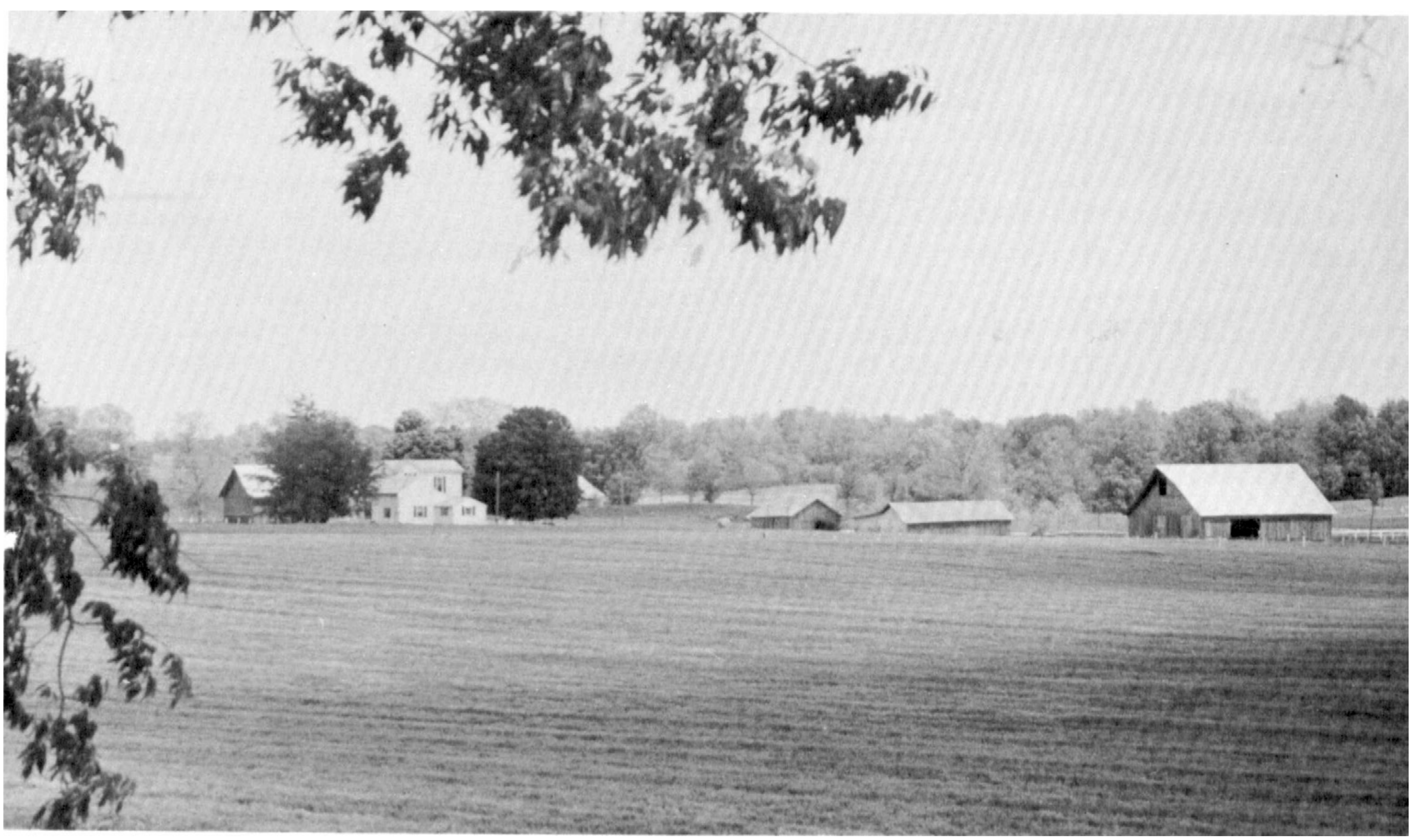
United States
Department of
Agriculture

Soil
Conservation
Service

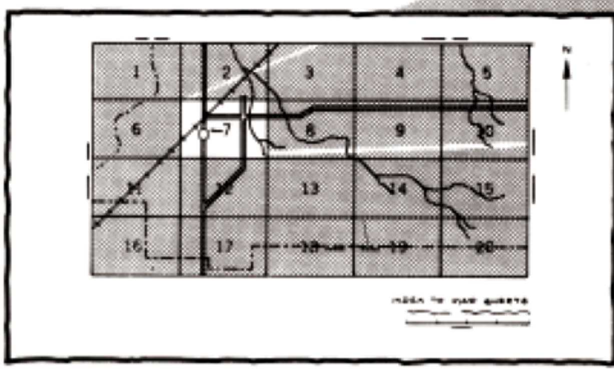
In cooperation with
Kentucky Natural Resources
and Environmental
Protection Cabinet
and Kentucky Agricultural
Experiment Station

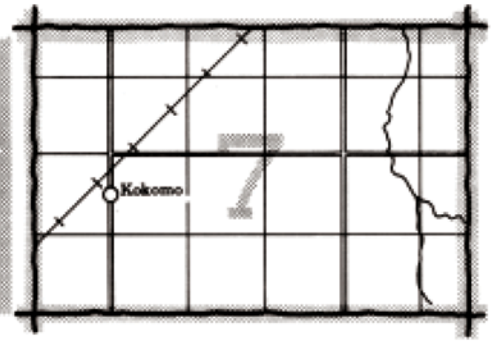
Soil Survey of Simpson County Kentucky



HOW TO USE

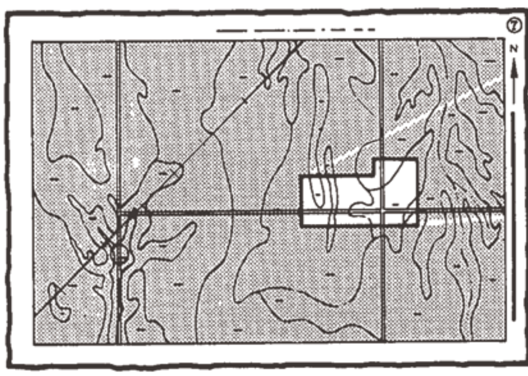
1. Locate your area of interest on the "Index to Map Sheets"

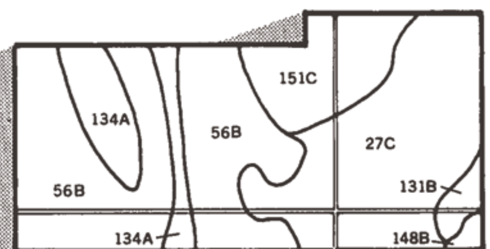




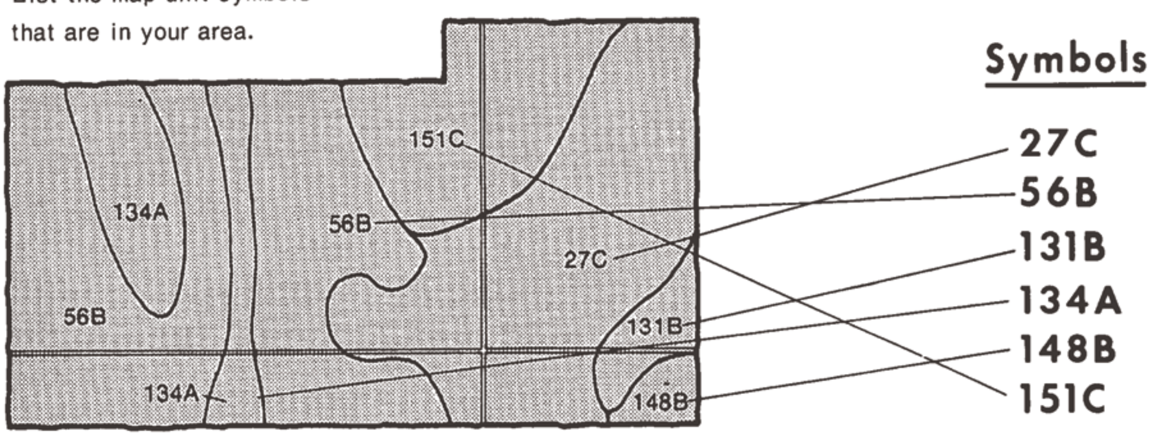
2. Note the number of the map sheet and turn to that sheet.

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



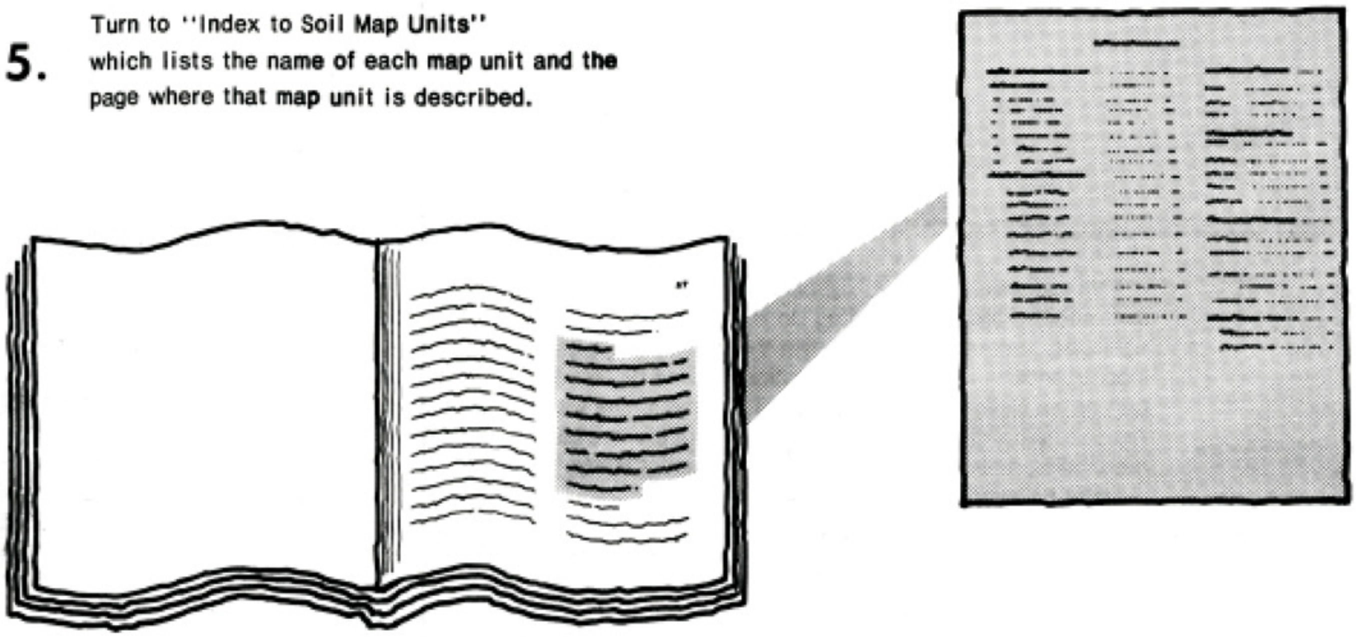


4. List the map unit symbols that are in your area.

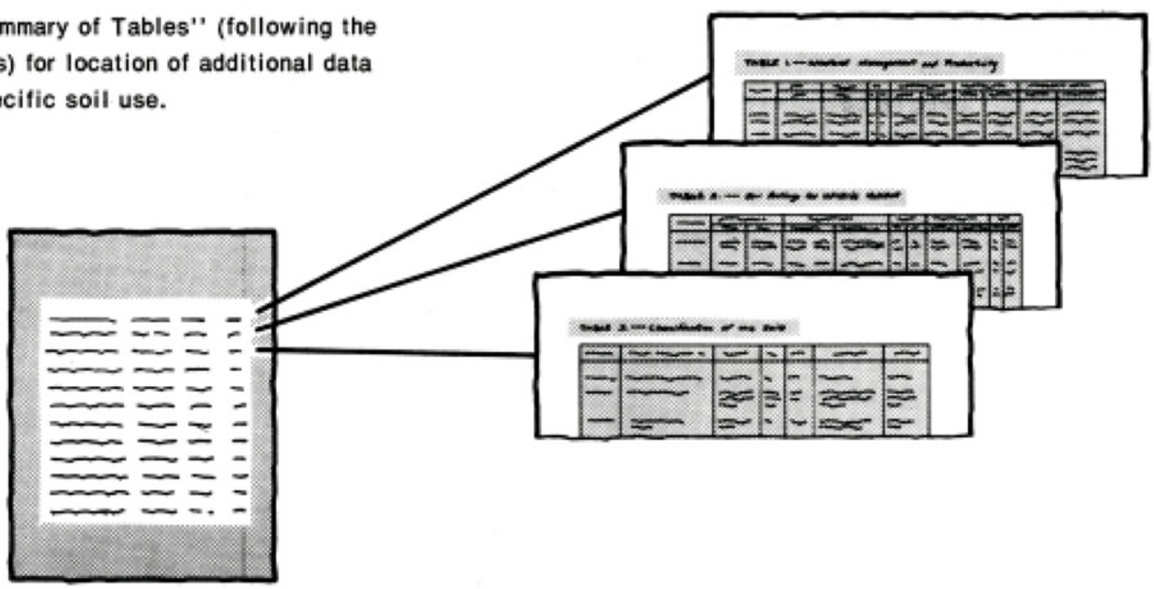


THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was completed in 1980. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service, the Kentucky Natural Resources and Environmental Protection Cabinet, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Simpson County Conservation District.

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

Cover: Small grains in an area of Pembroke silt loam, 2 to 6 percent slopes. The area is typical of the Pembroke-Bewleyville general soil map unit.

Contents

Soil Series

Issued May 1985

Index to Map Units

Summary of Tables

Foreword

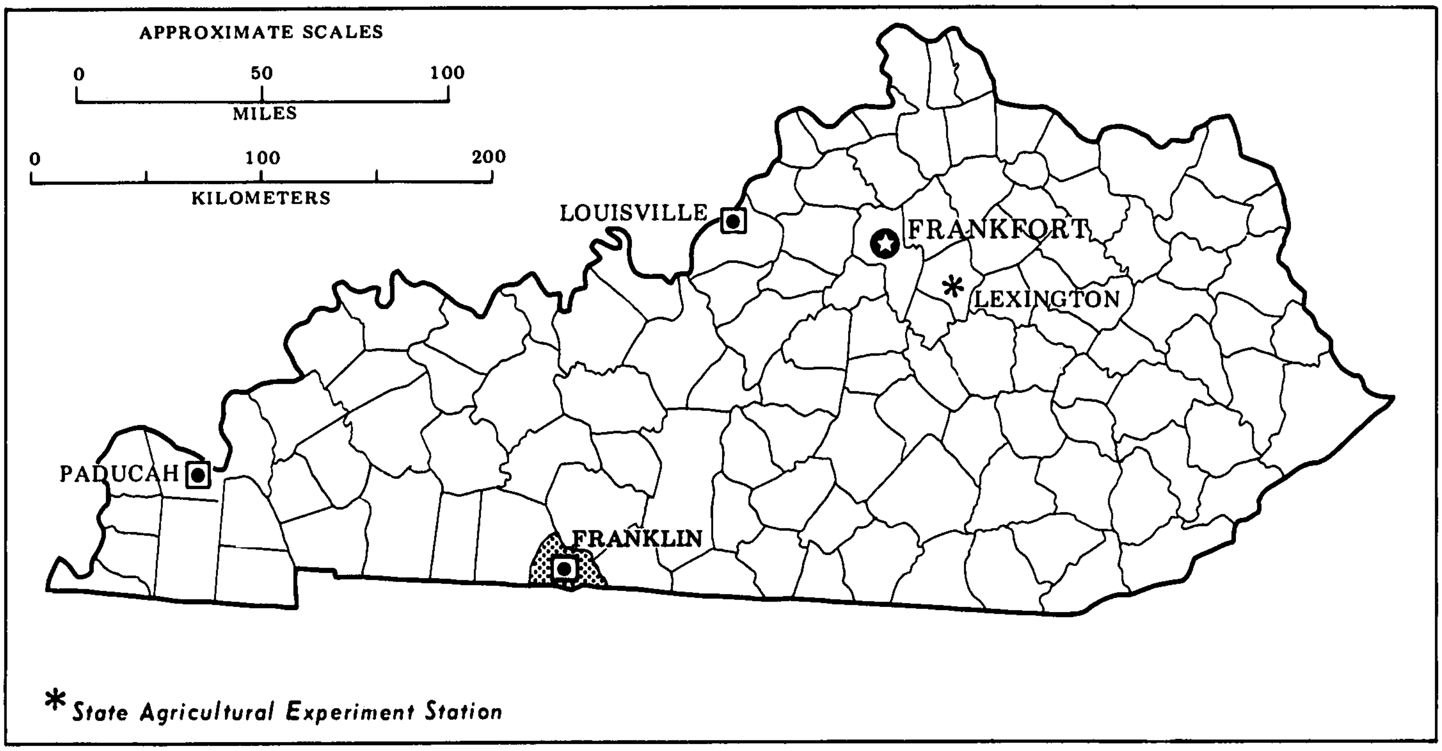
This soil survey contains information that can be used in land-planning programs in Simpson County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

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

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

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

Eddie L. Wood
State Conservationist
Soil Conservation Service



Location of Simpson County in Kentucky.

Soil Survey of Simpson County, Kentucky

By Michael J. Mitchell, Soil Conservation Service

Fieldwork by Michael J. Mitchell and Edward B. Campbell,
Soil Conservation Service, and
Donnie E. Owens and Donnie W. Holbrook,
Kentucky Natural Resources and Environmental Protection Cabinet

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

SIMPSON COUNTY is in the south-central part of Kentucky. The total land area is 151,315 acres, or 236.4 square miles. It is bounded on the north by Warren County, on the west by Logan County, and on the east by Allen County. In 1970, the population of Simpson County was 13,054, and in 1975, it was 14,112 (*17*). Franklin, the county seat, is the center of trade and industry.

The soils throughout the survey area are mainly deep, well drained, and highly productive. They formed mainly in material that weathered from limestone. Generally, the soils in the western part of the county range from gently sloping to undulating, and the soils in the eastern part range from gently sloping to steep. They are steep especially along streams that dissect the eastern part of the county.

Approximately 58 percent of the county is used for cultivated crops, and 18 percent is used for pasture. About 8 percent is used as woodland, and 16 percent is in other uses. Corn is grown on more than 55 percent of the farms. Tobacco is the main cash crop and is produced on 66 percent of the farms. Burley is the type most widely grown. It and dark air-cured tobacco are grown on farms throughout the county. Dark fired tobacco is grown mainly in the southwestern part of the county.

In 1978, more than 88,000 acres was harvested cropland, according to the Census Bureau. Nearly 2,000,000 bushels of corn, more than 500,000 bushels of wheat, and more than 1,000,000 bushels of soybeans were grown.

Although agriculture has played an important part in the economy of the county, industry is growing. There are several small and medium-size factories near Franklin.

General Nature of the Survey Area

This section discusses settlement and farming, geology and drainage, climate, and natural resources.

Settlement and Farming

The earliest settlements in the survey area, Bracken's Ford and Ditmore Ford, were made near salt licks, which were developed into salt mines. Water, timber, grass forage, and game were abundant. The area was virtually unsettled in 1780 but underwent rapid development after 1820. Simpson County was established on January 28, 1819. It consisted of areas of Logan, Warren, and Allen Counties. It was named in honor of Captain John Simpson, a Kentucky hero of the War of 1812. The county seat, Franklin, was established on November 2, 1820 (*3*).

The gently rolling, fertile soils in the area have been an important factor in the development of a strong agricultural economy. Since 1974, however, there has been a small but steady increase in the average size of farms. In 1978, 89.0 percent of the survey area was in farms. Total acreage of cropland from 1974 to 1978 had increased by 4.4 percent. There were 781 farms in the survey area in 1978, and the average size of a farm was 174 acres.

About 58 percent of the county is used for cultivated crops, including corn, milo, wheat, soybeans, and tobacco. Three crops can be grown in 2 years in a cropping system of corn, small grains, and soybeans. About 18 percent of the county is used for pasture, mainly to support beef and dairy operations. The pasture is also used on farms that have other livestock, including horses, ponies, hogs, and pigs. The acreage of pasture is available for use as additional cropland.

Geology and Drainage

Simpson County lies entirely within the Mississippian Plateau, which has well defined topographic features (*10*). The Mississippian Plateau is divided into two physiographic regions. The Western Pennyroyal Region is undulating to rolling and has karst landscapes. The soils formed in a mantle of loessial silty material overlying residuum. More than 90 percent of the survey area lies in the Western Pennyroyal Region. The Eastern Pennyroyal Region is highly dissected and hilly, and sinkholes are common. The soils formed mainly in residuum of limestone, cherty limestone, and calcareous shale overlain in places by a thin mantle of loess-like silty material.

The survey area is underlain by rocks of the Mississippian System. The soils formed in weathered limestone mainly of the St. Genevieve, St. Louis, Warsaw, and Salem Limestones (*13*). In the northwestern part of the county they formed in areas of the Girkin and Golconda Formations. The Girkin Formation consists of limestone and sandstone. The Golconda Formation consists of sandstone and shale and is exposed only in the rough, steep areas on Pilot Knob (*12*).

The lowest elevation in the survey area, 550 feet, is along the West Fork of Drakes Creek, and the highest elevation, 928 feet, is on Pilot Knob. The West Fork of Drakes Creek and its tributaries flow north. They drain much of the central and eastern parts of the survey area. The Red River and some streams that end in sinks drain the western half of the survey area.

Climate

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

The climate is relatively uniform throughout the area. Summers are hot, and winters are moderately cold. Rains are heavy and are well distributed throughout the year. Snow falls nearly every winter, but the snow cover usually lasts only a few days.

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

In winter the average temperature is 39 degrees F, and the average daily minimum temperature is 29 degrees. The lowest temperature on record, which occurred at Scottsville on January 24, 1953, is -20 degrees. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred at Scottsville on July 27, 1952 is 108 degrees.

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

The total annual precipitation is 52 inches. Of this, 26 inches, or 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 21 inches. The heaviest 1-day rainfall during the period of record was 9.68 inches at Scottsville on June 23, 1969. Thunderstorms occur on about 55 days each year, and most occur in summer.

The average seasonal snowfall is 15 inches. The greatest snow depth at any one time during the period of record was 10 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 65 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in spring.

Natural Resources

The most important natural resource in the county is the soil. Other natural resources are limestone, oil, and forest products.

Limestone of the St. Louis and St. Genevieve Limestones, which underlie a large part of the survey area, is suitable for use as aggregate, agricultural limestone, and building stone (*13*). A quarry in an area of the St. Genevieve Limestone is producing aggregate and limestone that is high in calcium. There are abandoned limestone quarries throughout the survey area.

There are small deposits of oil and gas throughout the survey area. Most of the producing oil wells are in the northeastern part of the county.

There are approximately 12,588 acres of woodland in the survey area. In the past 10 years, the acreage of woodland has been decreasing steadily. The largest continuous area of woodland is in the Robey Swamp.

How This Survey Was Made

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

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

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

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

Map Unit Composition

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

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

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

General Soil Map Units

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

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

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

1. Pembroke-Bewleyville

Deep, gently sloping and sloping, well drained loamy soils that have a loamy and clayey subsoil; formed in residuum of limestone and in a silty mantle underlain by loamy or clayey material that weathered from sandstone, shale, and limestone; on uplands

These soils are dominant in the western part of the county. They are mainly on broad, undulating plateaus (fig. 1) that have depressions and sinkholes. In most areas the soils are drained by sinkholes. In most areas the slope ranges from 0 to 12 percent.

This map unit makes up about 25 percent of the survey area. It is about 88 percent Pembroke soils and similar soils, 4 percent Bewleyville soils, and 8 percent minor soils.

Pembroke soils are on broad, rolling karst plateaus that have sinkholes and depressions. The surface layer is dark reddish brown silt loam. The subsoil is red silty clay loam grading to silty clay. These soils are very deep and have few chert fragments.

Bewleyville soils are generally on smoother slopes at slightly higher elevations. The surface layer is dark brown silt loam. The subsoil is mottled red and brown silt loam grading to silty clay loam.

The minor soils are the well drained Nolin soils in depressions and drainageways, the moderately well drained Nicholson soils and the somewhat poorly drained Lawrence soils on ridges and in slight depressions, the well drained Elk soils in drainageways and on terraces, and the Vertrees soils in karst areas.

The soils making up this map unit are used mainly for cultivated crops, including small grains, corn, soybeans, and tobacco. There are a few uncleared areas and some wooded areas that are rocky or steep.

These soils are well suited to farming. Erosion is a severe hazard if cultivated crops are grown in sloping areas; erosion control measures are generally needed.

These soils are well suited to use as pasture and hayland. Overgrazing, proper selection of grasses and legumes, and rotational grazing are management concerns. Because permeability is moderate, chemical treatment or compaction is generally required for ponds to hold water.

These soils are well suited to use as woodland, and potential productivity is high or very high. The oak-hickory forest type is predominant in scattered small woodlots. Hardwoods generally grow well on these soils. Competition to planted seedlings from invading vegetation is the only management concern.

The potential is good for the development of habitat for openland and woodland wildlife.

These soils are suited to urban uses. In areas where the slope is more than 4 percent, the hazard of erosion is a limitation. The limitation can be overcome if considered in the design of streets, roads, buildings, and other structures.

2. Vertrees-Fredonia

Deep and moderately deep, gently sloping and sloping, well drained loamy soils that have a clayey subsoil; formed in residuum of limestone and of shale; on uplands

These soils are in the northwestern and northern parts of the county. They are on broad ridges and in rolling areas that are dotted with sinkholes and depressions (fig. 2). The areas of this map unit do not have a well defined drainage pattern and in most places are drained by sinkholes. The slope ranges from 2 to 12 percent.

This map unit makes up about 4 percent of the survey area. It is about 56 percent Vertrees soils, 41 percent Fredonia soils, and 3 percent minor soils.

Vertrees soils are deep soils on narrow ridges and in sloping karst areas. The surface layer is dark brown silt

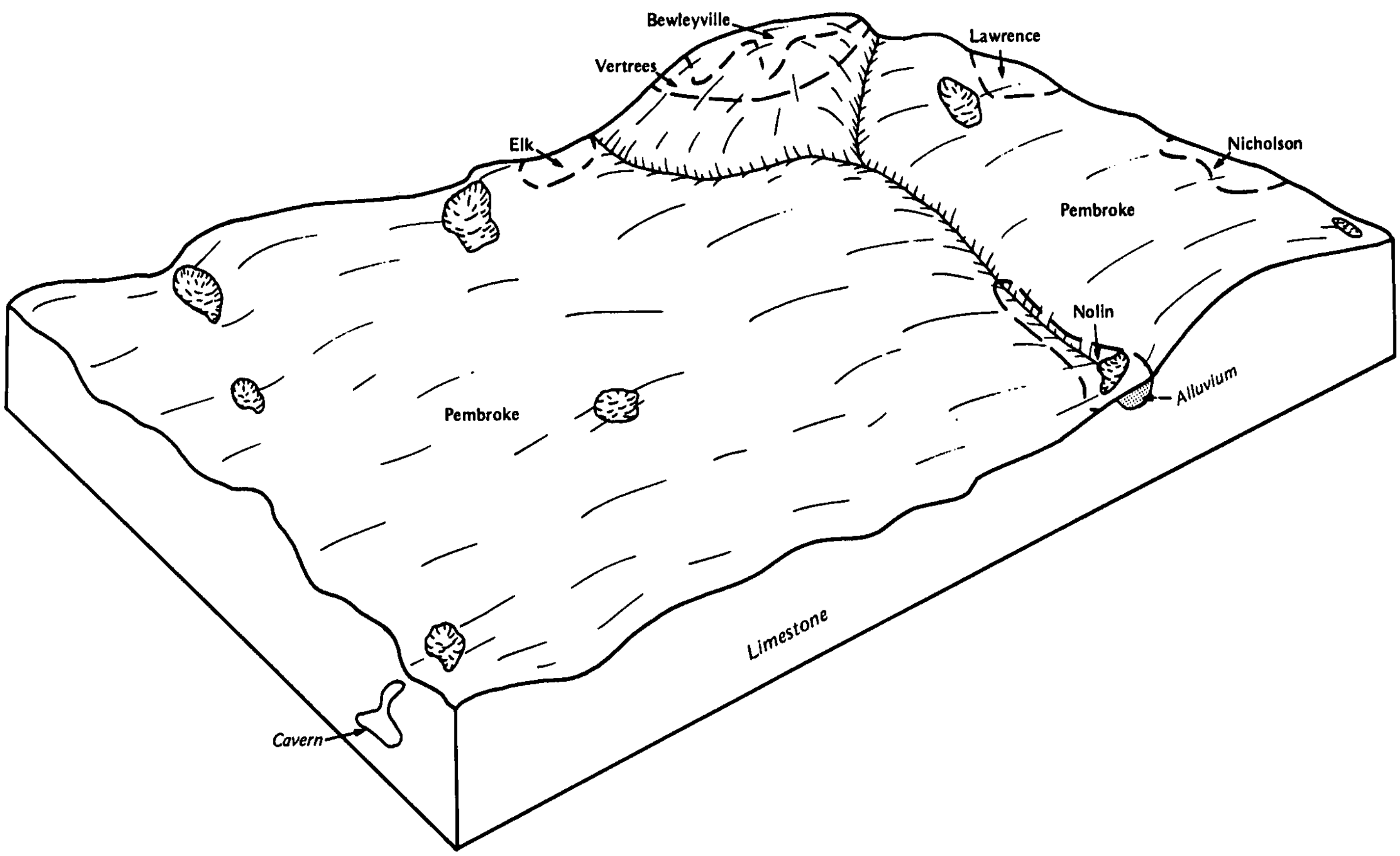


Figure 1.—Relationship of soils to topography and underlying material in the Pembroke-Bewleyville general soil map unit.

loam. The subsoil is mainly yellowish red to dark red silty clay and clay.

Fredonia soils are moderately deep soils on broad ridges and side slopes. The surface layer is dark reddish brown. The subsoil is red or dark red silty clay or clay. Fredonia soils are generally on smoother slopes than Vertrees soils. In some places Fredonia soils have rock outcrops.

The minor soils are Baxter, Mountview, Nolin, and Pembroke soils. Baxter soils are deep and cherty, and have a clayey subsoil; they are on narrow side slopes. Mountview and Pembroke soils are loamy; they are on broad ridges and side slopes. Nolin soils are loamy and alluvial; they are in depressions.

In most rolling areas the soils in this map unit have been cleared. There are small woodlots, generally in rocky or sloping areas. In cultivated areas these soils are used for corn, tobacco, soybeans, and small grains.

In gently sloping areas these soils are well suited to farming. Slope and the hazard of erosion are limitations to use of the soils for cultivated crops. In most sloping areas the clayey subsoil is a limitation to use of the soils for cultivated crops.

These soils are well suited to pasture and hay. Overgrazing and proper selection of grasses and legumes are management concerns.

Vertrees soils are well suited to use as woodland, and potential productivity is high. Fredonia soils are suited to use as woodland, and potential productivity is moderate. On both soils equipment limitations and plant competition are moderate.

The potential is good for the development of habitat for openland and woodland wildlife.

These soils are suited to urban uses. Slow permeability, the high content of clay, and the moderate shrink-swell potential are limitations. Some of these limitations can be overcome if considered in the design of roads, streets, buildings, and other structures.

3. Mountview-Baxter

Deep, nearly level to steep, well drained loamy soils that have a loamy and clayey subsoil; formed in a silty mantle *underlain by residuum of limestone and in cherty limestone; on uplands*

These soils are dominantly in the eastern and southern parts of the county on broad ridges and plateaus broken by rolling, karst side slopes (fig. 3). The ridges are wide and uniform in elevation. The side slopes are dotted with sinkholes and depressions. A large part of the area of this map unit is drained by the West and Middle Forks of Drakes Creek. The rest is drained by sinkholes. The slope ranges from 0 to 30 percent.

This map unit makes up about 63 percent of the survey area. It is about 40 percent Mountview soils, 36 percent Baxter soils, and 24 percent minor soils. Part of the total acreage, about 47,000 acres, is prime farmland.

Mountview soils are deep and well drained. They are on broad ridges and side slopes. The surface layer is brown silt loam. The subsoil is strong brown silty clay loam grading to red silty clay and clay.

Baxter soils are deep, well drained, and cherty. They generally are in karst areas and on ridges and hillsides. The slope ranges from 2 to 30 percent. The surface layer is yellowish brown cherty silt loam. The subsoil is strong brown cherty silt loam and cherty silty clay loam grading to red cherty clay.

The minor soils are Elk, Nicholson, Fredonia, Newark, Nolin, and Vertrees soils. Elk, Nolin, and Newark soils are on terraces and flood plains. Fredonia soils are on steep hills and bluffs along major drainageways. Vertrees soils are deep, clayey soils on a karst landscape. Nicholson soils are on broad upland ridges and stream terraces.

The soils making up this map unit are used mainly as cropland. The steep soils on the extreme eastern edge of the area and the steep soils on hillsides are covered by small woodlots consisting of mixed hardwoods. In the less sloping areas the soils are used for corn, small grains, tobacco, and soybeans.

In most areas where the slope is less than 12 percent, the soils are suited to the commonly grown crops. Measures are needed to reduce erosion.

These soils are well suited to use as pasture and hayland. Proper selection of grasses and legumes and the hazard of erosion are management concerns.

These soils are well suited to use as woodland, and potential productivity is high. The hickory forest type is

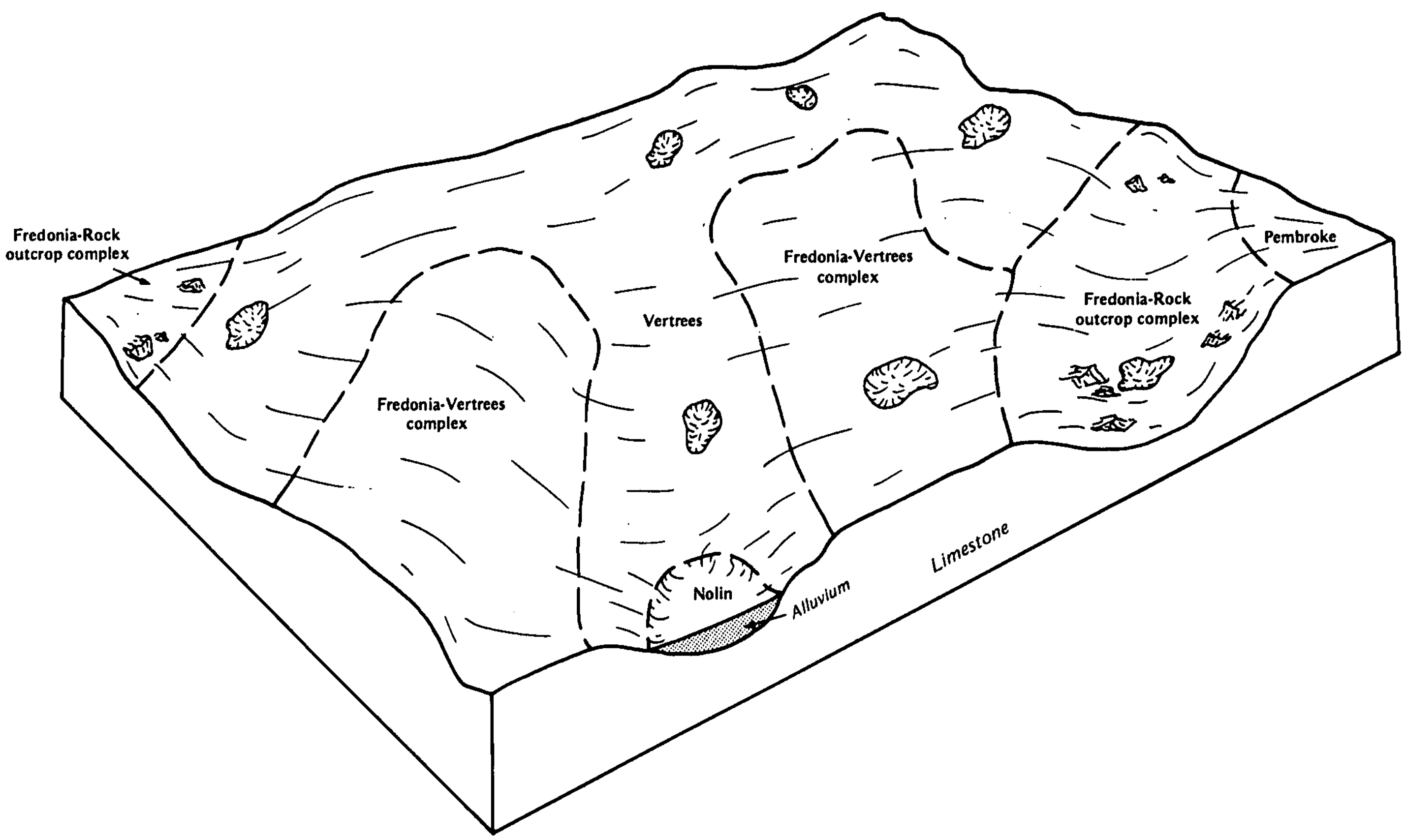


Figure 2.—Relationship of soils to topography and underlying material in the Vertrees-Fredonia general soil map unit.

predominant in woodlots (*9*). On some of the steeper slopes along the eastern edge of this map unit, erosion control measures are needed in woodland management activities such as timber harvesting.

The potential is good for the development of habitat for openland and woodland wildlife.

These soils are suited to urban uses. Slow permeability, slope, and the shrink-swell potential are limitations. These limitations can be overcome if considered in the design of streets, roads, buildings, and other structures.

4. Nicholson-Lawrence-Robertsville

Deep, nearly level to gently sloping, moderately well drained, somewhat poorly drained, and poorly drained loamy soils that have a fragipan; formed in a silty mantle underlain by residuum of limestone; in old, mixed alluvium; and in colluvium derived from limestone; on upland flats and in basins

These soils are in the central, south-central, and western parts of the county on broad, undulating plains separated by large basins or depressions (fig. 4). The basins have no outlets, or the outlets drain very slowly. The soils are very wet in winter and spring and usually dry out in summer and fall. The slope ranges from 0 to 6 percent.

This map unit makes up about 8 percent of the survey area. It is about 40 percent Nicholson soils, 28 percent Lawrence soils, 24 percent Robertsville soils, and 8 percent minor soils.

Nicholson soils are deep, moderately well drained soils on broad, smooth ridges and high stream terraces. Permeability is moderate. The surface layer is brown silt loam. The subsoil is yellowish brown silt loam. There is a fragipan at a depth of about 28 inches.

Lawrence soils are deep, somewhat poorly drained soils on upland flats, in depressions, and on stream terraces. Permeability is slow. The surface layer is light olive brown silt loam. The subsoil is mottled yellowish brown silt loam. There is a fragipan at a depth of about 2 feet.

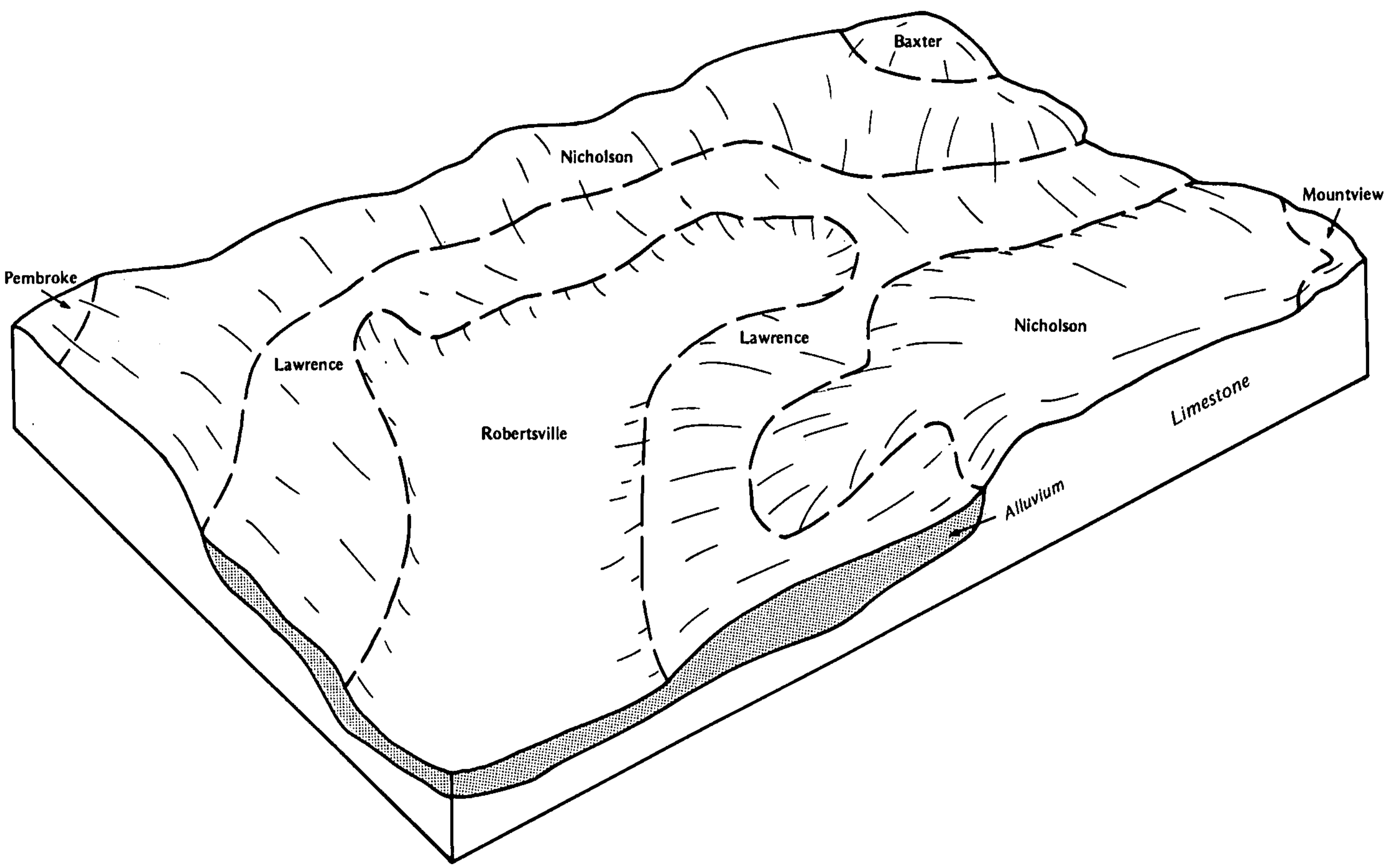


Figure 3.—Relationship of soils to topography and underlying material in the Mountview-Baxter general soil map unit.

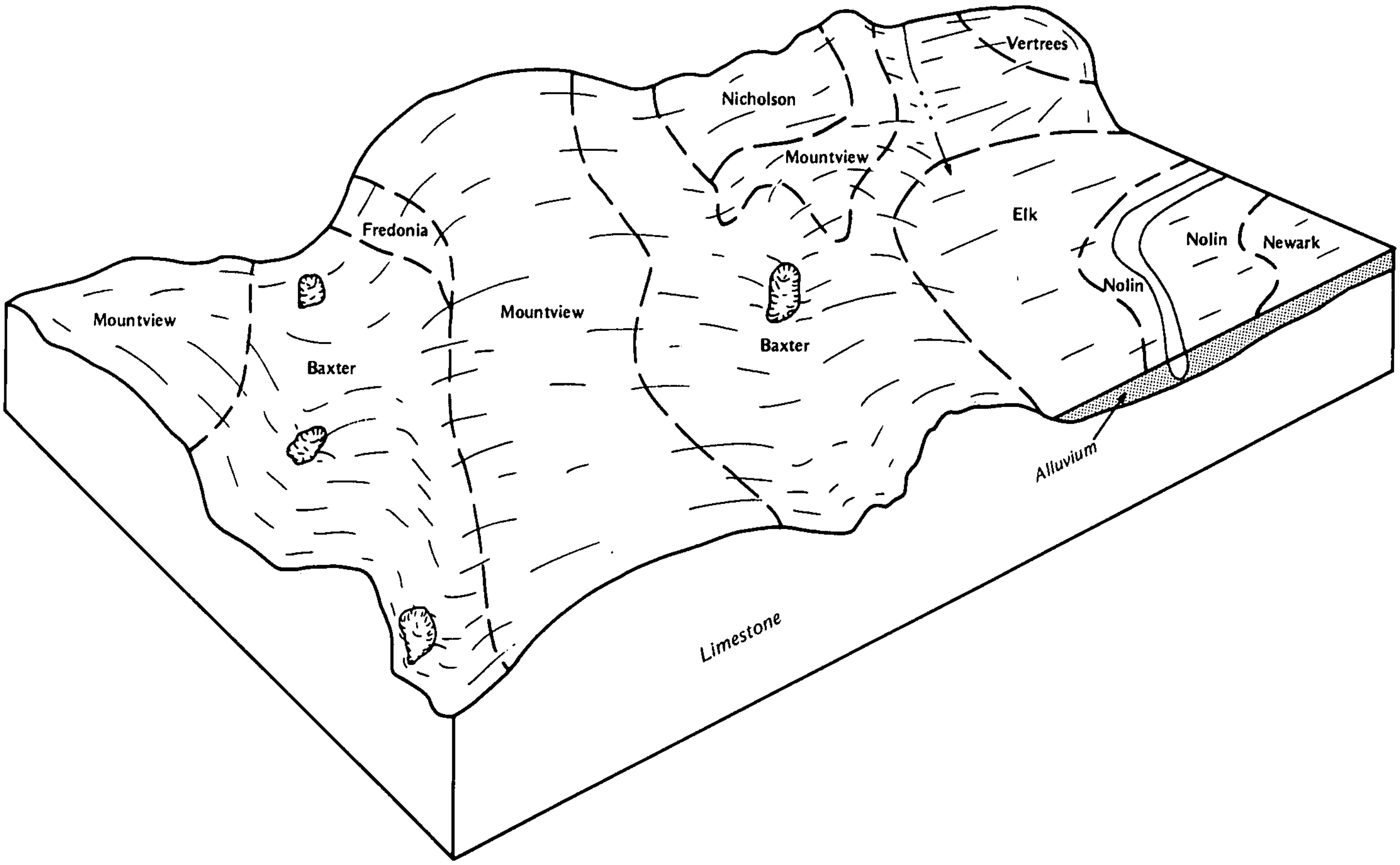


Figure 4.—Relationship of soils to topography and underlying material in the Nicholson-Lawrence-Robertsville general soil map unit.

Robertsville soils are poorly drained soils on upland flats, in depressions, and on nearly level stream terraces. Permeability is very slow. The surface layer is dark gray silt loam. The subsoil is light gray silt loam. There is a fragipan at a depth of about 21 inches. There is a seasonal high water table from December through May, when the soils remain saturated for long periods.

The minor soils are Baxter soils on narrow knolls and in sloping areas and the well drained Mountview and Pembroke soils on narrow knolls and adjoining ridges.

In most cleared areas, the soils making up this unit are used for corn and soybeans. A small acreage is used for pasture. The uncleared acreage consists of nearly level, poorly drained areas that are generally in mixed hardwoods.

These soils are suited to farming. A greater variety of crops could be grown if there were adequate drainage outlets. On Lawrence and Robertsville soils, from December through April, occasional flooding and ponding are hazards.

These soils are well suited to pasture and hay. The somewhat poorly drained and poorly drained soils are better suited to pasture plants that tolerate wetness.

These soils are well suited to use as woodland, and potential productivity is high to very high. Plant competition is severe.

The potential is good for the development of habitat for wetland wildlife.

These soils are poorly suited to urban uses and onsite waste disposal. Wetness and flooding are limitations.

Detailed Soil Map Units

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

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

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

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

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

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Fredonia-Vertrees complex, 2 to 6 percent slopes, is an example.

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

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

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

BaB—Baxter cherty silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on moderately wide ridges (fig. 5). Individual areas are irregular in shape and range from 3 to 78 acres in size. In a few areas there are sinks and depressions. The soil is eroded on the lower part of some slope breaks and just above some sloping or steeper areas. In karst areas the erosion generally is along the rim of depressions.

Typically, the surface layer is yellowish brown cherty silt loam about 7 inches thick. The subsoil is strong brown cherty silt loam and cherty silty clay loam grading to red cherty clay at a depth of about 19 inches. The red cherty clay extends to a depth of 60 inches or more. Where this soil is eroded or where the surface layer has been mixed with the upper part of the subsoil by plowing, the surface layer is yellowish red silty clay loam.

Permeability is moderate, and surface runoff is medium. The clay and chert content is high. The available water capacity is high. Reaction is very strongly acid or strongly acid unless the soil is limed. The organic matter content is moderate, and soil tilth is good. Chert fragments, however, hinder cultivation and limit the use of equipment. In areas where the plow layer has been mixed with the subsoil, the surface layer is not so friable and easily tilled. The shrink-swell potential is moderate. In some places root development is hindered by the rock fragments in the soil, but hard bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke and Mountview soils. Also included are soils

Figure 5.—Typical landscape of Baxter soils, in the foreground, and Mountview soils, on ridges in the background.

that are similar to the Baxter soil except that they have less than 5 percent chert fragments in the surface layer and subsoil. Also included are severely eroded areas that are less than 1 acre in size.

In most areas this Baxter soil is used for cultivated crops or pasture. It is suited to cultivated crops, including tobacco, corn, soybeans, and small grains. Erosion is a moderate hazard if conventional tillage is used. Conservation tillage, such as no-till, and crop residue management in combination with cropping systems help to reduce soil erosion. Returning crop residue to the soil helps to maintain soil tilth, to improve fertility, to reduce crusting, and to increase water infiltration.

This soil is well suited to pasture and hay. Yields are high if the soil is properly managed. Tall fescue, orchardgrass, alfalfa, red clover, and annual lespedeza grow well on this soil. Applications of lime and fertilizer, pasture renovation, rotational grazing, proper stocking rates, and control of weeds and woody vegetation help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and the potential productivity is high. A few areas are in timber. There are no severe limitations. The survival rate of newly planted seedlings is higher if herbicides are applied or cultivation is used to control undesirable plant species. Under proper management, high quality, desirable trees can be grown. Trees to plant or to favor include shortleaf pine, yellow-poplar, and eastern white pine.

The high content of clay, the shrink-swell potential, and the moderate permeability are limitations to use of this soil for building site development and for onsite waste disposal systems. Low strength is a limitation for local roads and streets.

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

BaC—Baxter cherty silt loam, 6 to 12 percent slopes. This is a deep, sloping, well drained soil on rolling uplands that are dotted with many sinks and depressions and on side slopes. Individual areas range from 3 to more than 900 acres in size. Most areas are large. The soil is eroded around the rim and sides of depressions and sinks.

Typically, the surface layer is yellowish brown cherty silt loam about 7 inches thick. The subsoil is strong brown cherty silt loam and cherty silty clay loam grading to red cherty clay at a depth of about 19 inches. The red cherty clay extends to a depth of 60 inches or more. Where this soil is eroded or where the surface layer has been mixed with the upper part of the subsoil by plowing, the surface layer is yellowish red silty clay loam.

Permeability is moderate. Surface runoff is medium if cultivated crops are grown. The clay and chert content is high. The available water capacity is high. Reaction is very strongly acid or strongly acid unless the soil is limed. The organic matter content is moderate, and soil tilth is good. Chert fragments hinder cultivation and limit the use of equipment. In areas where the plow layer has been mixed with the subsoil, the surface layer is not so friable and easily tilled. The shrink-swell potential is moderate. In some places root development is hindered by the rock fragments in the soil, but hard bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke and Mountview soils. Also included are soils that are similar to the Baxter soil except that they have less than 5 percent chert fragments in the surface layer and subsoil. Also included are severely eroded areas that are less than 1 acre in size.

In most areas this Baxter soil is used for cultivated crops or pasture or is idle. It is suited to cultivated crops, including tobacco, corn, soybeans, and small grains. Erosion is a severe hazard if cultivated crops are grown. Conservation tillage, such as no-till, crop residue management, growing cover crops, and including grasses and legumes in the rotation help to reduce soil erosion. Returning crop residue to the soil helps to maintain soil tilth, to improve fertility, to reduce crusting, and to increase water infiltration.

This soil is well suited to pasture and hay. Under good management, yields are high. Tall fescue, orchardgrass, alfalfa, red clover, and annual lespedeza are well suited to this soil. Applications of lime and fertilizer, pasture renovation, rotational grazing, proper stocking rates, and control of undesirable vegetation help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and the potential productivity is high. A few areas are forested. There are no severe limitations. Under proper management, high quality, desirable trees can be grown. Trees to plant or to favor include shortleaf pine, yellow-poplar, and eastern white pine.

The high content of clay, the moderate shrink-swell potential, slope, and the moderate permeability are some of the limitations to use of this soil for building site development and for onsite waste disposal systems.

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

BaD—Baxter cherty silt loam, 12 to 20 percent slopes. This is a deep, moderately steep, well drained soil on hilly uplands that are dotted with depressions and sinks and on side slopes. Most areas are small and narrow. Individual areas range from 3 to more than 269 acres in size. They average about 28 acres in size.

Typically, the surface layer is yellowish brown cherty silt loam about 7 inches thick. The subsoil is strong brown cherty silt loam and cherty silty clay loam grading to red cherty clay at a depth of about 19 inches. The red cherty clay extends to a depth of 60 inches or more. Where this soil is eroded or where the surface layer has been mixed with the upper part of the subsoil by plowing, the surface layer is yellowish red silty clay loam.

Permeability is moderate. Surface runoff is medium if cultivated crops are grown. The clay and chert content is high. The available water capacity is high. Reaction is very strongly acid or strongly acid unless the soil is limed. The organic matter content is moderate, and soil tilth is good. Chert fragments, however, hinder cultivation and limit the use of equipment. In areas where the plow layer has been mixed with the subsoil, the surface layer is not so friable and easily tilled. The shrink-swell potential is moderate. In some places root development is hindered by the rock fragments in the soil, but hard bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke and Mountview soils. Also included are soils that are similar to the Baxter soils except that they have less than 5 percent chert fragments in the surface layer and subsoil. Also included are severely eroded areas that are less than 1 acre in size and a few small areas where there are rock outcrops, generally at the base of slopes.

In most areas this Baxter soil is used as pasture or it has a forest cover of second-growth trees. Although it is poorly suited to cultivated crops, it is used for soybeans and small grains. Erosion is a very severe hazard if cultivated crops are grown. Conservation tillage, such as no-till, crop residue management, and growing cover crops or sod crops in sequence with row crops help to increase crop yields and to reduce erosion, runoff, and the loss of fertilizer. Returning crop residue to the soil helps to improve soil tilth.

This soil is well suited to pasture and hay. Tall fescue, crownvetch, annual lespedeza, and sericea lespedeza grow well on this soil. Applications of lime and fertilizer, pasture renovation, rotational grazing, proper stocking rates, and deferred grazing help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and the potential productivity is high. A few areas are forested. There are no severe limitations. The hazard of erosion, plant competition, and equipment limitations are management concerns. Under proper management, high-quality, desirable trees can be grown. Trees to plant or to favor include shortleaf pine, yellow-poplar, and eastern white pine.

Slope, the high content of clay, and the shrink-swell potential are limitations to use of this soil for most urban uses.

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

BaE—Baxter cherty silt loam, 20 to 30 percent slopes. This is a deep, steep, well drained soil on side slopes and around the rims of some depressions. Most areas are in moderately wide to narrow bands along drainageways and streams. Individual areas range from 4 to more than 160 acres in size. An average area is 40 acres in size.

Typically, the surface layer is yellowish brown cherty silt loam about 7 inches thick. The subsoil is brown cherty silt loam and cherty silty clay loam grading to red cherty clay at a depth of about 19 inches. The red cherty clay extends to a depth of 60 inches.

Permeability is moderate, and surface runoff is medium. The clay and chert content is high. The available water capacity is high. Reaction is very strongly acid or strongly acid unless the soil is limed. The organic matter content is low, and soil tilth is good. The plow layer is cherty, and the shrink-swell potential is moderate. In some places root development is hindered by the rock fragments in the soil, and hard bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are soils that are similar to the Baxter soil except that they have less than 5 percent chert fragments in the surface layer and subsoil. Also included are a few small areas that have rock outcrops, generally at the base of slopes.

In most areas this Baxter soil is used as pasture, is idle, or is used as woodland. It is not suited to cultivated crops.

This soil can be used as pasture and hayland; however, the slope and the cherty surface layer limit the use of equipment in establishing and maintaining grasses and legumes. Tall fescue, crownvetch, annual lespedeza, and sericea lespedeza can be grown on this soil. Plants to favor are those that require the least amount of renovation. Pasture renovation, rotational grazing, and control of weeds and woody vegetation help to maintain the quality of forage plants.

This soil is well suited to trees, and the potential productivity is high. A few areas are forested. Under proper management, high quality, desirable trees can be grown. Trees to plant or to favor include shortleaf pine, yellow-poplar, and eastern white pine. The hazard of erosion, equipment limitations, and plant competition are management concerns.

Slope, the high content of clay, and the shrink-swell potential are limitations to use of this soil for building site development and for onsite waste disposal systems.

This soil is in capability subclass VIe and in woodland suitability group 2r.

BeB—Bewleyville silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on broad, smooth ridges on uplands. In some places the soil is eroded around the terminal point of ridges. Areas range from 3 to 300 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 14 inches, is reddish brown silt loam. The middle part, to a depth of 21 inches, is red and yellowish red silt loam. The lower part to a depth of 76 inches is red silty clay loam that is mottled in shades of brown and yellowish red.

Permeability is moderate, and surface runoff is medium. The available water capacity is high. Reaction is strongly acid or very strongly acid unless the soil is limed. The organic matter content is moderate, and soil tilth is good. Adding manure or organic residue to the soil helps to maintain soil tilth. The plow layer is friable and is easily tilled. Erosion is a severe hazard if the soil is unprotected. The shrink-swell potential is moderate in the lower part of the subsoil. The root zone is deep, and bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke and Mountview soils. Also included are small areas of less friable, eroded soils.

In most areas this Bewleyville soil is used for cultivated crops or pasture. The soil is well suited to cultivated crops, including soybeans, corn, small grains, and tobacco. Erosion is a moderate hazard if cultivated crops are grown. Conservation tillage, contour stripcropping, and crop residue management in combination with terraces, grassed waterways, and diversions help to reduce erosion. Also, growing cover crops or sod crops in sequence with row crops helps to reduce runoff, to improve soil tilth, and to maintain organic matter content.

This soil is well suited to pasture and hay. Under a high level of management, yields are high. Bluegrass, tall fescue, alfalfa, timothy, and red and white clovers are well suited to this soil. Pasture renovation, applications of lime and fertilizer, rotational grazing, and proper stocking rates help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and the potential productivity is high. Trees to plant or to favor include black walnut, yellow-poplar, and white ash. Plant competition is a management concern.

This soil is suited to most urban uses. The clayey texture and the moderate permeability are limitations for sanitary facilities. Low strength is a limitation for local roads and streets.

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

BeC—Bewleyville silt loam, 6 to 12 percent slopes. This is a deep, sloping, well drained soil on narrow ridges and side slopes on uplands. The soil generally is more eroded along drainageways and on the upper part of slopes than elsewhere.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 21 inches, is reddish brown silt loam. The lower part, to a depth of 76 inches, is red silty clay loam that is mottled in shades of brown and red.

Permeability is moderate, and surface runoff is medium. The available water capacity is high. Reaction is strongly acid or very strongly acid unless the soil is limed. The organic matter content is moderate, and soil tilth is good. Adding manure or organic residue to the soil helps to maintain soil tilth. The plow layer is friable and easily tilled. Erosion is a severe hazard if the soil is unprotected. The shrink-swell potential is moderate in the lower part of the subsoil. The root zone is deep, and bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke and Mountview soils. Also included are areas of severely eroded soils that are less than 1 acre in size.

In most areas this soil is used for pasture or cultivated crops. It is suited to cultivated crops, including corn, soybeans, small grains, and tobacco. Erosion is a severe hazard if cultivated crops are grown. Conservation tillage, contour stripcropping, or crop residue management in combination with terraces, grassed waterways, and diversions help to reduce erosion. Cover crops or sod crops in sequence with row crops help to maintain the soil tilth and the organic matter content.

This soil is well suited to pasture and hay. Under a high level of management, yields are high. Bluegrass, tall fescue, alfalfa, timothy, and red and white clovers are well suited to this soil. Pasture renovation, rotational grazing, proper stocking rates, and applications of lime and fertilizer help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and the potential productivity is high. Trees to plant or to favor include black walnut, yellow-poplar, and white ash. Plant competition is a management concern.

This soil is suited to most urban uses. Slope and the clayey texture are limitations for sanitary facilities. Low strength is a limitation for local roads and streets.

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

Du—Dunning silty clay loam. This is a deep, poorly drained and very poorly drained, nearly level soil on flood plains and upland flats and in ponded areas in depressions.

Typically, the surface layer is very dark grayish brown silty clay loam about 5 inches thick. The subsurface layer is very dark gray silty clay loam about 8 inches thick. The subsoil is olive gray silty clay to a depth of 38 inches. The substratum is gray silty clay to a depth of 60 inches.

Permeability is slow, and surface runoff is slow. The available water capacity is high. Reaction ranges from medium acid to mildly alkaline. The organic matter content is moderate to high. The plow layer is difficult to till because of the clay content. From January through April a seasonal high water table is within 6 inches of the surface, and from December through May flooding is a hazard because water ponds on the surface. The root zone is deep.

Included with this soil in mapping are small areas of Lawrence, Robertsville, and Nolin soils. In some areas near Middleton the soil is covered by 24 inches of silty overwash material. The included soils make up less than 10 percent of the map unit.

This Dunning soil is suited to corn and soybeans if it is drained. A water management system, such as surface and subsurface drains, is needed to control the seasonal high water table. In many areas, however, there are no suitable outlets for a subsurface drainage system. Returning crop residue to the soil helps to improve soil tilth.

If properly managed, this soil is suited to pasture and hay. It is best suited to pasture and hay plants that tolerate wetness. Adequate drainage, applications of lime and fertilizer, rotational grazing, and proper stocking rates are needed.

This soil is suited to use as woodland, and the potential productivity is very high. Trees to plant or to favor include loblolly pine, sweetgum, pin oak, and other trees that tolerate wetness. The seedling mortality can be more than 50 percent, and replanting may be necessary. Also, plant competition is severe and can prevent natural or planted regeneration unless herbicides are applied or cultivation is used to control undesirable plant species.

This soil is not suited to most urban uses because of flooding and wetness.

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

ElA—Elk silt loam, 0 to 2 percent slopes. This is a nearly level, well drained soil on stream terraces. The mapped areas are 3 to 150 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 15 inches, is brown silt loam. The lower part, to a depth of 42 inches, is brown, strong brown, and pale brown silty clay loam. The substratum to a depth of 60 inches is yellowish brown silty clay loam that has pale brown and light yellowish brown mottles.

Permeability is moderate, and surface runoff is slow. The available water capacity is high. Reaction ranges from slightly acid to very strongly acid unless the soil is limed. The organic matter content is moderate. The surface layer is friable and is easily tilled within a fairly wide range of moisture content. Occasional flooding occurs for brief periods, especially in winter and early in spring. The root zone is deep, and bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Nolin soils along small drainageways. The included soils make up about 2 percent of the map unit. Also included are areas of soils that are in lower positions on the landscape and that have coarse fragments on the surface.

In most areas this Elk soil is used for cultivated crops. It is well suited to cultivated crops, including corn, soybeans, and tobacco. Under a high level of management, yields are high. Growing sod crops in sequence with cultivated crops, conservation tillage, and crop residue management help to maintain the organic matter content and to increase the infiltration rate.

This soil is well suited to pasture and hay. Yields are high. Bluegrass, orchardgrass, timothy, alfalfa, red clover, white clover, and annual lespedeza are well suited to this soil. Applications of lime and fertilizer, rotational grazing, and mowing weeds and woody vegetation help to maintain the quality of forage plants.

This soil is suited to use as woodland, and the potential productivity is high. Trees to plant or to favor are eastern white pine, yellow-poplar, and black walnut. Plant competition is severe unless competing plants are controlled by herbicides or cultivation.

This soil is not suited to most urban uses because flooding is a hazard. This limitation is difficult to overcome. Low soil strength is also a limitation for local roads. Soil strength can be improved by replacing the base material.

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

EIB—Elk silt loam, 2 to 6 percent slopes. This is a gently sloping, well drained soil on stream terraces. The mapped areas are 2 to 400 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 15 inches, is brown silt loam. The lower part, to a depth of 42 inches, is brown, strong brown, and pale brown silty clay loam. The substratum to a depth of 60 inches is yellowish brown silty clay loam that has pale brown and light yellowish brown mottles.

Permeability is moderate, and surface runoff is slow. The available water capacity is high. Reaction ranges from slightly acid to very strongly acid unless the soil is limed. The organic matter content is moderate. The surface layer is friable and is easily tilled within a fairly wide range in moisture content. Occasional flooding occurs for brief periods, especially in winter and early in spring. The root zone is deep, and bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Nolin soils in small drainageways or depressions; these soils make up about 1 percent of the map unit. Also included are areas of soils that are in lower positions on the landscape and that have coarse fragments on the surface.

In most areas this Elk soil is used for cultivated crops. It is well suited to cultivated crops. Under good management, yields are high. Erosion is a moderate hazard if cultivated crops are grown. Conservation tillage, contour stripcropping, crop residue management, and growing cover crops or sod crops in sequence with row crops help to improve soil tilth, to maintain the organic matter content, and to increase the infiltration rate.

This soil is well suited to pasture and hay. Bluegrass, tall fescue, orchardgrass, timothy, alfalfa, red clover, white clover, and annual lespedeza are well suited to this soil. Applications of lime and fertilizer, pasture renovation, rotational grazing, and mowing weeds and woody vegetation help to maintain the quality of forage plants.

This soil is suited to use as woodland, and the potential productivity is high. Trees to plant or to favor are eastern white pine, yellow-poplar, and black walnut. Plant competition is severe unless herbicides are applied or cultivation is used to control undesirable plant species.

This soil is not suited to most urban uses because flooding is a severe hazard. Low soil strength is also a limitation for local roads. Soil strength can be improved by replacing the base material.

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

FcB—Fredonia-Vertrees complex, 2 to 6 percent slopes. This complex consists of moderately deep, well drained Fredonia soil and deep, well drained Vertrees soil on a relatively broad, irregular landscape. In some areas there are sinks and depressions, and adjacent slopes surrounding depressions generally are eroded. The soils making up this complex are so intricately mixed that they could not be separated at the scale selected for mapping. Individual areas range in size from 3 to 300 acres. In some areas there are rock outcrops that cover less than 1 percent of the surface.

Fredonia soil makes up about 58 percent of the complex, Vertrees soil makes up 28 percent, and included soils make up 14 percent.

Typically, the surface layer of Fredonia soil is dark reddish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 24 inches, is red silty clay. The lower part, to a depth of 40 inches, is dark red silty clay. Bedrock is at a depth of 40 inches.

Permeability of the Fredonia soil is moderately slow or slow, and surface runoff is medium. The clay content is high. The available water capacity is moderate. Reaction ranges from slightly acid to strongly acid in the surface layer and upper part of the subsoil unless the soil is limed and from strongly acid to neutral in the lower part of the subsoil. The organic matter content is moderate; however, adding manure and organic residue to the soil helps to improve soil tilth. The surface layer is friable and is easily tilled. Some areas are eroded and thus are not so friable or easily tilled. The shrink-swell potential is moderate. Root development is restricted mainly by limestone bedrock between depths of 20 and 40 inches.

Typically, the surface layer of Vertrees soil is dark brown silt loam about 7 inches thick. The upper part of the subsoil, to a depth of 16 inches, is yellowish red silty clay loam. The lower part is dark red silty clay grading to yellowish red clay at a depth of 57 inches. The yellowish red clay extends to a depth of 61 inches or more.

Permeability of the Vertrees soil is moderately slow, and surface runoff is medium. The clay content increases with depth. The available water capacity is high. Reaction ranges from very strongly acid to medium acid unless the soil is limed. The organic matter content is moderate. Adding manure and organic residue to the soil helps to improve soil tilth. The plow layer is easy to till and can be worked within a wide range of moisture content. The shrink-swell potential is moderate. The root zone is deep. Hard bedrock is below a depth of 60 inches.

Included with this complex in mapping are small areas of Baxter and Mountview soils.

In most areas the soils making up this complex are used for cultivated crops or hay. They are suited to cultivated crops including soybeans, corn, and small grains. Under good management, yields are high. Erosion is a moderate hazard if cultivated crops are grown. Conservation tillage, crop residue management, and growing cover crops or sod crops in sequence with row crops help to maintain the organic matter content, to improve soil structure, and to increase the infiltration rate.

These soils are well suited to pasture and hay. Tall fescue, orchardgrass, alfalfa, red clover, and annual lespedeza are well suited to these soils. Applications of lime and fertilizer, pasture renovation, rotational grazing, proper stocking rates, and mowing weeds and woody vegetation help to improve the quality of the forage.

These soils are suited to use as woodland, and the potential productivity is moderate. A few areas are in good quality timber. On Fredonia soil, trees to plant are Virginia pine and eastern redcedar and, on Vertrees soil, are yellow-poplar, black walnut, and white ash. Equipment limitations and plant competition are management concerns.

On Fredonia and Vertrees soils, low strength is a limitation for local roads and streets, and the slow permeability and the clayey texture are limitations for sanitary facilities. On Fredonia soil, shallowness to rock is a limitation for building site development and for sanitary facilities.

These soils are in capability subclass IIe. Fredonia soil is in woodland suitability group 3c, and Vertrees soil is in woodland suitability group 2c.

FdC—Fredonia-Rock outcrop complex, 6 to 12 percent slopes. This complex consists of moderately deep, sloping, well drained Fredonia soil and areas of Rock outcrop. In most areas there are sinks or depressions. The areas of Fredonia soil and those of Rock outcrop are so intricately mixed that they could not be mapped separately at the scale selected for mapping. The mapped areas are 3 to 350 acres in size.

Fredonia soil makes up about 70 percent of the complex, Rock outcrop makes up about 19 percent, and included soils make up 11 percent.

Typically, the surface layer of Fredonia soil is dark reddish brown silt loam about 8 inches thick. The upper part of the subsoil is red silty clay to a depth of 24 inches. The lower part is dark red clay to a depth of 28 inches. Bedrock is at a depth of 28 inches.

Permeability is moderately slow or slow, and surface runoff is medium. The clay content is high. The available water capacity is moderate. Unless the soil is limed, reaction ranges from slightly acid to strongly acid in the surface layer and from strongly acid to neutral in the subsoil. The organic matter content is moderate, and soil tilth is good. In some areas the soil is eroded and is not so friable or easily tilled. The shrink-swell potential is moderate. Root development is restricted mainly by limestone, which is between depths of 20 and 40 inches.

Included with this complex in mapping are small areas of Baxter, Vertrees, Mountview, and Pembroke soils. Also included are small areas where there are no rock outcrops and areas where bedrock is at a depth of less than 20 inches.

In most areas the Fredonia soil in this map unit is used as pasture or as woodland consisting of second-growth trees, or it is idle. It is not suited to cultivated crops because of the pattern of the rock outcrops and the slope.

The Fredonia soil is suited to hay and pasture. Rock outcrops are a limitation for seedbed preparation, mowing, and harvesting hay.

The Fredonia soil is suited to use as woodland, and potential productivity is moderate. A few areas are forested. The slope and the outcrops are limitations for mechanical tree planters and timber harvesting equipment. Plant competition is a management concern. Trees to plant or to favor are Virginia pine and eastern redcedar.

Shallowness to bedrock, the high content of clay, and slow permeability are limitations for building site development and for onsite waste disposal systems. Low strength is a limitation for local roads and streets.

Fredonia soil is in capability subclass VIs and in woodland suitability group 3x. Rock outcrop was not assigned to a capability subclass or a woodland suitability group.

La—Lawrence silt loam. This is a gently sloping, somewhat poorly drained soil on nearly level stream terraces, concave uplands, and alluvial fans. The mapped areas are 4 to 200 acres in size.

Typically, the surface layer is light olive brown and brown silt loam about 8 inches thick. The upper part of the subsoil is yellowish brown, dark yellowish brown, and light brownish gray silt loam about 9 inches thick. Between depths of 17 and 44 inches there is a firm, compact fragipan that is yellowish brown and grayish brown silty clay loam. The lower part of the subsoil to a depth of 62 inches is yellowish brown, dark yellowish brown, and light yellowish brown silty clay loam.

Permeability and surface runoff are slow. The available water capacity is moderate. Reaction is strongly acid or very strongly acid in the surface layer, the upper part of the subsoil, and the fragipan; it ranges from very strongly acid to neutral in the lower part of the subsoil. The organic matter content is low to moderate. The surface layer is friable and can be worked within a fairly wide range of moisture content. The seasonal high water table is at a depth of 12 to 24 inches. The soil is subject to occasional, very brief flooding or ponding late in winter and early in spring. The root zone is moderately deep; the compact and brittle fragipan restricts root penetration of most plants.

Included with this soil in mapping are small areas of Nicholson, Nolin, and Robertsville soils. The included soils make up 2 percent of the map unit.

If it is drained, the Lawrence soil is suited to cultivated crops including soybeans and corn. In some years crops are damaged by wetness. Open-ditch drainage in combination with diversions and grassed waterways is needed to remove excess water. Conservation tillage and crop residue management help to improve soil tilth and to maintain the organic matter content.

This soil is well suited to pasture and hay plants, especially plants that tolerate wetness. Tall fescue, alsike clover, red clover, white clover, and annual lespedeza are well suited to this soil. Open-ditch drainage, applications of lime and fertilizer, pasture renovation, and rotational grazing help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and potential productivity is high. Trees to plant are yellow-poplar, white ash, and loblolly pine. Plant competition and equipment limitations are management concerns.

This soil is not suited to most urban uses because of flooding and wetness.

This soil is in capability subclass IIIw and in woodland suitability group 2w.

MoA—Mountview silt loam, 0 to 2 percent slopes. This is a nearly level, well drained soil in low areas on an undulating to rolling landscape. The mapped areas are 2 to 50 acres in size.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil, to a depth of 22 inches, is strong brown silty clay loam and, to a depth of 40 inches, yellowish red and red silty clay loam. The lower part, to a depth of 70 inches, is red silty clay and dark red clay.

Permeability is moderate, and surface runoff is medium. The available water capacity is high. Reaction is very strongly acid or strongly acid except where the soil is limed. The organic matter content is low. The surface layer is friable and is easily tilled within a fairly wide range of moisture content. The root zone is deep.

Included with this soil in mapping are small areas of Pembroke, Nolin, and Baxter soils.

In most areas this Mountview soil is used for cultivated crops. It is well suited to cultivated crops, including corn, soybeans, wheat, and tobacco. Conservation tillage, crop residue management, and growing sod crops in sequence with row crops help to improve soil tilth and to maintain the organic matter content.

This soil is well suited to pasture and hay. Bluegrass, tall fescue, orchardgrass, timothy, alfalfa, red clover, white clover, and annual lespedeza are well suited to this soil. In some wet or seepy spots good stands of water-tolerant plants can be established. Legumes can be established in a grass sod through renovation. Under good management, yields are high. Rotational grazing, proper stocking rates, and applications of lime and fertilizer help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and potential productivity is high. Yellow-poplar, white oak, shortleaf pine, loblolly pine, and Virginia pine grow well on this soil. Plant competition is a management concern.

This soil is suited to most urban uses. Moderate permeability and the clayey texture are limitations for sanitary facilities. The clayey texture and the shrink-swell potential are limitations for buildings. Low strength is a limitation for local roads and streets.

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

MoB—Mountview silt loam, 2 to 6 percent slopes. This is a gently sloping, well drained soil on bases and tops of gently sloping, broad ridges and in plateaulike areas. The mapped areas are 2 to 500 acres in size. Some small areas around points of ridges are more eroded than adjacent areas.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil, to a depth of 22 inches, is strong brown silty clay loam; below that, to a depth of 40 inches, it is yellowish red and red silty clay loam. The lower part, to a depth of 70 inches, is red silty clay and dark red clay.

Permeability is moderate, and surface runoff is medium. The available water capacity is high. Reaction is very strongly acid or strongly acid except where the soil is limed. The organic matter content is low. The surface layer is friable and is easily tilled within a fairly wide range of moisture content. The root zone is deep. Bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are small areas of Pembroke, Nolin, and Baxter soils.

In most areas this soil is used for cultivated crops (fig. 6). It is well suited to cultivated crops, including corn, soybeans, wheat, and tobacco. Erosion is a moderate hazard. Conservation tillage, contour stripcropping, crop residue management, and growing sod crops in sequence with row crops help to improve soil structure, to maintain organic matter content, and to increase the infiltration rate.

This soil is well suited to pasture and hay. Bluegrass, tall fescue, orchardgrass, timothy, alfalfa, red clover, white clover, and annual lespedeza grow well. Most of these grasses and legumes are long-lived on this soil. Under good management, yields are high. Rotational grazing, proper stocking rates, and applications of lime and fertilizer help to maintain the quality and yields of forage.

This soil is well suited to use as woodland, and the potential productivity is high. Yellow-poplar, loblolly pine,

Figure 6.—Young stand of corn in an area of Mountview silt loam, 2 to 6 percent slopes. Cross-slope cultivation helps to control erosion.

shortleaf pine, white oak, and Virginia pine grow well on this soil. Plant competition is a management concern.

This soil is suited to most urban uses. Moderate permeability and the clayey texture are limitations for sanitary facilities. The clayey texture and the shrink-swell potential are limitations for buildings. Low strength is a limitation for local roads and streets.

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

MoC—Mountview silt loam, 6 to 12 percent slopes. This is a sloping, well drained soil on side slopes of broad ridges and plateaus. Individual areas are irregular in shape and range from 2 to 500 acres in size. In some places the soil is eroded along the upper part of slope breaks and around the head of drainageways.

Typically, the surface layer is dark brown silt loam 8 inches thick. The upper part of the subsoil, to a depth of 29 inches, is strong brown, yellowish red silt loam that has mottles in shades of brown. The lower part, to a depth of 61 inches, is mottled dark red, yellowish red, yellowish brown, and light grayish brown silt loam grading to silty clay loam.

Permeability is moderate, and surface runoff is medium. The available water capacity is high. Reaction is very strongly acid or strongly acid unless the soil is limed. The organic matter content is low. The root zone is deep. Bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are small areas of Pembroke and Baxter soils.

In most areas the Mountview soil is not cultivated because of slope and because erosion is a severe hazard. In some areas it is used for cultivated crops, including corn, soybeans, and wheat. Conservation tillage, stripcropping, and including grasses and legumes in the rotation in combination with terraces, waterways, and diversions help to reduce erosion.

This soil is well suited to pasture and hay. Tall fescue, alfalfa, red clover, ladino clover, crownvetch, annual lespedeza, and sericea lespedeza are well suited to this soil. Rotational grazing, proper stocking rates, and applications of lime and fertilizer help to maintain the quality of forage plants. Sericea lespedeza and crownvetch grow well in areas where the soil is eroded. Tall fescue and bluegrass, which form a close-growing sod, help to reduce erosion.

This soil is well suited to use as woodland, and the potential productivity is high. Yellow-poplar, shortleaf pine, loblolly pine, white oak, and Virginia pine grow well on this soil. Plant competition is a management concern.

This soil is poorly suited to most urban uses because of slope, the clayey texture, the moderate permeability, and the moderate shrink-swell potential.

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

Ne—Newark silt loam. This is a nearly level, somewhat poorly drained soil on flood plains and in depressions. The mapped areas are 2 to 20 acres in size.

Typically, the surface layer is brown silt loam about 11 inches thick. The upper part of the subsoil, to a depth of 19 inches, is brown silt loam that has mottles in shades of brown and gray. The lower part, to a depth of 45 inches, is gray silt loam that is mottled in shades of brown. The underlying material is gray silt loam that has yellowish brown mottles.

Permeability is moderate, and the surface runoff is very slow. The available water capacity is high. Reaction ranges from medium acid to mildly alkaline throughout. The surface layer is friable and can be tilled within a fairly wide range of moisture content. The root zone is deep and is easily penetrated by roots. The high water table is at a depth of 6 to 18 inches from December to May. Occasional flooding occurs for brief periods from January to April.

Included with this soil in mapping are small areas of Lawrence and Nolin soils. The included soils make up about 2 percent of the map unit.

This soil is used mainly for hay and pasture. Flooding and the seasonal high water table are the main limitations. If it is drained, this soil is well suited to cultivated crops, including corn, soybeans, and wheat. Where there are suitable outlets, surface and subsurface drainage systems can effectively control wetness. In areas that are not drained, planting later in the year or planting water-tolerant crops is an economic alternative. Conservation tillage, crop residue management, growing cover crops, and including grasses and legumes in the cropping system help to improve soil tilth and to maintain the organic matter content.

This soil is suited to pasture and hay. Tall fescue, red clover, and alsike and white clovers, all of which tolerate occasional wetness, grow well on this soil. Pasture renovation to maintain the desired species, applications of lime and fertilizer, adequate drainage, rotational grazing, and proper stocking rates are needed.

This soil is well suited to use as woodland. The potential productivity is very high. Trees to plant are eastern cottonwood, sweetgum, post oak, and American sycamore. Equipment limitations are moderate because of wetness. Plant competition is severe. The survival rate of seedlings is higher if herbicides are applied or cultivation is used to control undesirable plant species.

This soil is not suited to most urban uses because of flooding and wetness.

This soil is in capability subclass IIw and in woodland suitability group 1w.

NhA—Nicholson silt loam, 0 to 2 percent slopes. This is a nearly level, moderately well drained soil on broad, smooth ridgetops and on low stream terraces. The mapped areas are 2 to 150 acres.

Typically, the surface layer is brown, friable silt loam about 12 inches thick. The upper part of the subsoil, to a depth of 28 inches, is yellowish brown, friable silt loam. Between depths of 28 and 37 inches there is a fragipan of yellowish brown silt loam that has brownish and grayish mottles. The lower part of the subsoil, to a depth of 57 inches, is strong brown silty clay loam that has yellowish brown mottles; to a depth of 62 inches it is yellowish brown silty clay loam that has red mottles.

Permeability is slow, and surface runoff is medium. The available water capacity is moderate. Reaction ranges from very strongly acid to medium acid in the surface layer, the upper part of the subsoil, and the fragipan; below the fragipan, it is very strongly acid to mildly alkaline. The organic matter content is moderate. The surface layer is friable and is easily tilled within a fairly wide range of moisture content. The thickness of the root zone and the depth to the fragipan range from 18 to 30 inches.

Included with this soil in mapping are small areas of Mountview, Pembroke, Lawrence, and Dunning soils. The included soils make up about 3 percent of the map unit.

This Nicholson soil is well suited to cultivated crops, including corn, soybeans, and wheat. Under a high level of management, yields are high. Erosion is a slight hazard. Soil drainage and the root zone are restricted by the fragipan. Conservation tillage, crop residue management, growing cover crops, and including grasses and legumes in the rotation help to improve soil tilth and to maintain the organic matter content.

This soil is well suited to hay and pasture. Bluegrass, tall fescue, orchardgrass, timothy, red clover, white clover, and annual lespedeza are well suited to this soil. Under intensive management, yields are high. Some legumes do not grow well because of wetness. Proper stocking rates, rotational grazing, applications of lime and fertilizer, and restricted use during wet periods help to maintain the quality of forage plants.

This soil is well suited to use as woodland, and the potential productivity is high. Yellow-poplar, white oak, black oak, and white pine grow well on this soil. Plant competition is a management concern.

Wetness is a limitation to use of this soil for most urban uses. The slow permeability of the fragipan also is a limitation for septic tank absorption fields. Low strength is a limitation for local roads and streets.

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

NhB—Nicholson silt loam, 2 to 6 percent slopes. This is a gently sloping, moderately well drained soil on broad ridgetops and stream terraces. The mapped areas are 50 to 500 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 28 inches, is yellowish brown silt loam. Between depths of 28 and 37 inches there is a fragipan of yellowish brown silt loam that has brownish and grayish mottles. The lower part of the subsoil, to a depth of 57 inches, is strong brown silty clay loam that has yellowish brown mottles, and to a depth of 62 inches, is yellowish brown silty clay loam that has red mottles.

Permeability is slow, and surface runoff is medium. The available water capacity is moderate. Reaction ranges from very strongly acid to medium acid in the surface layer, the upper part of the subsoil, and the fragipan; below the fragipan, it is very strongly acid to mildly alkaline. The organic matter content is moderate. The surface layer is friable and is easily tilled within a fairly wide range of moisture content. The root zone is moderately deep, and root penetration of most plants is restricted by the fragipan.

Included with this soil in mapping are small areas of Mountview, Pembroke, Lawrence, and Dunning soils. The included soils make up about 3 percent of the map unit.

This Nicholson soil is well suited to cultivated crops, including corn, soybeans, and wheat. Under a high level of management, yields are good. Erosion is a moderate hazard if cultivated crops are grown. Conservation tillage, such as no-till, contour stripcropping, terracing, and grassed waterways help to control erosion. Crop residue management helps to improve soil tilth and to maintain the organic matter content.

This soil is suited to most grasses; it is better suited to moderately deep-rooted legumes because of the restricted rooting depth. Bluegrass, tall fescue, orchardgrass, timothy, red clover, white clover, and annual lespedeza are well suited to this soil. Pasture renovation, applications of lime and fertilizer, rotational grazing, and controlled grazing before plants are well established or when the soil is wet are needed to maintain the quality of forage plants.

This soil is well suited to use as woodland, and the potential productivity is high. Trees to plant are yellow poplar, eastern white pine, black oak, and white ash. Plant competition is a management concern.

Wetness and the slow permeability are limitations to use of this soil for most urban uses. The slow permeability of the fragipan also is a limitation for septic tank absorption fields. Low strength is a limitation for local roads and streets.

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

No—Nolin silt loam. This is a nearly level, well drained soil on flood plains or in low positions that receive runoff from surrounding slopes. The mapped areas are 2 to 20 acres in size.

Typically, the surface layer is brown silt loam about 12 inches thick. The subsoil, which extends to a depth of about 60 inches, is dark yellowish brown and dark brown silt loam. The substratum to a depth of about 65 inches or more is dark brown silt loam or silty clay loam that is mottled in shades of brown and gray.

Permeability is moderate, and surface runoff is slow. The available water capacity is high. Reaction ranges from medium acid to mildly alkaline unless the soil is limed. The organic matter content is moderate. The root zone is deep. The surface layer is friable and is easily tilled within a fairly wide range in moisture content. This soil is subject to occasional flooding for short periods, usually late in winter and early in spring. A seasonal high water table is at a depth of 3 to 6 feet.

Included with this soil in mapping are small areas of Elk and Newark soils in small drainageways and on low terraces. Also included are soils that are similar to this Nolin soil except that they have a surface layer of fine sandy loam. The included soils make up about 2 percent of the map unit.

This Nolin soil is well suited to cultivated crops, including corn and soybeans. Under good management, yields are high. Erosion is a slight hazard if cultivated crops are grown. However, conservation tillage, such as no-till and minimum tillage, and crop residue management help to reduce erosion. The soil is subject to occasional flooding, but flooding usually is not a hazard during the growing season.

This soil is well suited to pasture and hay. Most of the commonly grown grasses and legumes grow well on this soil, but some hay crops may be damaged by flooding.

Pasture renovation, applications of lime and fertilizer, proper stocking rates, rotational grazing, and deferred grazing during wet periods are needed.

This soil is well suited to use as woodland, and the potential productivity is very high. Trees to plant or to favor are sweetgum, yellow-poplar, white pine, eastern cottonwood, white ash, and cherrybark oak. Plant competition is severe unless herbicides are applied or cultivation is used to control undesirable plant species.

This soil is not suited to most urban uses because of flooding.

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

PeA—Pembroke silt loam, 0 to 2 percent slopes. This is a deep, nearly level, well drained soil in broad upland areas. Most areas are 9 to 16 acres in size. In most areas there are depressions and sinks that are subject to flooding or ponding after heavy rains.

Typically, the surface layer is dark reddish brown silt loam about 5 inches thick. The subsurface layer is dark brown silt loam about 6 inches thick. The upper part of the subsoil, to a depth of 40 inches, is reddish brown to dark red silty clay loam. The lower part, to a depth of 68 inches or more, is dark red silty clay.

Permeability is slow, and surface runoff is medium. The available water capacity is high. Reaction ranges from very strongly acid to medium acid unless the soil is limed. The organic matter content is moderate, and soil tilth in the plow layer is good. Adding manure and organic residue to the soil helps to improve soil tilth. The shrink-swell potential is moderate. The root zone is deep, and hard bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Mountview, Baxter, and Fredonia soils. Also included are small areas of soils that are similar to this Pembroke soil but have coarse chert fragments 3 to 10 inches in diameter in the lower part of the subsoil. Also included are areas of alluvial soils in depressions that are less than 1 acre in size.

In most areas this Pembroke soil is used for cultivated crops. In some areas it is used for hay and pasture. It is well suited to cultivated crops. Erosion is a slight hazard. Cultivated crops can be grown year after year if the fertility and the organic matter content are maintained. Conservation tillage, crop residue management, growing cover crops, and including grasses and legumes in the cropping system help to improve soil structure and to maintain the organic matter content.

This soil is well suited to grasses and legumes. Under a high level of management, yields are high. Bluegrass, tall fescue, alfalfa, timothy, and red and white clovers are well suited to this soil. Pasture renovation, proper stocking rates, rotational grazing, and applications of lime and fertilizer improve the quality of forage plants.

This soil is well suited to use as woodland, and potential productivity is very high. There are few limitations. Plant competition is severe unless herbicides are applied or cultivation is used to control undesirable plant species. Trees to plant or to favor are black walnut, yellow-poplar, white ash, and eastern white pine.

This soil is suited to most urban uses. The clayey texture, the shrink-swell potential, and the moderate permeability are limitations for some uses.

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

PeB—Pembroke silt loam, 2 to 6 percent slopes. This is a gently sloping, well drained soil in moderately broad areas. Most mapped areas are 9 to 3,000 acres or more in size. In most areas there are depressions and sinks that are subject to flooding or ponding after heavy rains. On slopes adjacent to depressions the soil is eroded.

Typically, the surface layer is dark reddish brown silt loam about 5 inches thick. The subsurface layer is dark brown silt loam about 6 inches thick. The upper part of the subsoil, to a depth of 40 inches, is reddish brown to dark red silty clay loam. The lower part, to a depth of 68 inches or more, is dark red silty clay.

Permeability is moderate, and surface runoff is medium. The available water capacity is high. Reaction ranges from very strongly acid to medium acid unless the soil is limed. The organic matter content is moderate, and soil tilth in the plow layer is good. Adding manure and organic residue to the soil improves soil tilth. The shrink-swell potential is moderate. The root zone is deep, and hard bedrock is at a depth of 60 inches or more.

Included with this soil in mapping are small areas of Mountview, Baxter, and Fredonia soils. Also included are small areas of soils that are similar to this Pembroke soil except that they have coarse chert fragments 3 to 10 inches across in the lower part of the subsoil. Also included are areas of alluvial soils in depressions that are less than 3 acres in size.

In most areas this soil is used for cultivated crops (fig. 7). The soil is well suited to cultivated crops, including corn, soybeans, small grains, and tobacco. Erosion is a moderate hazard if cultivated crops are grown. Conservation tillage, contour stripcropping, and crop residue management in combination with terraces and grassed waterways help to reduce erosion. Growing cover crops or sod crops in sequence with row crops helps to improve soil tilth and to maintain the organic matter content.

This soil is well suited to pasture and hay. Under a high level of management, yields are high. Bluegrass, tall fescue, alfalfa, timothy, and red and white clovers are well suited to this soil. Pasture renovation, proper stocking rates, rotational grazing, and applications of lime and fertilizer improve the quality and yield of forage.

Figure 7.—A typical area of Pembroke silt loam, 2 to 6 percent slopes. The newly seeded crop is soybeans.

This soil is well suited to use as woodland, and the potential productivity is high. There are few limitations. Plant competition is severe unless the competing plants are controlled by herbicides or cultivation. Trees to plant or to favor are black walnut, yellow-poplar, white ash, and eastern white pine.

This soil is suited to most urban uses. The clayey texture, the low strength, the moderate shrink-swell potential, and the moderate permeability are limitations for some uses.

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

PeC—Pembroke silt loam, 6 to 12 percent slopes. This is a deep, sloping, well drained soil on side slopes below broad ridges and in karst areas. In most areas the soil is eroded around the rim of depressions and on adjacent slopes between depressions. Areas are narrow and irregular in shape and range from 3 to more than 200 acres in size.

Typically, the surface layer is dark reddish brown silt loam 5 inches thick. The subsurface layer is dark brown silt loam about 6 inches thick. The upper part of the subsoil, to a depth of 40 inches, is reddish brown to dark red silty clay loam. The lower part is dark red silty clay to a depth of 68 inches or more.

Permeability is moderate, and surface runoff is medium. The available water capacity is high. Reaction ranges from very strongly acid to medium acid, except in the surface layer and the upper part of the subsoil in areas where the soil is limed. The organic matter content is moderate, and soil tilth in the plow layer is good. Adding manure and organic residue to the soil improves soil tilth. The shrink-swell potential is moderate. The root zone is deep, and hard bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Mountview, Baxter, and Fredonia soils. Also included are severely eroded spots that are less than 1 acre in size.

In most areas this soil is used for pasture or cultivated crops. It is suited to cultivated crops, including corn, soybeans, small grains, and tobacco. Erosion is a severe hazard if cultivated crops are grown. Conservation tillage, contour stripcropping, and crop residue management in combination with terraces, diversions, and grassed waterways help to reduce erosion. Growing cover crops or sod crops in sequence with row crops helps to improve soil tilth and to maintain the organic matter content.

This soil is well suited to most grasses and legumes. Under a high level of management, yields are high. Bluegrass, tall fescue, alfalfa, timothy, and red and white clovers are well adapted to this soil. Pasture renovation, proper stocking rates, rotational grazing, and applications of lime and fertilizer improve the quality and yield of forage.

This soil is well suited to use as woodland, and the potential productivity is very high. There are few limitations. Plant competition is severe unless herbicides are applied or cultivation is used to control undesirable plant species. Trees to plant or to favor are black walnut, yellow-poplar, white ash, and eastern white pine.

Slope, the clayey texture, and the moderate shrink-swell potential are limitations to use of this soil for most urban uses.

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

PfC3—Pembroke silty clay loam, 6 to 12 percent slopes, severely eroded. This is a deep, sloping, well drained soil on side slopes below broad ridges and around the rim of depressions in karst areas. In karst areas, depressions are common and slope varies within a short distance. Runoff empties into openings in depressions and then into underground streams. Most of the original surface layer has been eroded. Areas of this soil are irregular in shape and range from 3 to 40 acres in size. The average size is about 8 acres.

Typically, the surface layer is reddish brown silty clay loam about 7 inches thick. The subsoil is red silty clay loam grading to dark red silty clay at a depth of 38 inches. The dark red silty clay extends to a depth of 60 inches or more.

Permeability is moderate, and the available water capacity is high. The root zone is deep. Runoff is medium. The organic matter content in the plow layer is low, and soil tilth is poor. Adding manure and organic residue to the soil improves soil tilth. The plow layer is difficult to till and can be worked only within a narrow range of moisture content. Reaction in the surface layer ranges from very strongly acid to medium acid unless the soil is limed. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part. Bedrock is at a depth of more than 6 feet.

Included with this soil in mapping are small intermingled areas of Pembroke soils that are not eroded and have a surface layer of brown silt loam. Also included are areas of alluvial soils in depressions that are less than 3 acres in size.

In most areas this soil is used for pasture, scrub timber, or cultivated crops. This soil is poorly suited to cultivated crops because it is eroded. Erosion is a severe hazard if cultivated crops are grown. Conservation tillage, crop residue management, and growing cover crops or sod crops in sequence with row crops increase yields and the efficiency of water and fertilizer and reduce erosion and runoff.

This soil is suited to pasture and hay. Good stands of grasses and legumes help to reduce any additional erosion. A high level of management is needed to ensure the stand life of desirable species. Tall fescue, annual lespedeza, crownvetch, and sericea lespedeza are well suited to this soil. Maintaining stands of the desired pasture plants to provide adequate forage and to reduce erosion is the main management concern. Adequate seedbed preparation, applications of lime and fertilizer according to crop needs, stocking rates that do not deplete the preferred pasture species, and deferred and rotational grazing are needed. A short, sparse cover of pasture plants permits weeds to invade and increases the hazard of soil erosion.

This soil is well suited to use as woodland. There are few limitations. Plant competition is severe unless herbicides are applied or cultivation is used to control undesirable plant species. Trees to plant or to favor are yellow-poplar, black walnut, white ash, and eastern white pine.

This soil is poorly suited to urban uses because of slope, the clayey texture, and the moderate shrink-swell potential.

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

Pt—Pits. This map unit consists of areas that have been quarried for limestone. The quarried rock has been conditioned and piled for future use or removed for agricultural or industrial use. Individual areas range in size from 15 to 70 acres.

The areas of exposed rock and remaining soil material support few plants at most. Limestone bedrock is at the bottom of the pits. The walls of the pits are generally vertical and are 10 to more than 50 feet high. Included in mapping areas of Pits are a few small areas of Fredonia, Vertrees, and Pembroke soils.

This map unit was not assigned to a capability class or woodland suitability group.

Rb—Robertsville silt loam. This is a nearly level, poorly drained soil on stream terraces and concave uplands. The mapped areas are 20 to 800 acres in size.

Typically, the surface layer is dark gray silt loam about 11 inches thick. The upper part of the subsoil, to a depth of 21 inches, is light brownish gray silt loam that is mottled in shades of brown and yellow. From 21 to 54 inches there is a fragipan of light gray silt loam that has strong brown mottles. The substratum is mottled gray and yellowish brown silty clay loam.

Permeability is slow or very slow, and surface runoff is very slow. The available water capacity is moderate. Reaction is strongly acid or very strongly acid unless the soil is limed. The organic matter content is low. From

December to May, a seasonal high water table is at or near the surface, and from December to April, water stands on the surface in many undrained areas. The root zone is shallow to moderately deep. The fragipan is at a depth of 15 to 30 inches.

Included with this soil in mapping are small areas of Lawrence and Nicholson soils. The included soils make up about 2 percent of the map unit.

This Robertsville soil is not suited to cultivated crops unless it is drained. Yields of soybeans and corn are fair where the soil is drained. Open-ditch and subsurface drainage and diversions can be used where there are suitable outlets.

This soil is suited to pasture and hay. Tall fescue, alsike clover, white clover, and annual lespedeza are well adapted to this soil. Adequate drainage, proper stocking rates, rotational grazing, deferred grazing, and restricted grazing during wet periods help to keep the pasture in good condition.

This soil is well suited to use as woodland, and the potential productivity is high. Trees to plant are pin oak, sweetgum, American sycamore, and loblolly pine. Plant competition is severe unless herbicides are applied or cultivation is used to control undesirable plant species.

This soil is not suited to urban uses because of flooding and wetness.

This soil is in capability subclass IVw and in woodland suitability group 1w.

RfE—Rock outcrop-Fredonia complex, 12 to 30 percent slopes. This complex consists of moderately deep, well drained Fredonia soil between areas of Rock outcrop. Most areas of this complex are along Drakes Creek and near Pilot Knob. The areas of the Fredonia soil and those of Rock outcrop are so intermingled that they could not be mapped separately at the scale selected for mapping. Individual mapped areas range from 4 to 125 acres in size. The average size is about 13 acres.

Rock outcrop makes up about 56 percent of the complex, Fredonia soil makes up 36 percent, and included soils make up 8 percent.

Typically, the Rock outcrop along Drakes Creek consists of bluffs and ledges and, in many areas, sheer cliffs. Near Pilot Knob it consists of exposed limestone bedrock in bands across the slope. Rubble is on the surface between the bands of rock.

Typically, the surface layer of Fredonia soil is dark reddish brown silt loam about 8 inches thick. The upper part of the subsoil, to a depth of 24 inches, is red silty clay. The lower part, to a depth of 28 inches, is dark red clay. Bedrock is at a depth of 28 inches.

Permeability of the Fredonia soil is moderately slow to slow, and surface runoff is rapid. The clay content is high, but the available water capacity is moderate. Reaction ranges from slightly acid to strongly acid in the upper part of the soil and from strongly acid to neutral in the lower part. The organic matter content is moderate. The shrink-swell potential is moderate. Root development is restricted mainly by limestone at depths between 20 and 40 inches.

Included with this complex in mapping are small areas of Baxter, Vertrees, Mountview, and Pembroke soils. Also included are small areas where there are no rock outcrops, areas where bedrock is at a depth of less than 20 inches, and small areas of soils that formed in sandstone on Pilot Knob.

In most areas the Fredonia soil in this complex is used as woodland or is idle. The soil is not suited to cultivated crops and is poorly suited to hay and pasture because of slope and rockiness. It is best suited to use as habitat for wildlife.

The Fredonia soil is suited to use as woodland, and potential productivity is moderate. Logging on steep slopes requires special precautions to control erosion. Providing good drainage on skid trails and roads and seeding disturbed areas reduce erosion. Equipment limitations are severe because of the slope and rock outcrops. Trees to plant are Virginia pine and eastern redcedar.

Rockiness and slope are limitations to use of the Fredonia soil for building site development. These limitations are difficult to overcome.

Fredonia soil is in capability subclass VIIs and in woodland suitability group 3x. Rock outcrop was not assigned to a capability subclass or woodland suitability group.

VrB—Vertrees silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on uplands. Areas range from 4 to more than 200 acres in size. An average area is about 95 acres in size. The soil is eroded in many areas on points of ridges and on slopes surrounding depressions.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The upper part of the subsoil, to a depth of 16 inches, is yellowish red silty clay loam. The middle part, to a depth of 57 inches, is dark red silty clay that is mottled in shades of brown. The lower part to a depth of 61 inches is yellowish red clay that is mottled in shades of brown.

Permeability is moderately slow, and surface runoff is medium. The clay content is high, and the available water capacity is high. Unless the soil has been limed, reaction ranges from medium acid to very strongly acid in the surface layer and the upper and middle parts of the subsoil and from very strongly acid to neutral in the lower part of the subsoil. The organic matter content is moderate, and soil tilth is good. Adding manure and organic residue to the soil improves soil tilth. The plow layer is friable and easily tilled; however, in some spots the plow layer has been mixed with the subsoil, and thus the surface layer is not so friable and is difficult to till.

The shrink-swell potential is moderate. The root zone is deep, and bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke and Mountview soils. Also included are some severely eroded areas that are less than 1 acre in size. Also included are small isolated areas where there are rock outcrops and floating boulders on the surface.

In most areas this Vertrees soil is used for cultivated crops or pasture. The soil is suited to cultivated crops, including corn, soybeans, and small grains. Erosion is a moderate hazard if cultivated crops are grown. Conservation tillage, stripcropping, crop residue management, and growing cover crops or sod crops in sequence with row crops help to reduce erosion, to improve soil tilth, and to maintain organic matter content.

This soil is well suited to pasture and hay. Tall fescue, red clover, annual lespedeza, and alfalfa are well adapted to this soil. Pasture renovation, rotational grazing, proper stocking rates, and applications of lime and fertilizer improve the quality and yield of forage.

This soil is well suited to use as woodland, and the potential productivity is high. Trees to plant or to favor are yellow-poplar, black walnut, northern red oak, and Virginia pine. There are no severe limitations.

The high content of clay, the moderately slow permeability, and the moderate shrink-swell potential are limitations for building site development and for onsite waste disposal systems.

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

VrC—Vertrees silt loam, 6 to 12 percent slopes. This is a deep, well drained soil on rolling uplands that consist mainly of karst areas and short side slopes. Areas of this soil range from 3 to more than 400 acres in size, but the average area is about 5 acres. In most areas there are sinks and depressions that are subject to flooding or ponding after heavy rains. In some places the soil is eroded, mainly around the rim of depressions and on adjacent slopes between depressions.

Typically, the surface layer is a dark brown silt loam about 6 inches thick. The upper part of the subsoil, to a depth of 16 inches, is yellowish red silty clay loam. The middle part, to a depth of 57 inches, is dark red silty clay that has brown and yellow mottles. The lower part, to a depth of 61 inches, is yellowish red clay that has brown and yellow mottles.

Permeability is moderately slow, and surface runoff is medium. The clay content is high, and the available water capacity is high. Unless the soil is limed, reaction ranges from medium acid to very strongly acid in the surface layer and upper and middle parts of the subsoil; it ranges from very strongly acid to neutral in the lower part of the subsoil. The organic matter content is moderate, and soil tilth is good. Soil tilth can be improved by the addition of manure or organic residue. The plow layer is friable and is easily tilled; in some areas the plow layer in spots has been mixed with the subsoil, and thus the surface layer is not so friable and is difficult to till. The shrink-swell potential is moderate. The root zone is deep, and bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke, Mountview, and Baxter soils. Also included are severely eroded spots that are less than 1 acre in size. Also included are small isolated areas where there are rock outcrops, generally at the base of slopes.

In most areas that have been cleared, this soil is used for cultivated crops or pasture. This soil is suited to cultivated crops, including corn, soybeans, and small grains. Erosion is a severe hazard if cultivated crops are grown. Conservation tillage, contour stripcropping, crop residue management, and growing cover crops help to reduce erosion, to improve soil tilth, and to maintain the organic matter content.

This soil is best suited to pasture and hay. Using the soil for these crops helps to reduce erosion. Tall fescue, alfalfa, red clover, annual lespedeza, and sericea lespedeza grow well on this soil. Rotational grazing, proper stocking rates, pasture renovation, and applications of lime and fertilizer help to maintain the quality and yield of forage.

This soil is well suited to use as woodland, and the potential productivity is high. Trees to plant or to favor are yellow-poplar, black walnut, northern red oak, and Virginia pine. There are no severe limitations.

The high content of clay, the moderately slow permeability, the moderate shrink-swell potential, and slope are limitations for building site development and for onsite waste disposal systems.

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

VsC3—Vertrees silty clay loam, 6 to 12 percent slopes, severely eroded. This is a deep, well drained soil on rolling uplands that consist mainly of karst areas and short side slopes. Individual areas range from 3 to 63 acres in size, but the average area is about 14 acres. Most areas are small, and many are on the rim of depressions. The largest area is in the eastern part of the county. In most areas there are sinks and depressions that are subject to flooding or ponding after extremely heavy rains.

Typically, the surface layer is reddish brown silty clay loam about 3 inches thick. The upper part of the subsoil, to a depth of 15 inches, is mottled yellowish red silty clay. The lower part, to a depth of 60 inches, is dark red clay that is mottled in shades of brown and gray.

Permeability is moderate, and in cultivated areas surface runoff is medium. The clay content is high, and the available water capacity is high. Unless the soil is limed, reaction ranges from medium acid to very strongly acid in the upper part; in the subsoil below a depth of 57 inches, reaction ranges from very strongly acid to neutral. The organic matter content is low, and soil tilth is poor. Soil tilth can be improved by adding manure or organic residue to the soil. The plow layer is firm and is not easily tilled. The shrink-swell potential is moderate. The root zone is deep, and bedrock is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of Pembroke and Mountview soils. Also included are small isolated areas where there are rock outcrops or floating boulders, generally at the base of slopes.

In most areas this Vertrees soil is used for cultivated crops or pasture. In a few areas it is used as woodland. This soil is poorly suited to cultivated crops because it has been eroded. However, in some areas it is used for corn, soybeans, and small grains. Erosion is a severe hazard if cultivated crops are grown. Conservation tillage, crop residue management, and growing cover crops or sod crops in sequence with row crops help to reduce erosion, to improve soil tilth, and to maintain organic matter content.

This soil is best suited to pasture and hay. Using the soil as pasture helps to minimize further erosion. Tall fescue, crownvetch, annual lespedeza, and sericea lespedeza are well adapted to this soil. The high content of clay limits the kinds of forage plants that can grow well on this soil. Good management is needed. Rotational grazing, proper stocking rates, and deferred grazing help to maintain the quality and yield of forage.

This soil is well suited to use as woodland, and the potential productivity is moderately high. Trees to plant or to favor are white ash, Virginia pine, and northern red oak. There are no severe limitations.

The high content of clay, the moderate shrink-swell potential, and slope are limitations for building site development and for onsite waste disposal systems.

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

Prime Farmland

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

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

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

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

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

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland soils if the limitations or hazards are overcome by drainage, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

Nearly 59 percent of Simpson County, about 90,000 acres, is prime farmland. Areas of prime farmland are scattered throughout the county. The largest areas are in map unit 1 on the general soil map. About 82 percent of map unit 1 is prime farmland. Nearly 20 percent of map unit 2, about 1,300 acres, is prime farmland, and 50 percent of map unit 3, more than 47,000 acres, is prime farmland. About 9,400 acres in map unit 4 is prime farmland. Prime farmland provides the largest share of total crop production.

A recent trend in land use in some parts of the county has been the conversion of some prime farmland to urban and industrial uses. For example, some areas of prime farmland soils near Franklin are used for urban development. The Soil Conservation Service has estimated that in the last 10 years less than 150 acres of prime farmland in Simpson County has been converted to urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are wet, more erodible, droughty, or difficult to cultivate and less productive than prime farmland.

The following map units, or soils, make up prime farmland in Simpson County. Some areas of these soils are urban or built-up land. In addition, on some soils included in the list, appropriate measures have been applied to overcome a hazard or limitation, such as flooding or wetness. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

BaB	Baxter cherty silt loam, 2 to 6 percent slopes
BeB	Bewleyville silt loam, 2 to 6 percent slopes
Du	Dunning silty clay loam [1] [2]
ElA	Elk silt loam, 0 to 2 percent slopes [2]
ElB	Elk silt loam, 2 to 6 percent slopes [2]
FcB	Fredonia-Vertrees complex, 2 to 6 percent slopes
La	Lawrence silt loam [1] [2]
MoA	Mountview silt loam, 0 to 2 percent slopes
MoB	Mountview silt loam, 2 to 6 percent slopes
Ne	Newark silt loam [1] [2]
NhA	Nicholson silt loam, 0 to 2 percent slopes
NhB	Nicholson silt loam, 2 to 6 percent slopes
No	Nolin silt loam [2]
PeA	Pembroke silt loam, 0 to 2 percent slopes

PeB Pembroke silt loam, 2 to 6 percent slopes
VrB Vertrees silt loam, 2 to 6 percent slopes

[1] Where artificially drained.
[2] Where flooding during the growing season occurs less frequently than once in 2 years.

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

Jonathan Hawes, district conservationist, Soil Conservation Service, helped prepare this section.

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

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

Simpson County consists mainly of highly fertile, gently sloping upland soils that formed in weathered limestone. The soils are well suited to row crops and forage production. About two-thirds of the survey area is tillable. Large areas, particularly in the western part of the survey area, are virtually entirely tillable. There are large areas of Pembroke and Mountview soils in the county. These soils are easy to cultivate, and yields are high. Erosion is a serious problem but it can be reduced by proper management practices.

In 1980, nearly 90,000 acres was used as cropland. The main crops were tobacco, soybeans, corn, and small grains. The minor crops were milo and specialty crops, including vegetables and fruits. Some row crops were grown in rotation with hay crops. About 23,000 acres was used as permanent pasture.

There is karst topography in much of Simpson County. Karst topography is characterized by hills and depressions that result when the soil slumps into caverns or solution holes in the underlying limestone bedrock. One management problem is localized flooding or ponding in areas where water collects and drains into the caverns. Also contour farming is difficult because of the lack of general slope direction.

There are unique management problems on some soils in the survey area. Baxter soils have chert in the surface layer. The chert fragments are as much as 4 inches in diameter. Chert is harder than limestone, and the fragments cause excessive wear on farm equipment during cultivation.

On Fredonia soils, there are boulders in the surface layer. Some of the boulders weigh several tons apiece. Because of the boulders and rock outcrops, the soils are difficult to cultivate (fig. 8). In areas where the soil is shallow to bedrock, during periods of low rainfall, soil moisture is inadequate for crops and pasture.

Vertrees soils have a clayey subsoil. If the subsoil is mixed with the surface layer during cultivation, the surface tends to crust as the soil dries. The crust inhibits the emergence of crop seedlings. If the soil is cultivated when wet, clods form that are difficult to break down in

Figure 8.—An area of Rock outcrop in the Fredonia-Rock outcrop complex, 6 to 12 percent slopes.

subsequent cultivation. Soil tilth in the uppermost layer of the soils is poor if the surface layer of silt loam has been eroded. Dunning soils also have poor soil tilth because of the high content of clay in the surface layer and subsoil.

The hazard of erosion ranges from slight to severe on the soils of the survey area. Soils vary in permeability, slope, depth, and texture, and all of these factors determine the severity of the hazard of erosion. On Mountview and Bewleyville soils, erosion is a serious problem because of the high content of silt and very fine sand in the surface layer.

In areas of eroded soils, soil tilth is poor. The available water capacity is low, and the content of organic matter is low. Cultivating these soils is more difficult and expensive, and yields are lower, especially in dry years. Fertilizers, herbicides, and soil amendments are lost if the plow layer is eroded.

The management practices used to control erosion include terraces with pipe outlets, conservation tillage, crop residue management, diversions, grassed waterways, stripcropping, crop rotation, cover crops, and contour farming.

Soil fertility ranges from medium to high in most soils in the survey area. Reaction ranges from slightly acid to neutral. Applications of fertilizer and lime increase the yields of most crops. Such applications should be based on past management, natural fertility, the needs of the crop, and a current soil test.

About 17,000 acres in the survey area is moderately well drained to poorly drained because of slow permeability or a seasonal high water table. On most wet soils, surface and subsurface drainage systems are feasible.

Robertsville, Nicholson, and Lawrence soils have a fragipan and consequently have a restricted rooting zone. The fragipan restricts the downward movement of water in the soil and the amount and depth of root penetration. The fragipan is at a depth of 18 to 30 inches.

In Dunning and Newark soils, permeability is slow or there is a seasonal high water table. The slow movement of water in these soils causes management problems for field crops. Because of wetness, the soils warm up later in the season, and planting is delayed. The wet condition in poorly aerated soils also reduces the availability of nitrogen.

Pasture and Hayland

A successful forage program can provide as much as 78 percent of the feed for beef cattle and 66 percent for dairy cattle (*7*).

The soils in Simpson County vary widely in their suitability for grasses and legumes and grass-legume combinations. For highest yields the pasture plants or mixture of pasture plants should be matched to the soil.

The level to gently sloping, deep, and well drained soils are best suited to the highest producing crops such as corn for silage, alfalfa, or a mixture of alfalfa and orchardgrass or alfalfa and timothy (fig. 9). The steeper soils should be maintained in sod-forming grasses such as tall fescue to reduce soil erosion. Where the soils are at least 2 feet deep and well drained, alfalfa and a cool-season grass should be grown. On soils that are less than 2 feet deep or are not well drained, a mixture of clover and grass or a pure stand of grass can be grown. Legumes can be established through renovation in sods that are dominantly grass.

Plants need to be adapted to the soil and also to the intended use. Legumes generally produce feed of higher quality than do grasses and should be planted to the maximum possible extent. Taller legumes, such as alfalfa and red clover, are more versatile than a legume such as white clover, which is used mainly for grazing. For hay and silage, grasses such as orchardgrass, timothy, and tall fescue are better adapted than bluegrass.

Tall fescue is a cool-season grass that is suited to a wide range of soil conditions. It is used for both pasture and hay. The growth made by tall fescue from August through November is commonly permitted to accumulate in the field and is reserved for deferred grazing late in fall and in winter. Applications of nitrogen fertilizer are needed during this period of growth and should be based on the desired level of production.

Renovation can increase the yields of pasture and hayland on which there is a good stand of grass. In renovation, the sod is partly destroyed and the soil is limed, fertilized, and seeded in reestablishing desirable forage plants. Including legumes in grass pasture provides high quality feed and increases production of feed in summer. Legumes also add nitrogen to the soil. Under normal growing conditions, alfalfa can fix 200 to 300 pounds of nitrogen per acre per year, red clover 100 to 200 pounds, ladino clover 100 to 150 pounds, and Korean lespedeza, vetch, and other annual forage legumes 75 to 100 pounds (*8*).

Some important steps in successful renovation and management are:

- Graze or mow closely before disking or disturbing the sod.
- Disturb 40 to 60 percent of the grass for clovers and 80 to 100 percent for alfalfa. Use a disk, field cultivator, or field tiller.
- Test the soil to determine the amount of lime, phosphate, and potash to be applied. Do not use nitrogen in renovating old grass fields because nitrogen favors grass in competition with the legume seedlings.
- Distribute the seed evenly over a smooth, firm seedbed, planting the seed at a depth of about 1/8 to 1/4 inch to ensure good contact between seed and soil.
- Seed an adapted variety with a high rate of germination, and inoculate with the proper nitrogen-fixing bacteria.
- Seed fescue, bluegrass, timothy, orchardgrass, ryegrass, and small grains for forage late in summer or early in fall. Seedings of alfalfa, red clover, white clover, and lespedeza are most successful in spring.
- Keep renovated fields grazed short until livestock start grazing the young legumes; then remove the livestock and allow the legumes to become established.
- Control grazing so that 2 to 3 inches of top growth is left on established mixtures of grasses and legumes.
- Mow the pasture as needed to remove the grass seedheads and to control weeds and woody vegetation.
- Topdress annually with phosphate and potash; add lime to maintain the soil pH needed by the legume that is being grown. The amount of each should be based on current soil tests.
- Check renovated fields for disease or damage by insects.

Additional information on management of pasture and hayland is available at the local office of the Soil Conservation Service or the Kentucky Cooperative Extension Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 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.

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

Figure 9.—Pasture in an area of Nicholson silt loam, 0 to 2 percent slopes.

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

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

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

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

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

Woodland Management and Productivity

Charles A. Foster, forester, Soil Conservation Service, helped prepare this section.

Simpson County is in the Western Mesophytic Forest region, a transitional area in which oak species dominate the forest communities. Commercial forest land occupies 23,100 acres, or 15 percent of the land area. The oak-hickory type makes up 74 percent of the woodland, the elm-ash-red maple type makes up 11 percent, the maple-beech-birch type makes up 5 percent, the oak-pine type makes up 5 percent, the loblolly-shortleaf pine makes up 4 percent, and the oak-gum type makes up 1 percent.

Woodland tracts in the survey area are small private holdings averaging 24 acres and are essentially unmanaged. Most woodland sites are capable of growing 50 cubic feet or more of wood per acre per year, but the actual growth is about 35 cubic feet (*9*). The management of private forest lands has lagged behind that of cropland and pasture; about one landowner in three owns woodland simply because it happens to be a part of the farm. Many woodland tracts are not well stocked with desirable, high quality trees, and many tracts are owned less than 10 years.

Tree growth, stocking, and quality can be improved by removal of low quality trees in fully stocked and understocked stands of all sizes as well as by regeneration of sawtimber stands after harvest. Soil surveys are a useful management tool to identify Kentucky's most productive woodland sites, soil limitations for management, and tree species to favor or to plant.

The woodland industry in Simpson County consists of one commercial sawmill and one custom mill. The products are rough lumber, dimension stock, chips, and crossties. Several mills in adjacent counties also buy logs or standing trees from the survey area.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

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

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

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

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* (*4*). This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

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

Recreation

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have 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 campsites.

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

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

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

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

Wildlife Habitat

The wildlife population of Simpson County consists of an estimated 39 species of mammals, 47 species of terrestrial reptiles and amphibians, and 97 species of birds that commonly nest in the county. About 200 other species of birds visit Kentucky during migration each year, and many of them can be found in the county during certain seasons.

The most important kinds of wildlife in Simpson County are cottontail rabbit, gray squirrel, fox squirrel, white-tailed deer, raccoon, red fox, mink, muskrat, bobwhite quail, mourning dove, and various waterfowl, mainly ducks and geese.

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

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

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

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

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

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

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

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

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

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

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

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

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

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

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

Engineering

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

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

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

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

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

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

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

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

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

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

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

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

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

Sanitary Facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

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

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

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

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

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

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

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

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

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

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

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

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

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

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

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

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

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

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

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

Soil Properties

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

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

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

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

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

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

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

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

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

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

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

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

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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

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

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

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

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

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

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have 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, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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

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

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

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

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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

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

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

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

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

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 17 and the results of chemical analysis in table 18. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by the Kentucky Agricultural Experiment Station.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (*15*).

Coarse materials—(2-75 mm fraction) weight estimates of the percentages of all materials less than 75 mm (3B1).

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).

Organic carbon—dichromate, ferric sulfate titration (6A1a).

Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).

Extractable acidity—barium chloride-triethanolamine I (6H1a).

Cation-exchange capacity—ammonium acetate, pH 7.0 (5A1a).

Cation-exchange capacity—sum of cations (5A3a).

Base saturation—ammonium acetate, pH 7.0 (5C1).

Base saturation—sum of cations, TEA, pH 8.2 (5C3).

Reaction (pH)—1:1 water dilution (8C1a).

Reaction (pH)—potassium chloride (8C1c).

Available phosphorus—(Procedure (656), Kentucky Agricultural Experiment Station).

Field sampling—site selection (1A1).

Field sampling—site sampling (1A2).

Laboratory preparation—standard (air-dry) material (1B1).

Particles—<specified size >2mm (2A2).

Particles—<2mm (2A1).

Data sheet symbols—(2B).

Particles greater than 2 mm by field or laboratory weighing—(3B1a).

Extractable bases—(5B1a).

Exchangeable acidity (H+A1)—Method of Yuan Procedure 67-3.52, Part 2, Methods of Analysis, ASA, 1965.

Calcium carbonate equivalent—Procedure (236b), USDA Handbook 60, USDA Salinity Laboratory 1954 (6N7).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*16*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

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

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

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

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

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*14*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*16*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Baxter Series

The Baxter series consists of deep, well drained, moderately permeable soils on karst uplands, steep hillsides, and ridgetops. The soils formed in cherty limestone. The slope ranges from 2 to 30 percent.

Baxter soils are associated with Mountview, Nicholson, and Pembroke soils, all of which are fine-silty. Mountview soils have less chert in the upper part of the subsoil. Pembroke soils have less chert throughout and have a darker surface layer. Nicholson soils have a fragipan.

Typical pedon of Baxter cherty silt loam, 6 to 12 percent slopes, 2.0 miles east of the intersection of

Kentucky Highway 100 and U.S. Highway 31W in Franklin, 6.2 miles south on Kentucky Highway 73, 2.2 miles east on Rapids-New Roe Road, 0.8 mile south on Pirkle Road, 0.5 mile east on farm road, and 500 feet north, in a pasture:

Ap—0 to 7 inches; yellowish brown (10YR 5/4) cherty silt loam; weak fine granular structure; very friable; many fine roots; 15 percent chert fragments; neutral; clear wavy boundary.

B1—7 to 11 inches; strong brown (7.5YR 5/6) cherty silt loam; moderate medium subangular blocky structure; firm; many fine roots; common thin clay films; common brown and black concretions; 20 percent chert fragments; strongly acid; gradual wavy boundary.

B21t—11 to 19 inches; strong brown (7.5YR 5/6) cherty silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; common thick clay films; common black concretions; 25 percent chert fragments; strongly acid; clear smooth boundary.

B22t—19 to 48 inches; red (2.5YR 4/6) cherty clay; common medium distinct mottles of yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4); moderate medium subangular blocky structure; very firm, sticky; few fine roots; common thick clay films; 15 percent chert fragments; strongly acid; gradual wavy boundary.

B23t—48 to 60 inches; red (2.5YR 4/6) cherty clay; common distinct mottles of light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/6); moderate medium subangular blocky structure; very firm, very sticky; 30 percent chert fragments; strongly acid.

The solum is more than 60 inches thick. Bedrock is at a depth of more than 6 feet. Reaction is strongly acid or very strongly acid unless the soil is limed. In individual horizons chert makes up 10 to 30 percent of the volume. The weighted average ranges from 15 to 35 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. In forested areas the A1 horizon is 1 to 6 inches thick. It has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. The A2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 4. Its texture is cherty silt loam.

The B1 horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 6. Its texture is cherty silt loam or cherty silty clay loam.

The B2t horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 4 to 8. In some pedons it is mottled in the lower part in shades of olive, brown, and gray. Its texture ranges from cherty clay to cherty silty clay loam. The B3 horizon is similar to the B23t horizon, but in most pedons it is mottled in shades of red, gray, olive, and brown. Its texture is cherty clay or cherty silty clay. There is no B3 horizon in some pedons.

The C horizon has colors and texture similar to those of the B horizon. There is no C horizon in some pedons.

Bewleyville Series

The Bewleyville series consists of deep, well drained, moderately permeable soils on ridgetops and side slopes, generally at the highest elevations on the landscape. The soils formed in a silty mantle overlying loamy or clayey material that weathered from sandstone, shale, and limestone. The soils are in a sporadic pattern in the northwestern part of the county. Most slopes are smooth, and some areas are dotted with sinks and depressions. The slope ranges from 2 to 12 percent.

Bewleyville soils are on the same landscape as Pembroke, Fredonia, and Nicholson soils. Pembroke soils have a redder subsoil. Fredonia soils are clayey and moderately deep. Nicholson soils have a fragipan.

Typical pedon of Bewleyville silt loam, 2 to 6 percent slopes, 0.6 mile west of Turnertown, about 6 miles west of Franklin, 0.25 mile south of Kentucky Highway 1170, and 1,000 feet east of Hughes Road, in a cultivated field:

Ap—0 to 8 inches; dark brown (7.5YR 4/4) silt loam; weak fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 14 inches; reddish brown (5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; neutral; clear wavy boundary.

B22t—14 to 21 inches; yellowish red (5YR 4/6) silt loam; moderate medium subangular blocky structure; friable; few fine roots; strongly acid; gradual wavy boundary.

B23t—21 to 32 inches; mottled red (2.5YR 4/6), yellowish red (5YR 5/6), and strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; dark red (2.5YR 3/6) clay films on surfaces of peds, and light brownish gray (10YR 6/2) silt coatings; strongly acid; gradual wavy boundary.

B24t—32 to 76 inches; mottled red (2.5YR 4/6), yellowish red (5YR 5/6), and strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; dark red (2.5YR 3/6) clay films on surfaces of peds, and light brownish gray (10YR 6/2) silt coatings; strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Chert and sandstone fragments make up 0 to 5 percent of the volume in the upper part of the solum and 0 to 15 percent in the lower part. Unless the soil is limed, reaction is strongly acid or very strongly acid. Clay makes up 25 to 35 percent of the control section, and sand makes up 15 to 30 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Its texture is silt loam. The horizon is 4 to 12 inches thick.

The B21t horizon has hue of 5YR and 7.5YR, value of 4 or 5, and chroma of 4 to 6. Its texture is silt loam or silty clay loam.

The B22t horizon has hue of 5YR or 2.5YR, value of 4 or 5, and chroma of 4 to 8. Its texture is silt loam or silty clay loam.

The B23t and B24t horizons have hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 8. In most pedons they are mottled in shades of brown and red. There are brown and gray silt coatings on faces of peds. Texture is silt loam or silty clay loam.

The IIB horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 6 to 8. It is more than 40 inches thick. In most pedons it is mottled in shades of brown and gray. Its texture is clay loam, clay, and silty clay loam. In some pedons there is no IIB horizon.

The Bewleyville soils in this survey area are considered taxadjuncts to the Bewleyville series because they are fine-loamy in the control section. The difference does not affect the use and management of the soils.

Dunning Series

The Dunning series consists of deep, very poorly drained to poorly drained soils that have a subsoil of silty clay. The soils are on nearly level flood plains and in depressions. They formed mainly in alluvium from soils that formed in residuum of limestone. The slope ranges from 0 to 2 percent.

Dunning soils are associated with Elk, Nicholson, and Pembroke soils, all of which are better drained and have less clay throughout than Dunning soils.

Typical pedon of Dunning silty clay loam (0 to 2 percent slopes), 0.6 mile north of the intersection of U.S. Highway 31W and Kentucky Highway 100 in Franklin, 2 miles west on Kentucky Highway 73, 6.75 miles west on Kentucky Highway 1170, 0.3 mile north on Elliott Road, and 1,000 feet west, in a cultivated field:

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silty clay loam; few fine distinct light olive brown (2.5Y 5/4) and dark reddish brown (5YR 3/3) mottles; moderate fine and medium subangular blocky structure; firm; many fine roots; neutral; gradual smooth boundary.

A1g—5 to 13 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct light olive brown (2.5Y 5/4) and dark reddish brown (5YR 3/2) mottles; moderate fine and medium subangular blocky structure; very firm; neutral; gradual smooth boundary.

Bg—13 to 38 inches; olive gray (5Y 4/2) silty clay; common medium distinct dark grayish brown (2.5Y 4/2), pale olive (5Y 6/3), and reddish brown (5YR 5/4) mottles; moderate medium subangular blocky structure; very firm; neutral; gradual smooth boundary.

Cg—38 to 60 inches; gray (5Y 4/1) silty clay; common medium distinct dark grayish brown (2.5Y 4/2) and strong brown (7.5YR 5/4) mottles; massive; firm; neutral.

The solum ranges from 30 to 58 inches in thickness. Bedrock is at a depth of more than 60 inches. Reaction ranges from medium acid to mildly alkaline.

The Ap horizon has hue of 10YR or 2.5Y, value of 3, and chroma of 1 or 2. It is mottled in shades of brown, olive, and gray. Its texture is silty clay loam.

The Bg horizon has hue of 10YR, 2.5Y, and 5Y, value of 4 to 6, and chroma of 0 to 2. It is mottled in shades of brown, olive, and gray. Its texture is silty clay loam, silty clay, or clay.

The Cg horizon has colors and texture similar to those of the B horizon.

Elk Series

The Elk series consists of deep, well drained, moderately permeable soils on stream terraces. The soils formed in mixed alluvium from soils that formed in residuum of limestone and loess. The slope ranges from 0 to 6 percent.

Elk soils are associated with Pembroke, Baxter, Mountview, and Nolin soils. Pembroke soils have a dark surface layer and a clayey lower subsoil. Baxter soils formed in residuum of cherty limestone. Mountview soils are clayey in the lower part of the subsoil. Nolin soils formed in alluvium from soils derived from limestone and do not have an argillic horizon. Pembroke, Baxter, and Mountview soils generally are in higher positions on the landscape, and Nolin soils generally are in lower positions.

Typical pedon of Elk silt loam, 0 to 2 percent slopes, about 1 mile north of Middleton and the intersection of Kentucky Highways 100 and 103, and about 2,000 feet east of Kentucky Highway 103, in a cultivated field:

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

B1—8 to 15 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common very fine roots; slightly acid; gradual smooth boundary.

B21t—15 to 25 inches; brown (7.5YR 4/4) silty clay loam; few fine faint pale brown mottles; moderate medium subangular blocky structure; firm; few very fine roots; thin patchy clay films; few small black concretions; medium acid; clear smooth boundary.

B22t—25 to 42 inches; strong brown (7.5YR 5/6) silty clay loam; few fine faint pale brown mottles; moderate medium subangular blocky structure; firm;

few very fine roots; thin patchy clay films; few small black concretions; medium acid; clear smooth boundary.

C—42 to 60 inches; yellowish brown (10YR 5/6) silty clay loam; common medium faint pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) mottles; massive; friable; few small black concretions; strongly acid.

The solum ranges from 30 to 60 inches in thickness. Bedrock is at a depth of 5 to more than 20 feet. Reaction ranges from slightly acid to very strongly acid.

The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4. Its texture is silt loam.

The B horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. In some pedons it has few to common mottles that have hue of 10YR, value of 6, and chroma of 3 to 6. Its texture is silt loam or silty clay loam.

The C horizon has the same colors as those of the B horizon. In some pedons it has few to common mottles with chroma of 2 or higher. Its texture ranges from silt loam to silty clay loam. Some pedons have stratified layers of loam and clay loam.

Fredonia Series

The Fredonia series consists of moderately deep, well drained soils. Permeability is slow to moderately slow. The soils formed in limestone on karst and rolling uplands. The slope ranges from 2 to 20 percent.

Fredonia soils are associated with Baxter, Vertrees, Mountview, and Pembroke soils. Baxter soils are more than 60 inches deep and are more than 15 percent chert fragments in the control section. Vertrees soils are more than 60 inches deep to bedrock. Mountview and Pembroke soils have a fine-silty control section and are more than 60 inches deep to bedrock.

Typical pedon of Fredonia silt loam in an area of Fredonia-Rock outcrop complex, 6 to 12 percent slopes, about 10 miles northwest of Franklin, 0.5 mile south of the intersection of Kentucky Highways 103 and 621, and 500 feet west of Kentucky Highway 103, in a pasture:

Ap—0 to 8 inches; dark reddish brown (5YR 3/4) silt loam; moderate fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

B21t—8 to 16 inches; red (2.5YR 4/6) silty clay; moderate fine and medium subangular blocky structure; very firm; common fine roots; many thin clay films; neutral; gradual smooth boundary.

B22t—16 to 24 inches; red (2.5YR 4/8) silty clay; moderate fine and medium subangular blocky structure; very firm; few fine roots; many clay films; few black concretions; slightly acid; gradual smooth boundary.

B23t—24 to 28 inches; dark red (10R 3/6) clay; moderate fine and medium subangular blocky structure; very firm; few fine roots; many clay films; few fine black concretions; slightly acid; abrupt wavy boundary.

R—28 inches; limestone bedrock.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. Chert makes up 0 to 5 percent of the volume. Unless the soil is limed, reaction ranges from slightly acid to strongly acid in the A horizon and in the upper part of the B horizon. Reaction in the lower part of the subsoil ranges from strongly acid to neutral.

The Ap or A1 horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The A2 horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. Its texture is silt loam. There is no A2 horizon in some pedons.

The B2t horizon has hue of 2.5YR to 10R, value of 3 or 4, and chroma of 4 to 6. Its texture is silty clay or clay. The B3 or C horizon has colors and texture that are the same as those of the B2t horizon; some pedons have mottles in shades of brown or yellow. There is no B3 or C horizon in some pedons.

Lawrence Series

The Lawrence series consists of deep, somewhat poorly drained, slowly permeable soils on stream terraces, fans, and nearly level concave uplands. The soils formed in old mixed alluvium or colluvium from soils that formed in residuum of limestone.

Lawrence soils are associated with Robertsville, Nicholson, and Nolin soils. Robertsville soils have dominantly grayish colors and are poorly drained. Nicholson soils are moderately well drained. Nolin soils do not have a fragipan or an argillic horizon.

Typical pedon of Lawrence silt loam (0 to 2 percent slopes), 1/4 mile north of the intersection of Kentucky 100 and U.S. Highway 31W in Franklin, 7/8 mile west of Kentucky 73, and 100 feet north of Robey-Bethel Grove Road:

Ap—0 to 8 inches; light olive brown (2.5Y 5/4) silt loam; common medium distinct brown (7.5YR 4/4) mottles; weak fine granular structure; friable; common fine pores; neutral; gradual smooth boundary.

B21t—8 to 17 inches; yellowish brown (10YR 5/4) silt loam; common fine faint light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; few fine roots; thin patchy clay films; strongly acid; abrupt smooth boundary.

Bx—17 to 44 inches; mottled yellowish brown (10YR 5/6), grayish brown (10YR 5/2), and dark yellowish brown (10YR 4/6) silty clay loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle and compact; few black concretions and stains; very strongly acid; gradual wavy boundary.

B3—44 to 62 inches; mottled yellowish brown (10YR 5/4), dark yellowish brown (10YR 4/6), pale brown (10YR 6/3), and light yellowish brown (2.5Y 6/2) silty clay loam; moderate medium subangular blocky structure; firm; black stains; thick continuous clay films; very strongly acid.

The solum ranges from 40 to 62 inches in thickness. Bedrock is at a depth of more than 62 inches. Unless the soil is limed, reaction is strongly acid or very strongly acid from the Ap horizon to the Bx horizon and is very strongly acid to neutral in the B3 and C horizons.

The Ap horizon has hue of 2.5Y through 10YR, value of 4 or 5, and chroma of 2 to 4. In some pedons there are few to common mottles that have hue of 2.5Y to 7.5YR, value of 4 to 6, and chroma of 2 to 6. The texture is silt loam.

The B2t horizon has hue of 2.5Y to 10YR, value of 5 or 6, and chroma of 3 to 6. It has few to common mottles that have chroma of 2 or less and that are in shades of brown. Its texture is silt loam or silty clay loam.

The Bx horizon has hue of 7.5YR, 10YR, and 2.5Y, value of 6 or less, and chroma of 8 or less. Its texture is silt loam or silty clay loam.

The B3 horizon has colors that range from light gray (N7) to yellowish red (5YR 4/6). Its texture ranges from silt loam to silty clay.

In some pedons there is a C horizon. It is the same in color and texture as the B3 horizon.

The Lawrence soils in this survey area are considered taxadjuncts to the Lawrence series because they have siliceous mineralogy and low base saturation. These differences do not affect the use or management of the soils.

Mountview Series

The Mountview series consists of deep, well drained, moderately permeable soils on nearly level to strongly sloping broad ridgetops and plateaulike areas. The soils formed in a silty mantle, presumably loess, underlain by residuum of limestone. The slope ranges from 0 to 12 percent.

Mountview soils are commonly associated with Baxter, Nicholson, and Pembroke soils. Baxter soils have more clay and more coarse fragments in the upper part than Mountview soils have. Pembroke soils have a darker surface layer. Nicholson soils have a fragipan and in most places are in lower positions on the landscape. All the associated soils have higher base saturation.

Typical pedon of Mountview silt loam, 2 to 6 percent slopes, about 3 1/2 miles west of Kentucky Highway 383, about 1 1/4 miles north of the Tennessee State line, about 2 miles southwest of Prices Mill, about 10 miles southwest of Franklin:

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

B21t—9 to 22 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; friable; few fine roots; common fine pores; common thin discontinuous clay films; few small channels filled with material from the Ap horizon; very strongly acid; clear smooth boundary.

B22t—22 to 28 inches; yellowish red (5YR 4/6) silty clay loam; moderate coarse subangular blocky structure parting to weak fine angular blocky; firm; few fine roots; few fine pores; many thin brown silt coatings on large peds; many thin reddish brown clay films; few channels and holes filled with brown silt loam; very strongly acid; clear smooth boundary.

IIB23t—28 to 40 inches; red (2.5YR 4/6) silty clay loam; moderate coarse subangular blocky structure parting to fine and very fine angular blocky; firm; common thin brown silt coatings on large peds; nearly continuous dark red clay films on small peds; few channels and holes filled with brown silt loam; few small concretions and nodules; very strongly acid; gradual smooth boundary.

IIB24t—40 to 50 inches; red (2.5YR 4/6) silty clay; moderate coarse subangular blocky structure parting to moderate fine angular blocky; firm; few fine pores; common thin brown silt coatings on large peds; nearly continuous clay films; few small concretions; few channels and holes filled with brown silt loam; very strongly acid; gradual smooth boundary.

IIB25t—50 to 70 inches; dark red (10R 3/6) clay; moderate coarse subangular blocky structure parting to moderate fine angular blocky; firm; few fine pores; brown silt coatings on peds; nearly continuous dusky red clay films; few highly weathered chert fragments; very strongly acid.

The solum is 6 to more than 8 feet thick. Depth to bedrock varies over most of the area, but in most places bedrock is between depths of 8 and 30 feet. Reaction is very strongly acid or strongly acid unless the soil is limed. Coarse fragments range from 0 to 5 percent within a depth of 30 inches and from 5 to 35 percent below a depth of 30 inches.

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

In some places there is a B1 horizon. It has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Its texture is silt loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 6 to 8. Its texture is silt loam or silty clay loam. Some lower B2t horizons have hue of 5YR.

The IIB2t horizon has hue of 5YR, 2.5YR, or 10R, value of 3 to 5, and chroma of 6. In some pedons it has mottles in shades of brown, yellow, or red. Its texture is silty clay loam, silty clay, or clay.

Newark Series

The Newark series consists of deep, somewhat poorly drained, moderately permeable, nearly level soils on flood plains along major streams and their tributaries. The soils formed in mixed alluvium washed from soils that formed in residuum of limestone. The slope is mainly less than 2 percent.

Newark soils are associated with Lawrence and Nolin soils. Nolin soils are well drained soils on flood plains. Lawrence soils are somewhat poorly drained and have a fragipan.

Typical pedon of Newark silt loam (0 to 2 percent slopes), in Simpson County, 4.2 miles north of Franklin, 0.24 mile northwest of Kentucky Highway 621, and 1 mile north of Adams Road, in a pasture:

Ap—0 to 11 inches; brown (10YR 5/3) silt loam; few fine faint pale brown mottles; weak fine granular structure; friable; many small black and brown stains; few fine roots; neutral; gradual wavy boundary.

B21—11 to 19 inches; brown (10YR 5/3) silt loam; few fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles and common medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; few fine roots; many black stains; neutral; gradual wavy boundary.

B22g—19 to 45 inches; gray (10YR 5/1) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; many brown stains on faces of peds; neutral; gradual wavy boundary.

Cg—45 to 62 inches; dark gray (10YR 4/1) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; few fine roots; many black and brown stains; slightly acid.

The solum ranges from 22 to 45 inches in thickness. Bedrock is at a depth of more than 60 inches. Reaction ranges from medium acid to mildly alkaline throughout.

The Ap horizon has hue of 2.5Y through 7.5YR, value of 4 or 5, and chroma of 2 through 4. In some pedons it is mottled in shades of brown and gray. Its texture is silt loam.

The B21 horizon has hue of 2.5Y through 7.5YR, value of 4 or 5, and chroma of 2 to 4. Its texture is silt loam or silty clay loam. The horizon is mottled in shades of brown and gray.

The B2g horizon has hue of 2.5Y through 7.5YR, value of 4 to 7, and chroma of 0 to 5. Its texture is silt loam or silty clay loam. The horizon is mottled in shades of brown.

The B3 horizon has colors and texture similar to those of the B22g horizon.

The C horizon has colors and texture similar to those of the lower part of the B horizon.

Nicholson Series

The Nicholson series consists of deep, moderately well drained, slowly permeable soils on broad, smooth ridgetops and on high stream terraces. The soils formed in a mantle of silty material that is underlain by residuum of limestone. The slope ranges from 0 to 6 percent.

Nicholson soils are associated with Lawrence, Mountview, Pembroke, and Dunning soils. Lawrence soils are somewhat poorly drained and have mottles that have chroma of 2 or less within the upper 10 inches of the argillic horizon. Mountview and Pembroke soils do not have a fragipan and are well drained. Dunning soils are very poorly drained and do not have an argillic horizon.

Typical pedon of Nicholson silt loam, 0 to 2 percent slopes, 1 1/4 miles north of Kentucky Highway 100 and U.S. Highway 31W in Franklin, 1 mile west of Kentucky Highway 73, and 200 feet south of Robey-Bethel Grove Road:

Ap—0 to 12 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine roots; slightly acid; gradual smooth boundary.

B21t—12 to 28 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular and angular blocky structure; friable; common pores; few fine roots; thin clay films; strong brown stains and black concretions; neutral; gradual wavy boundary.

Bx—28 to 37 inches; yellowish brown (10YR 5/4) silt loam; few fine faint light gray and few fine distinct dark yellowish brown (10YR 3/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky and angular blocky; firm, brittle and compact; common black stains and concretions; strongly acid; abrupt wavy boundary.

B22t—37 to 57 inches; strong brown (7.5YR 5/6) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thick clay films; very strongly acid.

B23t—57 to 62 inches; yellowish brown (10YR 5/8) silty clay loam; common medium distinct red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; thick clay films; very strongly acid.

The solum ranges from 40 to 80 inches in thickness. Bedrock is at a depth of more than 80 inches. Reaction ranges from very strongly acid to medium acid from the Ap horizon through the Bx horizon. Reaction ranges from very strongly acid to mildly alkaline in the Bt horizon.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. Its texture is silt loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. Its texture ranges from silt loam to silty clay loam. In some pedons there are few or common brownish or grayish mottles below the upper 10 inches of the argillic horizon. In some pedons the B1 horizon is silt loam or silty clay loam that is 3 to 8 inches thick.

The Bx horizon has hue of 10YR through 2.5Y, value of 3 to 5, and chroma of 4 to 8. It has few to many brownish or grayish mottles. In some pedons the prisms have silt coatings. Texture is silt loam or silty clay loam.

The IIB horizon has hue of 2.5YR through 2.5Y, value of 4 or 5, and chroma of 4 to 6. It has few to common brownish or grayish mottles. Its texture is silty clay loam, silty clay, or clay. There is no IIB horizon in some pedons.

The IIC horizon has colors and texture similar to those of the IIB horizon. Coarse fragments make up from 0 to 35 percent of the volume. There is no IIC horizon in some pedons.

In some pedons the Nicholson soils in this survey area do not have a lithological discontinuity within 60 inches of the surface.

Nolin Series

The Nolin series consists of deep, well drained, moderately permeable soils on nearly level flood plains and in depressions that receive runoff from surrounding slopes. The soils formed in alluvium from soils that formed in residuum of limestone and in loess.

Nolin soils are associated with Pembroke and Newark soils. Newark soils are somewhat poorly drained. Pembroke soils are deep, well drained soils that have an argillic horizon.

Typical pedon of Nolin silt loam (0 to 2 percent slopes), approximately 6 miles north of the intersection of Kentucky Highway 100 and U.S. Highway 31W in Franklin, 2.3 miles east of U.S. Highway 31W, and 0.4 mile north of Uhls Road, in a cultivated field:

Ap—0 to 12 inches; brown (10YR 4/3) silt loam; weak fine granular structure; very friable; few fine roots; slightly acid; gradual smooth boundary.

B21—12 to 25 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; few roots; slightly acid; gradual wavy boundary.

B22—25 to 60 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; few fine roots; slightly acid; gradual wavy boundary.

C—60 to 65 inches; dark brown (7.5YR 4/4) gravelly silt loam; weak fine subangular blocky structure; friable; strongly acid.

The solum is more than 40 inches thick. Bedrock is at a depth of more than 60 inches. Reaction ranges from medium acid to mildly alkaline. Coarse fragments make up from 0 to 5 percent of the volume in the solum and from 0 to 30 percent of the volume in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. It is loam, silt loam, or silty clay loam. In some areas there are waterworn pebbles on the surface.

In some pedons there is a B1 horizon that is 4 to 10 inches thick and has colors similar to those of the Ap horizon.

The B2 horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 or 4. In some pedons, below a depth of 24 inches, it has mottles that have chroma of 2 or less.

The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Its texture is silty clay loam, silt loam, loam, fine sandy loam, or stratified layers of these textures or their gravelly analogs. In some pedons, below a depth of 40 inches, there is a yellowish brown to yellowish red buried B horizon.

Pembroke Series

The Pembroke series consists of deep, well drained, moderately permeable soils on karst uplands, side slopes, and ridgetops. The soils formed in residuum of limestone. The slope ranges from 0 to 12 percent.

Pembroke soils are associated with Baxter, Fredonia, Mountview, and Nicholson soils. Baxter soils are cherty and have a fine control section. Fredonia soils are clayey and moderately deep. Mountview soils do not have a dark surface layer. Nicholson soils are moderately well drained and have a fragipan.

Typical pedon of Pembroke silt loam, 0 to 2 percent slopes, 500 feet east of Mary Adams Road, 0.6 mile east of the intersection of Kentucky Highway 73 and Jances Mill Road, and approximately 5 miles northwest of Franklin, in a pasture:

Ap1—0 to 5 inches; dark reddish brown (5YR 3/3) silt loam; weak to moderate fine granular structure; very friable; common fine roots; strongly acid; gradual wavy boundary.

Ap2—5 to 11 inches; dark brown (10YR 3/3) silt loam, dark reddish brown (5YR 3/3) intrusions; weak to moderate fine granular structure; friable; common fine roots; strongly acid; abrupt wavy boundary.

B1t—11 to 21 inches; reddish brown (5YR 4/4) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; few rounded black concretions; strongly acid; abrupt smooth boundary.

B21t—21 to 31 inches; red (2.5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; common clay films; common dark stains on ped faces; strongly acid; gradual smooth boundary.

B22t—31 to 40 inches; dark red (2.5YR 3/6) silty clay loam; moderate medium subangular blocky structure; firm; common clay films; few yellowish brown (10YR 5/6) silt coatings on ped faces; common black concretions and stains; very strongly acid; gradual smooth boundary.

B23t—40 to 56 inches; dark red (2.5YR 3/6) silty clay; moderate medium subangular blocky structure; firm; common clay films; common black stains on faces of peds; very strongly acid; gradual smooth boundary.

B24t—56 to 68 inches; dark red (2.5YR 3/6) silty clay; moderate medium subangular blocky structure; firm; common clay films; few black concretions; reddish brown (5YR 4/4) silt coatings on faces of peds; very strongly acid.

The thickness of the solum and the depth to bedrock are more than 60 inches. Chert fragments make up 0 to 5 percent of the volume in the upper part of the solum and 0 to 15 percent of the volume in the lower part. Reaction ranges from very strongly acid to medium acid unless the soil is limed.

The Ap horizon is 5 to 11 inches thick. It has hue of 10YR through 5YR, value of 3, and chroma of 2 or 3. Its texture is silt loam.

The B1 horizon has hue of 5YR, value of 4, and chroma of 4 or 6. It is 8 to 11 inches thick. Its texture is silt loam or silty clay loam. There is no B1 horizon in some pedons.

The B21t horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 6. It is 9 to 20 inches thick. Its texture is silty clay loam.

The B22t and B23t horizons have hue of 5YR through 10R, value of 3 or 4 and chroma of 6. It is 10 to 25 inches thick. Its texture is silty clay loam or silty clay. In some pedons the B23t horizon has mottles in shades of brown and gray.

Pembroke soils in this survey area are considered taxadjuncts to the Pembroke series because they have siliceous mineralogy instead of mixed. This difference does not affect the use or management of the soils.

Robertsville Series

The Robertsville series consists of poorly drained, very slowly permeable soils on nearly level stream terraces and in concave upland areas. The soils formed mainly in old alluvium or colluvium from soils that formed in residuum of limestone.

Robertsville soils are associated with Lawrence, Nicholson, and Pembroke soils. Lawrence soils have a brownish argillic horizon that has grayish mottles above the fragipan. Nicholson soils are moderately well drained. Pembroke soils do not have a fragipan.

Typical pedon of Robertsville silt loam (0 to 2 percent slopes, 1/4 mile north of the intersection of Kentucky Highway 100 and U.S. Highway 31W in Franklin, 1 mile northwest on Kentucky Highway 73, 1 3/4 miles west of Kentucky Highway 73 on Robey-Bethel Grove Road, 1/2 mile west of the intersection of Allen Road and Robey-Bethel Grove Road, in a pasture:

Ap—0 to 11 inches; dark gray (10YR 4/1) silt loam; weak fine granular structure; friable; common fine roots and few medium roots; neutral; gradual wavy boundary.

B2g—11 to 21 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine roots; small rock fragments; very strongly acid; gradual wavy boundary.

Bx—21 to 54 inches; light gray (10YR 7/1) silt loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle and compact; very strongly acid; abrupt smooth boundary.

Cg—54 to 62 inches; mottled gray (10YR 5/1) and yellowish brown (10YR 5/6) silty clay loam; massive; firm; few black concretions; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Bedrock is at a depth of more than 60 inches. Reaction is strongly acid or very strongly acid unless the soil is limed. The fragipan is at a depth of 15 to 30 inches.

The Ap horizon has hue of 2.5Y through 10YR, value of 3 or 4, and chroma of 1 or 2. It is mottled in shades of brown and gray. Its texture is silt loam. In some pedons there is an A2 horizon which extends into the fragipan.

The B2 horizon has hue of 10YR, 2.5Y, and 5Y, value of 6 or 7, and chroma of 1 or 2. It is mottled in shades of brown, gray, and yellow. Its texture is silt loam or silty clay loam.

The Bx horizon has the same colors as the B2 horizon, but the color range includes hue of N5 through N7. The Bx horizon has mottles in shades of brown, gray, and yellow. Its texture is silt loam or silty clay loam.

In some pedons there is a B3 or Bt horizon that has the same colors as the Cg horizon. The B3 or Bt horizon is 5 to 15 inches thick and is between the fragipan and the Cg horizon or bedrock.

The Cg horizon has matrix colors and mottles in shades of gray and brown, or it is evenly mottled. Its texture is silt loam, silty clay loam, or silty clay, and in some pedons it has layers of loam, clay loam, or clay. There is no Cg horizon in some pedons.

Vertrees Series

The Vertrees series consists of deep, well drained, moderately permeable soils on karst uplands and around the rim of depressions. The soils formed in residuum of limestone and shale. The slope ranges from 2 to 20 percent.

Vertrees soils are associated with Fredonia, Mountview, and Pembroke soils. Fredonia soils are moderately deep. Mountview soils have medium-textured subhorizons and generally are on smoother slopes. Pembroke soils have a dark surface layer and a fine-silty control section.

Typical pedon of Vertrees silt loam, 6 to 12 percent slopes, 100 feet west of Kentucky Highway 73 and 1 mile south of Elliot Harrison Road, about 8 miles northwest of Franklin, in a cultivated field:

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine roots; neutral; gradual smooth boundary.

B21t—6 to 16 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thick clay films; neutral; gradual smooth boundary.

B22t—16 to 42 inches; dark red (2.5YR 3/6) silty clay; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; thick clay films on faces of peds; small chert fragments; very strongly acid; gradual smooth boundary.

B23t—42 to 57 inches; dark red (2.5YR 3/6) silty clay; common medium distinct yellowish brown (10YR 5/6) and very pale brown (10YR 7/4) mottles; moderate medium subangular blocky structure; firm; very strongly acid; abrupt wavy boundary.

B24t—57 to 61 inches; yellowish red (5YR 4/6) clay; common medium distinct yellowish brown (10YR 5/6) and very pale brown (10YR 7/4) mottles; moderate medium subangular blocky structure; firm; very strongly acid.

The solum is more than 60 inches thick. Bedrock is at a depth of 5 to 10 feet. Chert fragments make up 0 to 10 percent of the volume, but in most horizons there is no chert. Unless the soil is limed, reaction ranges from medium acid to very strongly acid in the upper horizons and from very strongly acid to neutral below a depth of 60 inches.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. In forested or uncultivated areas, the A1 horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. The A2 horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 or 4. The texture of the A horizon is silt loam or silty clay loam.

The B21t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. Its texture is silt loam or silty clay loam.

The lower part of the B2t horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 6 to 8. In most pedons it is mottled in shades of red, brown, and yellow, and in some pedons it has gray mottles at a depth below 30 inches. Its texture is silty clay or clay.

Formation of the Soils

A soil as the term is used in this discussion, can best be described as a "dynamic natural body on the surface of the earth in which plants grow, composed of mineral and organic materials and living forms" (*6*). The dynamic natural bodies in Simpson County are dominantly deep, loamy and clayey, residual soils. They are very productive and are medium in natural fertility.

The characteristics of the soils in the county have been determined by the factors of soil formation: climate, parent material, vegetation, relief, and time. The interrelationship among the factors is complex; the effect of any one factor sometimes is difficult to determine. In some places one factor may dominate in determining the characteristics of the soils.

Climate

Moisture and temperature functions of climate are important in determining soil properties. Moisture is involved in most physical, chemical, and biochemical processes. Temperature influences the rate of chemical reaction. For example, the rate of clay production in soil is tied to climate. The rate is low in cold-dry, cold-wet, or hot-dry environments. The rate increases as relative humidity increases, and thus the rate is high in a hot, humid environment (*5*). The content of clay in the soils in Simpson County indicates that the soils developed mainly under hot, humid conditions.

Parent Material

Parent material is the unconsolidated mass in which soil forms. The characteristics of the parent material influence the rate of weathering and in some places the type of natural vegetation on the soil.

The soils of Simpson County are underlain by rocks of the Mississippian System: the Girkin Formation and the St. Genevieve, St. Louis, Salem, and Warsaw Limestones (*12, 13*). The individual characteristics of each of these limestone formations has shaped to some extent the development of the soils.

In some parts of the survey area the limestone is relatively resistant to weathering. Fredonia soils, which are only moderately deep, formed in these areas. In the eastern part of the survey area, the deep Baxter soils formed in residuum of cherty limestone. Chert is highly resistant to weathering; consequently, chert nodules and fragments make up 10 to 40 percent of the volume in individual horizons of Baxter soils.

In Simpson County there are two basic types of parent material: sedentary and transported. Sedentary parent material developed in place in the underlying layer of rock. Pembroke (in part), Vertrees, and Baxter soils formed in sedentary parent material. Transported parent material has been transported by gravity, water, or wind. Recent investigations indicate that the red clayey parent material is mainly debris, derived through erosion from higher lying, clastic sedimentary rocks, that was transported and deposited on pediments cut into lower lying limestone. The deep, red clayey soils subsequently formed in this weathered pedisediment (*11*). According to this study, the deep, red clayey soils that overlie limestone, such as Pembroke soils, have a more complex genesis than simple solution of limestone.

Soils that formed in alluvium are along large and small streams and in sinks or depressions throughout the survey area. Dunning, Newark, and Nolin soils are examples. Some soils formed in loess, which is wind-transported parent material. Some soils formed in a mantle of loessial silty material overlying residuum of limestone. Mountview and Nicholson soils are examples.

Vegetation

The litter of leaves, twigs, stems, and grasses on the surface and the mass of roots in the soil are the source of organic matter in the soil profile. The content of organic matter conditions some soil properties, including soil tilth and friability. Soils that developed under grassland vegetation, such as Pembroke soils, are characterized by a higher content of organic matter and a dark surface horizon. Many soils in the county developed under mixed hardwood forest. These soils, for example, Baxter, Mountview, and Bewleyville soils, have a low content of organic matter and a lighter colored surface layer.

Relief

Relief influences the distribution or pattern of soil on the landscape. In the survey area, relief ranges from nearly level to steep.

In the survey area, the differences between the soils vary with relief. This is due to a combination of microclimate, pedogenesis, and geology, Birkeland (*5*) states that soil properties vary laterally with topography. One reason for this is the direction of slope on which soils form. This affects the microclimate and hence the soils. Another is the steepness of slope; this affects soil properties because the rate of surface-water runoff, infiltration, and erosion vary with slope. The effects of relief are most apparent on the soils along Drakes Creek and near Pilot Knob. These areas have many rocky, steep, and moderately deep soils. Fredonia soils are an example. In areas of rolling terrain, soil properties vary because some areas are likely to have an accumulation of water runoff and of sediment from higher lying areas. In the survey area, the higher lying soils would be Baxter, Bewleyville, Mountview, Pembroke, and Vertrees soils. The soils in the lower lying areas would be Dunning, Lawrence, and Robertsville soils. The soils in the lowest areas and in depressions are Nolin and Newark soils.

Time

Time refers to the duration for which the parent material has been subjected to weathering. In Simpson County the dominant soil properties are dependent on time. The formation and translocation of clay proceed at a slow pace. The thickness of the B horizon increases with time. By these standards, therefore, many soils in the survey area that have a thick Bt horizon are relatively old. Baxter, Mountview, Pembroke, and Vertrees soils are older soils that have strong profile development. Nolin, Newark, and Dunning soils are younger soils that have very faint horizons. They are on flood plains and in depressions where alluvium is continually deposited.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	less than 2.4
Low	2.4 to3.2
Moderate	3.2 to 5.2
High	more than 5.2

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to 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.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A form of noninversion tillage that retains protective amounts of residue mulch on the surface throughout the year. These include no tillage, strip tillage, stubble mulching, and other types of noninversion tillage.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

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.

Crop residue management. The use of plant residue to protect cultivated fields during critical erosion periods.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

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 they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

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.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, alluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

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. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables), The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure 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 accumulated as consolidated rock disintegrated in place.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

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. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

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.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

[Recorded in the period 1951-79 at Scottsville, Kentucky]

Month	Temperature						Precipitation				
	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*	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----	44.9	26.6	35.8	72	-7	32	4.75	2.50	6.72	9	5.0
February---	49.9	29.5	39.7	74	0	44	4.25	2.23	6.01	8	4.3
March------	59.3	37.6	48.5	82	15	143	5.47	3.22	7.47	9	2.7
April------	70.9	47.5	59.2	87	28	283	4.61	2.91	6.13	8	.1
May--------	77.9	55.3	66.6	91	34	515	4.72	3.07	6.21	8	.0
June-------	84.9	62.9	73.9	96	47	717	4.80	2.05	7.14	7	.0
July-------	87.8	66.5	77.2	97	52	843	4.44	2.56	6.10	8	.0
August-----	87.4	65.3	76.4	97	52	818	3.61	1.73	5.24	6	.0
September--	81.9	59.3	70.6	95	39	618	3.55	1.68	5.16	5	.0
October----	71.6	47.6	59.6	88	27	311	2.74	1.31	3.97	5	.0
November---	58.3	37.7	48.0	80	14	69	4.39	2.50	6.06	7	1.0
December---	48.9	30.8	39.9	71	3	28	4.96	2.39	7.17	8	2.1
Yearly:											
Average--	68.6	47.2	58.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	99	-7	---	---	---	---	---	---
Total----	---	---	---	---	---	4,421	52.29	44.87	58.69	88	15.2

* 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

[Recorded in the period 1951-79 at Scottsville, Kentucky]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 2	April 14	May 6
2 years in 10 later than--	March 28	April 10	April 29
5 years in 10 later than--	March 18	April 1	April 16
First freezing temperature in fall:			
1 year in 10 earlier than--	October 28	October 22	October 11
2 years in 10 earlier than--	November 2	October 27	October 16
5 years in 10 earlier than--	November 12	November 5	October 25

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-79 at Scottsville, Kentucky]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24°F	Higher than 28°F	Higher than 32°F
	Days	Days	Days
9 years in 10	218	196	167
8 years in 10	225	203	175
5 years in 10	238	217	191
2 years in 10	250	230	207
1 year in 10	257	237	215

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
BaB	Baxter cherty silt loam, 2 to 6 percent slopes	3,995	2.6
BaC	Baxter cherty silt loam, 6 to 12 percent slopes	25,815	17.1
BaD	Baxter cherty silt loam, 12 to 20 percent slopes	10,640	7.0
BaE	Baxter cherty silt loam, 20 to 30 percent slopes	2,270	1.5
BcB	Bewleyville silt loam, 2 to 6 percent slopes	1,260	0.8
BeC	Bewleyville silt loam, 6 to 12 percent slopes	425	0.3
Du	Dunning silty clay loam	305	0.2
ElA	Elk silt loam, 0 to 2 percent slopes	525	0.4
ElB	Elk silt loam, 2 to 6 percent slopes	2,205	1.5
FcB	Fredonia-Vertrees complex, 2 to 6 percent slopes	1,070	0.7
FdC	Fredonia-Rock outcrop complex, 6 to 12 percent slopes	3,330	2.2
La	Lawrence silt loam	4,705	3.1
MoA	Mountview silt loam, 0 to 2 percent slopes	1,900	1.3
MoB	Mountview silt loam, 2 to 6 percent slopes	31,180	20.6
MoC	Mountview silt loam, 6 to 12 percent slopes	5,550	3.7
Ne	Newark silt loam	465	0.3
NhA	Nicholson silt loam, 0 to 2 percent slopes	2,095	1.4
NhB	Nicholson silt loam, 2 to 6 percent slopes	7,060	4.7
No	Nolin silt loam	3,760	2.5
PeA	Pembroke silt loam, 0 to 2 percent slopes	2,435	1.6
PeB	Pembroke silt loam, 2 to 6 percent slopes	25,920	17.1
PeC	Pembroke silt loam, 6 to 12 percent slopes	5,095	3.4
PfC3	Pembroke silty clay loam, 6 to 12 percent slopes, severely eroded	440	0.3
Pt	Pits	80	*
Rb	Robertsville silt loam	3,220	2.1
RfE	Rock outcrop-Fredonia complex, 12 to 30 percent slopes	570	0.4
VrB	Vertrees silt loam, 2 to 6 percent slopes	1,410	0.9
VrC	Vertrees silt loam, 6 to 12 percent slopes	2,480	1.6
VsC3	Vertrees silty clay loam, 6 to 12 percent slopes, severely eroded	1,050	0.7
	Water	60	*
	Total	151,315	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Corn	Soybeans	Tobacco	Wheat	Grass-legume hay	Pasture
	Bu	Bu	Lb	Bu	Ton	AUM*
BaB: Baxter	120	40	3,100	45	4.5	9.0
BaC: Baxter	100	35	2,900	40	4.5	9.0
BaD: Baxter	90	30	1,900	30	3.5	7.0
BaE: Baxter	---	---	---	---	---	4.0
BeB: Bewleyville	125	40	3,500	45	5.0	9.0
BeC: Bewleyville	100	35	3,300	40	5.0	8.0
Du: Dunning	120	45	---	---	4.0	8.0
ElA, ElB: Elk	165	45	3,500	45	4.5	9.0
FcB: Fredonia-Vertrees	120	40	2,800	40	4.2	8.4
FdC: Fredonia-Rock outcrop	---	---	---	---	---	4.0
La: Lawrence	125	45	1,700	---	3.0	5.5
MoA: Mountview	145	45	3,500	40	5.0	9.0
MoB: Mountview	135	45	3,500	55	4.5	9.0
MoC: Mountview	120	40	3,000	40	3.5	7.0
Ne: Newark	125	45	2,800	45	4.5	8.5
NhA: Nicholson	125	45	2,800	40	4.5	6.5
NhB: Nicholson	130	40	3,300	40	3.5	6.5
No: Nolin	165	50	3,500	45	5.0	9.0
PeA: Pembroke	160	45	3,500	50	5.0	9.5
PeB: Pembroke	155	45	3,500	50	5.0	9.5
PeC: Pembroke	125	40	3,200	45	4.5	8.0
Pfc3: Pembroke	90	35	2,800	35	4.5	8.0
Pt**. Pits						

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Soybeans	Tobacco	Wheat	Grass-legume hay	Pasture
	Bu	Bu	Lb	Bu	Ton	AUM*
Rb------------------------ Robertsville	110	30	---	---	3.0	5.5
RfE**. Rock outcrop-Fredonia						
VrB----------------------- Vertrees	120	35	2,800	45	4.5	9.0
VrC----------------------- Vertrees	100	35	2,600	40	4.5	9.0
VsC3---------------------- Vertrees	75	25	1,700	30	3.5	7.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	4,860	---	---	---
II	80,420	74,100	6,320	---
III	44,375	39,365	5,010	---
IV	15,350	12,130	3,220	---
V	---	---	---	---
VI	5,600	2,270	---	3,330
VII	570	---	---	570
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]

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
BaB, BaC----------- Baxter	2o	Slight	Slight	Slight	Moderate	Black oak----------- Yellow-poplar------- White oak-----------	82 89 74	Eastern white pine, loblolly pine, shortleaf pine, black oak, yellow-poplar, white oak.
BaD, BaE----------- Baxter	2r	Moderate	Moderate	Slight	Moderate	Black oak----------- Yellow-poplar------- White oak-----------	82 89 74	Eastern white pine, loblolly pine, shortleaf pine, black oak, yellow-poplar, white oak.
BeB---------------- Bewleyville	2o	Slight	Slight	Slight	Moderate	Yellow-poplar------- White oak-----------	95 73	Yellow-poplar, black walnut, loblolly pine, white ash, white oak, black oak.
Du----------------- Dunning	1w	Slight	Moderate	Severe	Severe	Pin oak------------- Sweetgum------------ Eastern cottonwood--	95 95 100	Loblolly pine, pin oak, sweetgum.
ElA, ElB----------- Elk	2o	Slight	Slight	Slight	Severe	Northern red oak---- Yellow-poplar------- Hackberry-----------	80 90 ---	Eastern white pine, yellow-poplar, black walnut, loblolly pine, white ash, eastern cottonwood.
FcB*:								
Fredonia----------	3c	Slight	Moderate	Slight	Moderate	Black oak----------- Eastern redcedar----	70 50	Virginia pine, eastern redcedar.
Vertrees----------	2c	Slight	Moderate	Slight	Moderate	Yellow-poplar------- White oak----------- Chinkapin oak------- Black oak----------- Northern red oak----	90 80 80 80 80	Yellow-poplar, white ash, Virginia pine, northern red oak, black oak, black walnut.
FdC*:								
Fredonia----------	3x	Slight	Moderate	Slight	Moderate	Black oak----------- Eastern redcedar----	70 50	Virginia pine, eastern redcedar.
Rock outcrop.								
La----------------- Lawrence	2w	Slight	Moderate	Slight	Severe	White oak----------- Yellow-poplar------- Sweetgum------------ Black oak----------- Willow oak----------	74 86 87 78 76	Yellow-poplar, white ash, loblolly pine, American sycamore, sweetgum.
MoA, MoB, MoC------ Mountview	2o	Slight	Slight	Slight	Moderate	Yellow-poplar------- White oak----------- American beech------ Sugar maple--------- Black walnut-------- Black oak-----------	90 70 --- --- --- ---	Shortleaf pine, loblolly pine, Virginia pine, yellow-poplar, black oak, white oak.
Ne----------------- Newark	1w	Slight	Moderate	Slight	Severe	Pin oak------------- Eastern cottonwood-- Sweetgum------------ Cherrybark oak------	99 94 88 ---	Eastern cottonwood, sweetgum, post oak, loblolly pine, red maple, American sycamore, eastern white pine, yellow-poplar, cherrybark oak.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
NhA, NhB: Nicholson	2o	Slight	Slight	Slight	Moderate	Northern red oak Black oak White oak Sugar maple Sweetgum	80 76 78 --- ---	Black oak, yellow-poplar, white oak, sweetgum, white ash, eastern white pine.
No: Nolin	1o	Slight	Slight	Slight	Severe	Sweetgum Cherrybark oak Red maple	100 97 ---	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak, black walnut, sweetgum.
PeA, PeB, PeC, PfC3: Pembroke	1o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Virginia pine Sugar maple Hickory Black walnut Black cherry White ash	85 90 85 --- --- --- --- ---	Yellow-poplar, black walnut, white ash, eastern white pine, shortleaf pine, loblolly pine, northern red oak, Virginia pine.
Rb: Robertsville	1w	Slight	Moderate	Moderate	Severe	Pin oak Yellow-poplar Sweetgum Shumard oak	85 100 95 90	Sweetgum, loblolly pine, American sycamore, pin oak.
RfE*:								
Rock outcrop.								
Fredonia	3x	Severe	Severe	Slight	Moderate	Black oak Eastern redcedar	70 50	Virginia pine, eastern redcedar.
VrB, VrC: Vertrees	2c	Slight	Moderate	Slight	Moderate	Yellow-poplar White oak Chinkapin oak Black oak Northern red oak	90 80 80 80 80	Yellow-poplar, white ash, Virginia pine, northern red oak, black oak, white oak.
VsC3: Vertrees	3c	Slight	Moderate	Moderate	Slight	White oak Chinkapin oak Black oak Northern red oak	70 70 70 70	White oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BaB: Baxter	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
BaC: Baxter	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
BaD: Baxter	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
BaE: Baxter	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
BeB: Bewleyville	Slight	Slight	Moderate: slope.	Slight	Slight.
BeC: Bewleyville	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Du: Dunning	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
ElA: Elk	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
ElB: Elk	Severe: flooding.	Slight	Moderate: flooding, slope.	Slight	Moderate: flooding.
FcB*:					
Fredonia	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock.	Severe: erodes easily.	Moderate: thin layer.
Vertrees	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
FdC*:					
Fredonia	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Rock outcrop.					
La: Lawrence	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, flooding.
MoA: Mountview	Slight	Slight	Slight	Severe: erodes easily.	Slight.
MoB: Mountview	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
MoC: Mountview	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Ne: Newark	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
NhA: Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
NhB------------------- Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
No-------------------- Nolin	Severe: flooding.	Slight----------	Moderate: flooding.	Slight------------	Moderate: flooding.
PeA------------------- Pembroke	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
PeB------------------- Pembroke	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
PeC, PfC3------------- Pembroke	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
Pt*. Pits					
Rb-------------------- Robertsville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
RfE*: Rock outcrop.					
Fredonia-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
VrB------------------- Vertrees	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight------------	Slight.
VrC------------------- Vertrees	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
VsC3------------------ Vertrees	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Slight------------	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
BaB: Baxter	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BaC: Baxter	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BaD: Baxter	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BaE: Baxter	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BeB: Bewleyville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BeC: Bewleyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Du: Dunning	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
ElA, ElB: Elk	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FcB*:										
Fredonia	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Vertrees	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FdC*:										
Fredonia	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rock outcrop.										
La: Lawrence	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MoA, MoB: Mountview	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
MoC: Mountview	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
Ne: Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
NhA: Nicholson	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
NhB: Nicholson	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
No: Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PeA, PeB: Pembroke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PeC, PfC3----------- Pembroke	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Pt*. Pits										
Rb----------------- Robertsville	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
RfE*: Rock outcrop.										
Fredonia-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
VrB----------------- Vertrees	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
VrC, VsC3----------- Vertrees	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BaB: Baxter	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: small stones.
BaC: Baxter	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: small stones, slope.
BaD, BaE: Baxter	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
BeB: Bewleyville	Slight	Slight	Moderate: shrink-swell.	Moderate: slope.	Severe: low strength.	Slight.
BeC: Bewleyville	Moderate: slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Du: Dunning	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
ElA, ElB: Elk	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
FcB*:						
Fredonia	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.
Vertrees	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
FdC*:						
Fredonia	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
Rock outcrop.						
La: Lawrence	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding.	Moderate: wetness, flooding.
MoA: Mountview	Moderate: too clayey.	Slight	Moderate: shrink-swell.	Slight	Severe: low strength.	Slight.
MoB: Mountview	Moderate: too clayey.	Slight	Moderate: shrink-swell.	Moderate: slope.	Severe: low strength.	Slight.
MoC: Mountview	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Ne: Newark	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
NhA: Nicholson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
NhB----------------- Nicholson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Moderate: wetness.
No------------------ Nolin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
PeA----------------- Pembroke	Moderate: too clayey.	Slight----------	Moderate: shrink-swell.	Slight----------	Severe: low strength.	Slight.
PeB----------------- Pembroke	Moderate: too clayey.	Slight----------	Moderate: shrink-swell.	Moderate: slope.	Severe: low strength.	Slight.
PeC, PfC3---------- Pembroke	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Pt*. Pits						
Rb------------------ Robertsville	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
RfE*: Rock outcrop.						
Fredonia----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
VrB----------------- Vertrees	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
VrC, VsC3---------- Vertrees	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BaB----------------- Baxter	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
BaC----------------- Baxter	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
BaD, BaE------------ Baxter	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack.
BeB----------------- Bewleyville	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
BeC----------------- Bewleyville	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey.
Du------------------ Dunning	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
ElA, ElB------------ Elk	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
FcB*:					
Fredonia-----------	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Vertrees-----------	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
FdC*:					
Fredonia-----------	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
La------------------ Lawrence	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
MoA----------------- Mountview	Moderate: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
MoB----------------- Mountview	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
MoC----------------- Mountview	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Ne------------------ Newark	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

TABLE 11.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
NhA, NhB------------ Nicholson	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
No------------------ Nolin	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey.
PeA----------------- Pembroke	Slight-----------	Moderate: seepage.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
PeB----------------- Pembroke	Slight-----------	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
PeC, PfC3----------- Pembroke	Moderate: slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Pt*. Pits					
Rb------------------ Robertsville	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
RfE*: Rock outcrop.					
Fredonia-----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
VrB----------------- Vertrees	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
VrC, VsC3----------- Vertrees	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
BaB, BaC: Baxter	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
BaD: Baxter	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BaE: Baxter	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BeB, BeC: Bewleyville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Du: Dunning	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
ElA, ElB: Elk	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
FcB*:				
Fredonia	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FdC*:				
Fredonia	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Rock outcrop.				
La: Lawrence	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
MoA, MoB, MoC: Mountview	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
Ne: Newark	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
NhA, NhB: Nicholson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
No: Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PeA, PeB: Pembroke	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PeC: Pembroke	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
PfC3------------------ Pembroke	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Pt*. Pits				
Rb-------------------- Robertsville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RfE*: Rock outcrop.				
Fredonia-------------	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey.
VrB, VrC, VsC3-------- Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
BaB: Baxter	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable	Favorable.
BaC, BaD: Baxter	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Slope	Slope.
BaE: Baxter	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope	Slope.
BeB: Bewleyville	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily.
BeC: Bewleyville	Moderate: seepage.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Du: Dunning	Slight	Severe: wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
ElA, ElB: Elk	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
FcB*:					
Fredonia	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Vertrees	Slight	Severe: hard to pack.	Deep to water	Erodes easily	Erodes easily.
FdC*:					
Fredonia	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.					
La: Lawrence	Slight	Severe: piping.	Percs slowly, flooding.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
MoA, MoB: Mountview	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
MoC: Mountview	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ne: Newark	Moderate: seepage.	Severe: piping, wetness.	Flooding	Erodes easily, wetness.	Wetness, erodes easily.
NhA: Nicholson	Slight	Moderate: hard to pack, wetness.	Percs slowly	Erodes easily, wetness.	Erodes easily, rooting depth.
NhB: Nicholson	Slight	Moderate: hard to pack, wetness.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
No: Nolin	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
PeA: Pembroke	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Favorable	Favorable.
PeB: Pembroke	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Favorable	Favorable.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
PeC, PfC3 Pembroke	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope	Slope.
Pt*. Pits					
Rb Robertsville	Slight	Severe: piping, wetness.	Percs slowly, flooding.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
RfE*: Rock outcrop.					
Fredonia	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
VrB Vertrees	Slight	Severe: hard to pack.	Deep to water	Erodes easily	Erodes easily.
VrC Vertrees	Slight	Severe: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
VsC3 Vertrees	Slight	Severe: hard to pack.	Deep to water	Slope	Slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils have Unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown]

Map symbol and soil name	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BaB, BaC, BaD, BaE-------------- Baxter	0-7	Cherty silt loam	ML, GM, CL-ML, GM-GC	A-4	0-10	60-90	55-80	45-70	45-70	25-35	4-10
	7-19	Cherty silty clay loam, cherty silt loam.	CL, GM, GC, CL-ML	A-4, A-6	0-10	60-90	55-80	55-80	45-80	25-40	5-20
	19-60	Cherty silty clay, cherty clay.	CH, CL, GC	A-7	0-10	55-90	45-85	45-85	45-80	40-60	20-35
BeB, BeC---------- Bewleyville	0-8	Silt loam---------	ML, CL-ML	A-4	0	100	95-100	95-100	85-100	20-30	2-7
	8-21	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-100	30-45	11-22
	21-76	Clay, clay loam, silty clay loam.	CL, ML, MH, CH	A-6, A-7	0-5	75-100	75-100	70-95	60-95	35-65	12-32
Du---------------- Dunning	0-13	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-95	34-42	15-22
	13-60	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	85-100	45-70	20-40
ElA, ElB---------- Elk	0-8	Silt loam---------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	70-95	25-35	3-10
	8-60	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
FcB*: Fredonia---------	0-8	Silt loam---------	CL	A-6, A-4	0-5	95-100	90-100	85-100	75-100	25-40	8-20
	8-40	Silty clay, clay	CH, MH, CL	A-7	0-5	95-100	90-100	85-100	80-100	45-75	20-45
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Vertrees---------	0-6	Silt loam---------	ML, CL, CL-ML	A-4, A-6	0	85-100	80-100	70-95	55-90	20-40	3-20
	6-57	Clay, silty clay	CH, CL	A-7	0	85-100	75-100	70-95	65-95	41-70	25-45
	57-61	Clay, cherty clay	CH, GC	A-7	0-10	60-100	60-100	55-90	45-80	50-70	25-45
FdC*: Fredonia---------	0-8	Silt loam---------	CL	A-6, A-4	0-5	95-100	90-100	85-100	75-100	25-40	8-20
	8-28	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.											
La---------------- Lawrence	0-8	Silt loam---------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-100	25-35	2-10
	8-17	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	17-44	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	44-62	Silty clay, silty clay loam, silt loam.	ML, CL, MH, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	75-100	25-60	5-25
MoA, MoB, MoC----- Mountview	0-9	Silt loam---------	ML, CL-ML	A-4	0	100	95-100	95-100	80-96	20-30	2-7
	9-40	Silt loam, silty clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	80-96	30-43	10-20
	40-70	Clay, silty clay, cherty silty clay loam.	CL, ML, MH, CH	A-6, A-7	0-20	75-100	65-100	60-98	50-96	35-65	11-32
Ne---------------- Newark	0-11	Silt loam---------	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
	11-62	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	22-42	3-20

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
NhA, NhB--------- Nicholson	0-12	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	12-28	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	85-100	85-100	80-100	25-45	5-20
	28-62	Silty clay loam, silt loam, silty clay.	CL, CH	A-6, A-7	0	95-100	90-100	80-100	75-95	25-60	11-25
No--------------- Nolin	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	12-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
	60-65	Loam, gravelly silt loam, gravelly loam.	ML, CL, CL-ML, GM	A-4, A-6	0-10	50-100	50-100	40-95	35-95	<30	NP-15
PeA, PeB, PeC---- Pembroke	0-11	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	70-100	25-40	3-16
	11-40	Silty clay loam	CL	A-6, A-7	0	95-100	90-100	85-100	75-100	30-45	11-25
	40-68	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	90-100	75-100	75-100	65-100	35-65	20-45
PfC3------------- Pembroke	0-7	Silty clay loam	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	70-100	25-40	5-20
	7-38	Silty clay loam	CL	A-6, A-7	0	95-100	90-100	85-100	75-100	30-45	11-25
	38-60	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	90-100	75-100	75-100	65-100	35-65	20-45
Pt*. Pits											
Rb--------------- Robertsville	0-11	Silt loam--------	ML	A-4	0	95-100	95-100	85-100	75-100	25-35	2-10
	11-21	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	3-20
	21-54	Silty clay loam, silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	3-20
	54-62	Silty clay loam, silty clay, silt loam.	CL, CH, CL-ML	A-6, A-7, A-4	0-5	80-100	75-100	70-100	60-100	25-60	5-35
RfE*: Rock outcrop.											
Fredonia--------	0-8	Silt loam--------	CL	A-6, A-4	0-5	95-100	90-100	85-100	75-100	25-40	8-20
	8-28	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.	---	---	---	---	---	---	---	---	---
VrB, VrC--------- Vertrees	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	85-100	80-100	70-95	55-90	20-40	3-20
	6-57	Clay, silty clay	CH, CL	A-7	0	85-100	75-100	70-95	65-95	41-70	25-45
	57-61	Clay, cherty clay	CH, GC	A-7	0-10	60-100	60-100	55-90	45-80	50-70	25-45
VsC3------------- Vertrees	0-6	Silty clay loam	CL	A-6	0	85-100	80-100	70-95	65-95	30-40	12-20
	6-57	Clay, silty clay	CH, CL	A-7	0	85-100	75-100	70-95	65-95	41-70	25-45
	57-61	Clay, cherty clay	CH, GC	A-7	0-10	60-100	60-100	55-90	45-80	50-70	25-45

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
BaB, BaC, BaD, BaE------------- Baxter	0-7	12-27	1.20-1.40	0.6-2.0	0.14-0.18	4.5-6.5	Low-----------	0.28	5	2-4
	7-19	18-40	1.30-1.55	0.6-2.0	0.14-0.18	4.5-6.5	Moderate------	0.24		
	19-60	40-60	1.30-1.55	0.6-2.0	0.10-0.14	4.5-5.5	Moderate------	0.24		
BeB, BeC--------- Bewleyville	0-8	15-27	1.30-1.50	0.6-2.0	0.20-0.22	4.5-5.5	Low-----------	0.43	5	1-3
	8-21	22-35	1.35-1.55	0.6-2.0	0.18-0.20	4.5-5.5	Low-----------	0.37		
	21-76	35-50	1.30-1.50	0.6-2.0	0.12-0.17	4.5-5.5	Moderate------	0.37		
Du--------------- Dunning	0-13	27-40	1.20-1.40	0.6-2.0	0.19-0.23	5.6-7.8	Moderate------	0.32	5	2-10
	13-60	35-60	1.40-1.65	0.06-0.2	0.14-0.18	5.6-7.8	Moderate------	0.28		
ElA, ElB--------- Elk	0-8	10-27	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low-----------	0.37	5	.5-3
	8-60	18-34	1.20-1.50	0.6-2.0	0.18-0.22	4.5-6.5	Low-----------	0.28		
FcB*: Fredonia--------	0-8	18-40	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.37	3	3-5
	8-40	40-60	1.30-1.60	0.06-0.6	0.13-0.18	5.1-7.3	Moderate------	0.28		
	40	---	---	---	---	---	-------------	----		
Vertrees--------	0-6	15-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-7.3	Low-----------	0.37	4	2-4
	6-57	40-60	1.40-1.65	0.2-0.6	0.14-0.18	4.5-6.0	Moderate------	0.28		
	57-61	40-60	1.45-1.65	0.2-0.6	0.10-0.16	4.5-7.3	Moderate------	0.28		
FdC*: Fredonia--------	0-8	18-40	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.37	3	3-5
	8-28	40-60	1.30-1.60	0.06-0.6	0.13-0.18	5.1-7.3	Moderate------	0.28		
	28	---	---	---	---	---	-------------	----		
Rock outcrop.										
La--------------- Lawrence	0-8	12-27	1.20-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low-----------	0.43	3	1-4
	8-17	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-5.5	Low-----------	0.37		
	17-44	18-35	1.50-1.70	0.06-0.2	0.08-0.12	4.5-5.5	Low-----------	0.43		
	44-62	18-60	1.50-1.70	0.06-0.6	0.08-0.12	4.5-7.3	Low-----------	0.37		
MoA, MoB, MoC---- Mountview	0-9	15-25	1.35-1.55	0.6-2.0	0.18-0.22	4.5-5.5	Low-----------	0.43	5	1-3
	9-40	20-35	1.40-1.60	0.6-2.0	0.17-0.20	4.5-5.5	Low-----------	0.43		
	40-70	35-55	1.30-1.50	0.6-2.0	0.10-0.15	4.5-5.5	Moderate------	0.32		
Ne--------------- Newark	0-11	7-27	1.20-1.40	0.6-2.0	0.15-0.23	5.6-7.8	Low-----------	0.43	5	1-4
	11-62	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.6-7.8	Low-----------	0.43		
NhA, NhB--------- Nicholson	0-12	12-30	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.0	Low-----------	0.43	3	2-4
	12-28	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.10	Low-----------	0.43		
	28-62	18-55	1.50-1.70	0.06-0.2	0.07-0.12	4.5-7.8	Low-----------	0.43		
No--------------- Nolin	0-12	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-7.8	Low-----------	0.43	5	2-4
	12-60	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-7.8	Low-----------	0.43		
	60-65	10-30	1.30-1.55	0.6-6.0	0.10-0.23	5.1-7.8	Low-----------	0.43		
PeA, PeB, PeC---- Pembroke	0-11	15-27	1.30-1.50	0.6-2.0	0.18-0.23	4.5-7.3	Low-----------	0.32	5	2-4
	11-40	27-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.28		
	40-68	36-60	1.35-1.65	0.6-2.0	0.13-0.19	4.5-6.0	Moderate------	0.28		
PfC3------------- Pembroke	0-7	27-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-7.3	Low-----------	0.32	5	0.5-2
	7-38	27-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.28		
	38-60	36-60	1.35-1.65	0.6-2.0	0.13-0.19	4.5-6.0	Moderate------	0.28		
Pt*. Pits										

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
Rb----------------- Robertsville	0-11	12-27	1.30-1.50	0.6-2.0	0.19-0.23	4.5-5.5	Low-----------	0.43	3	1-3
	11-21	15-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-5.5	Low-----------	0.43		
	21-54	18-35	1.50-1.65	0.06-0.2	0.08-0.12	4.5-5.5	Low-----------	0.43		
	54-62	15-45	1.40-1.60	0.2-0.6	0.08-0.12	4.5-5.5	Low-----------	0.37		
RfE*: Rock outcrop.										
Fredonia---------	0-8	18-40	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.37	3	3-5
	8-28	40-60	1.30-1.60	0.06-0.6	0.13-0.18	5.1-7.3	Moderate------	0.28		
	28	---	---	---	---	---	-------------	----		
VrB, VrC---------- Vertrees	0-6	15-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-7.3	Low-----------	0.37	4	2-4
	6-57	40-60	1.40-1.65	0.2-0.6	0.14-0.18	4.5-6.0	Moderate------	0.28		
	57-61	40-60	1.45-1.65	0.2-0.6	0.10-0.16	4.5-7.3	Moderate------	0.28		
VsC3-------------- Vertrees	0-6	27-40	1.20-1.40	0.6-2.0	0.14-0.22	4.5-7.3	Low-----------	0.32	4	0.5-3
	6-57	40-60	1.40-1.65	0.2-0.6	0.14-0.18	4.5-6.0	Moderate------	0.28		
	57-61	40-60	1.45-1.65	0.2-0.6	0.10-0.16	4.5-7.3	Moderate------	0.28		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
BaB, BaC, BaD, BaE: Baxter	B	None	---	---	>6.0	---	---	>60	---	High	High.
BeB, BeC: Bewleyville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Du: Dunning	D	Occasional	Brief	Dec-May	0-0.5	Apparent	Jan-Apr	>60	---	High	Moderate.
ElA, ElB: Elk	B	Occasional	Brief	Jan-Jun	>6.0	---	---	>60	---	Moderate	Moderate.
FcB*:											
Fredonia	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
Vertrees	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
FdC*:											
Fredonia	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
Rock outcrop.											
La: Lawrence	C	Occasional	Very brief	Dec-Apr	1.0-2.0	Perched	Dec-Apr	>60	---	High	High.
MoA, MoB, MoC: Mountview	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Ne: Newark	C	Occasional	Brief	Jan-Apr	0.5-1.5	Apparent	Dec-May	>60	---	High	Low.
NhA, NhB: Nicholson	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	High	Moderate.
No: Nolin	B	Occasional	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	Low	Moderate.
PeA, PeB, PeC, PfC3: Pembroke	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Pt*. Pits											
Rb: Robertsville	D	Occasional	Brief	Dec-Apr	0-1.0	Perched	Dec-May	>60	---	High	High.
RfE*:											
Rock outcrop.											
Fredonia	C	None	---	---	>6.0	---	---	20-40	Hard	High	Moderate.
VrB, VrC, VsC3: Vertrees	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS

Soil series, soil number, horizon, and depth in inches	Total			Size class and particle diameter in millimeters: Sand					Sand coarser than very fine (2-0.1)	Very fine sand plus silt (0.1-0.002)	Textural class
	Sand (2-0.05)	Silt (0.05-0.002)	Int. IV Clay (< 0.002)	Very coarse (2-1)	Coarse (1-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			
	Pct < 2 mm										
Pembroke silt loam: (79KY-213-3)											
Ap1-----0.5	6.7	66.8	26.5	---	0.2	0.7	4.0	1.8	4.9	68.6	Silt loam
Ap2-----5-11	8.4	71.7	19.9	---	0.2	0.7	5.3	2.2	6.2	73.9	Silt loam
B1t----11-21	6.5	61.7	31.8	0.1	0.2	0.6	3.8	1.8	4.7	63.5	Silty clay loam
B21t---21-31	11.2	52.3	36.5	0.1	0.2	1.0	6.8	3.2	8.1	55.5	Silty clay loam
B22t---31-40	11.6	49.7	38.7	---	0.1	0.1	7.8	3.6	8.0	53.3	Silty clay loam
B23t---40-56	12.3	46.1	41.6	0.1	0.1	0.5	7.9	3.7	8.6	49.8	Silty clay
B24t---56-68	13.9	41.8	44.3	---	0.1	1.1	8.6	4.1	9.8	45.9	Silty clay
Mountview silt loam: (75KY-213-8)											
Ap------0-9	3.7	76.2	20.1	0.1	0.2	0.4	1.8	1.2	2.5	77.4	Silt loam
B21t----9-22	4.2	66.8	29.0	0.1	0.3	0.3	2.2	1.3	2.9	68.1	Silty clay loam
B22t---22-28	6.5	63.9	29.6	0.1	0.3	0.5	3.4	2.2	4.3	66.1	Silty clay loam
B23t---28-40	6.4	57.8	35.8	0.1	0.3	0.5	3.2	2.3	4.1	60.1	Silty clay loam
IIB24t---40-50	6.8	46.2	47.0	0.2	0.3	0.5	3.2	2.6	4.2	48.8	Silty clay
IIB25t---50-70	8.4	36.1	55.5	0.2	0.4	0.7	3.8	3.3	5.1	39.4	Clay

TABLE 18.--CHEMICAL ANALYSES OF SELECTED SOILS

Soil name, report number, horizon, and depth in inches	pH		Extractable bases					Cation exchange capacity		Extractable acidity	Hydrogen and aluminum	Base saturation		Organic matter	Calcium carbonate equivalent	Phosphorus
	H_2O (1:1)	KCl 1N (1:1)	Calcium	Magnesium	Potassium	Sodium	Total bases	Ammonium acetate	Sum of cations			Ammonium acetate	Sum of cations			
			Milliequivalents per 100 grams of soil										Pct	Pct	Pct	Ppm
Pembroke silt loam: (79KY-213-3)																
Ap1----------0-5	5.1	4.7	4.27	1.19	2.15	0.43	8.04	11.37	17.52	9.48	0.12	71	46	2.42	0.14	38.5
Ap2----------5-11	5.2	4.5	3.33	0.74	1.38	0.45	5.90	7.88	14.02	8.12	0.14	75	42	1.35	0.14	35.0
B1t---------11-21	5.5	4.8	5.76	1.58	1.22	0.47	9.03	12.20	16.21	7.18	0.08	74	56	0.53	0.9	2.0
B21t--------21-31	5.1	4.3	6.30	1.34	0.73	0.45	8.82	12.91	16.94	8.12	0.17	68	52	0.13	0.1	1.0
B22t--------31-40	4.8	4.0	5.20	1.38	0.38	0.47	7.43	13.43	16.23	8.88	0.24	55	46	0.16	0.1	1.0
B23t--------40-56	4.5	3.8	4.11	2.07	0.36	0.34	6.88	12.59	16.49	9.61	0.27	55	42	0.19	0.1	2.0
B24t--------56-68	4.6	3.8	3.05	1.84	0.37	0.33	5.59	12.35	16.42	10.83	0.09	45	34	0.16	0.16	1.0
Mountview silt loam: (79KY-213-8)																
Ap-----------0-9	5.2	4.1	3.10	0.82	0.29	0.07	4.28	8.43	19.96	15.68	0.60	51	21	1.76	0.03	11.0
B21t---------9-22	4.8	3.6	1.63	1.32	0.22	0.07	3.24	10.33	20.28	17.04	3.17	31	16	0.49	0.01	0.5
B22t--------22-28	4.6	3.5	0.43	1.65	0.12	0.08	2.28	9.70	19.32	17.04	4.78	24	12	0.13	0.02	0.5
B23t--------28-40	4.7	3.5	0.23	1.97	0.08	0.10	2.38	10.72	20.78	18.40	3.74	22	12	0.10	0.02	0.5
IIB24t--------40-50	4.7	3.4	0.15	2.47	0.09	0.11	2.82	17.81	23.18	20.36	4.76	16	12	0.14	0.02	0.5
IIB25t--------50-70	4.5	3.3	0.23	2.71	0.08	0.10	3.12	14.21	23.93	20.81	4.11	22	13	0.15	0.01	2.0

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Baxter	Fine, mixed, mesic Typic Paleudalfs
*Bewleyville	Fine-silty, siliceous, thermic Typic Paleudults
Dunning	Fine, mixed, mesic Fluvaquentic Haplaquolls
Elk	Fine-silty, mixed, mesic Ultic Hapludalfs
Fredonia	Fine, mixed, mesic Typic Hapludalfs
*Lawrence	Fine-silty, mixed, mesic Aquic Fragiudalfs
Mountview	Fine-silty, siliceous, thermic Typic Paleudults
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
*Pembroke	Fine-silty, mixed, mesic Mollic Paleudalfs
Robertsville	Fine-silty, mixed, mesic Typic Fragiaqualfs
Vertrees	Fine, mixed, mesic Typic Paleudalfs

*The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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