | | | | | | | | | | | | | | | |
| Larue County, Kentucky; 1 1/4 mile east of Sonora; on No. side of road along Kentucky Highway 84 and 3/8 mile east of intersection of Kentucky Highway 84 and U.S. Highway 31-W. | Loess and residuum from sandstone and shale. | 62-4-2 | 9-25 | 110 | 16 | 100 | 100 | 100 | 73 | 65 | 53 | 31 | 26 | 32 | 12 | A-6 | CL |
| | | 62-4-4 | 33-72 | 101 | 23 | 100 | 100 | 100 | 68 | 51 | 46 | 43 | 40 | 42 | 25 | A-7-6 | CL |
| Vertrees silt loam (modal): | | | | | | | | | | | | | | | | | |
| Larue County, Kentucky; 4 1/2 miles northwest of Athertonville; on north side of Cecil Ridge Road. | Residuum from limestone and shale. | 62-2-2 | 7-24 | 96 | 22 | 98 | 98 | 97 | 90 | 86 | 79 | 63 | 56 | 70 | 41 | A-7-6 | CH |
| | | 62-2-3 | 24-51 | 98 | 20 | 96 | 96 | 93 | 84 | 78 | 72 | 58 | 51 | 62 | 33 | A-7-6 | CH |

[1]Maximum dry density and optimum moisture based on AASHTO Designation T 99-74, Method A.

[2]Mechanical analyses according to the AASHTO designation T 88-72. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[3]Based on AASHTO Designation T 89-68.

[4]Based on AASHTO Designation T 90-70.

[5]Based on AASHTO Designation M 145-73.

[6]Based on the Unified Soil Classification System ASTM Designation D2487. Soil Conservation Service and the Federal Highway Administration have agreed to consider that all soils having a plasticity index within 2 points of the A line are to be given a borderline classification. An example of a borderline classification obtained by this method is CL-ML.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that 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]

| Soil name | Family or higher taxonomic class |
|---|---|
| Allegheny | Fine-loamy, mixed, mesic Typic Hapludults |
| Ashton | Fine-silty, mixed, mesic Mollic Hapludalfs |
| Caneyville | Fine, mixed, mesic Typic Hapludalfs |
| Corydon | Clayey, mixed, mesic Lithic Argiudolls |
| *Crider | Fine-silty, mixed, mesic Typic Paleudalfs |
| *Cumberland | Fine, mixed, thermic Rhodic Paleudalfs |
| Dunning | Fine, mixed, mesic Fluvaquentic Haplaquolls |
| Elk | Fine-silty, mixed, mesic Ultic Hapludalfs |
| Fredonia | Fine, mixed, mesic Typic Hapludalfs |
| *Frondorf | Fine-loamy, mixed, mesic Ultic Hapludalfs |
| Garmon | Fine-loamy, mixed, mesic Dystric Eutrochrepts |
| Gatton | Fine-loamy, mixed, mesic Typic Fragiudalfs |
| Gullied land | Udorthents |
| Hagerstown | Fine, mixed, mesic Typic Hapludalfs |
| Huntington | Fine-silty, mixed, mesic Fluventic Hapludolls |
| Lawrence | Fine-silty, mixed, mesic Aquic Fragiudalfs |
| Lenberg | Fine, mixed, mesic Ultic Hapludalfs |
| Lindside | Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts |
| Markland | Fine, mixed, mesic Typic Hapludalfs |
| *McGary | Fine, mixed, mesic Aeric Ochraqualfs |
| Melvin | Fine-silty, mixed, nonacid, mesic Typic Fluvaquents |
| Newark | Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents |
| Nicholson | Fine-silty, mixed, mesic Typic Fragiudalfs |
| Nolin | Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts |
| Nolin variant | Coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts |
| Otwell | Fine-silty, mixed, mesic Typic Fragiudalfs |
| Pembroke | Fine-silty, mixed, mesic Mollic Paleudalfs |
| Ramsey | Loamy, siliceous, mesic Lithic Dystrochrepts |
| Riney | Fine-loamy, siliceous, mesic Typic Hapludults |
| Robertsville | Fine-silty, mixed, mesic Typic Fragiaqualfs |
| Sadler | Fine-silty, mixed, mesic Glossic Fragiudalfs |
| Sensabaugh | Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts |
| Sonora | Fine-loamy, mixed, mesic Typic Paleudalfs |
| Steinsburg | Coarse-loamy, mixed, mesic Typic Dystrochrepts |
| Vertrees | Fine, mixed, mesic Typic Paleudalfs |
| *Waynesboro | Clayey, kaolinitic, thermic Typic Paleudults |
| Wellston | Fine-silty, mixed, mesic Ultic Hapludalfs |

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