United States
Department of
Agriculture

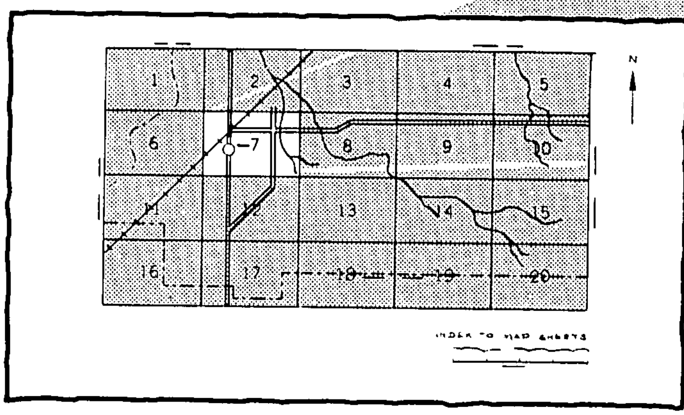
Soil
Conservation
Service

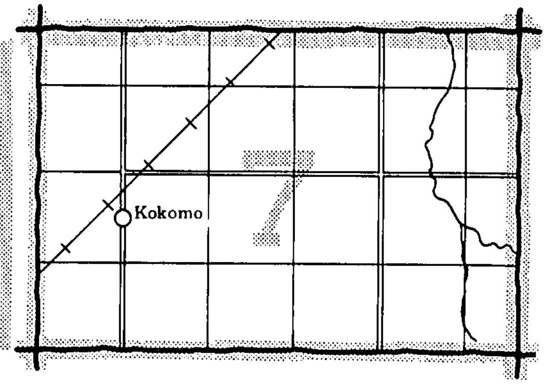
In cooperation with
Kentucky Natural Resources
and Environmental
Protection Cabinet
and Kentucky Agricultural
Experiment Station

Soil Survey of Todd County, Kentucky

HOW TO USE

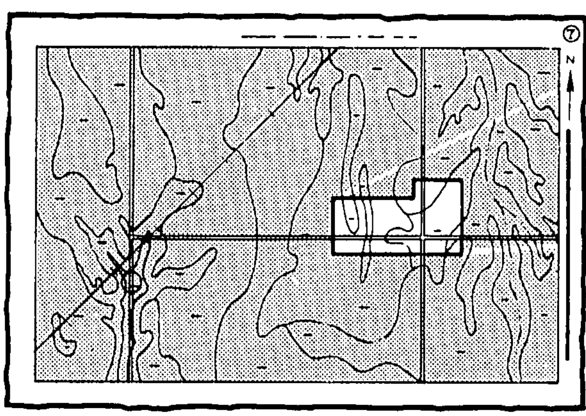
1. Locate your area of interest on the "Index to Map Sheets."

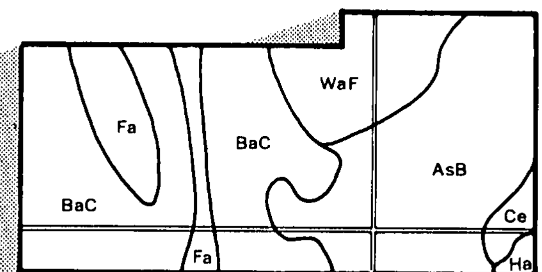




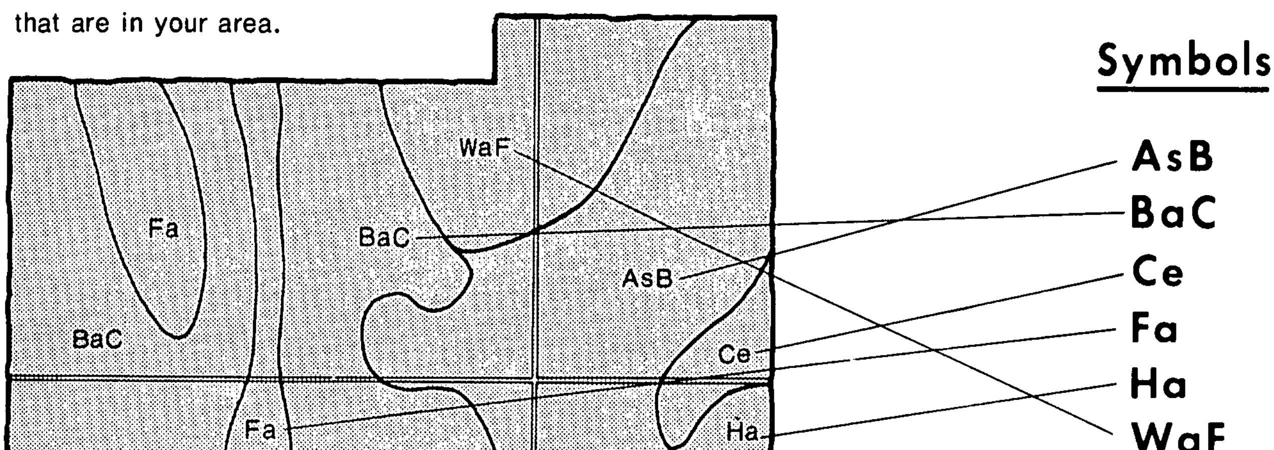
2. Note the number of the map sheet and turn to that sheet.

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



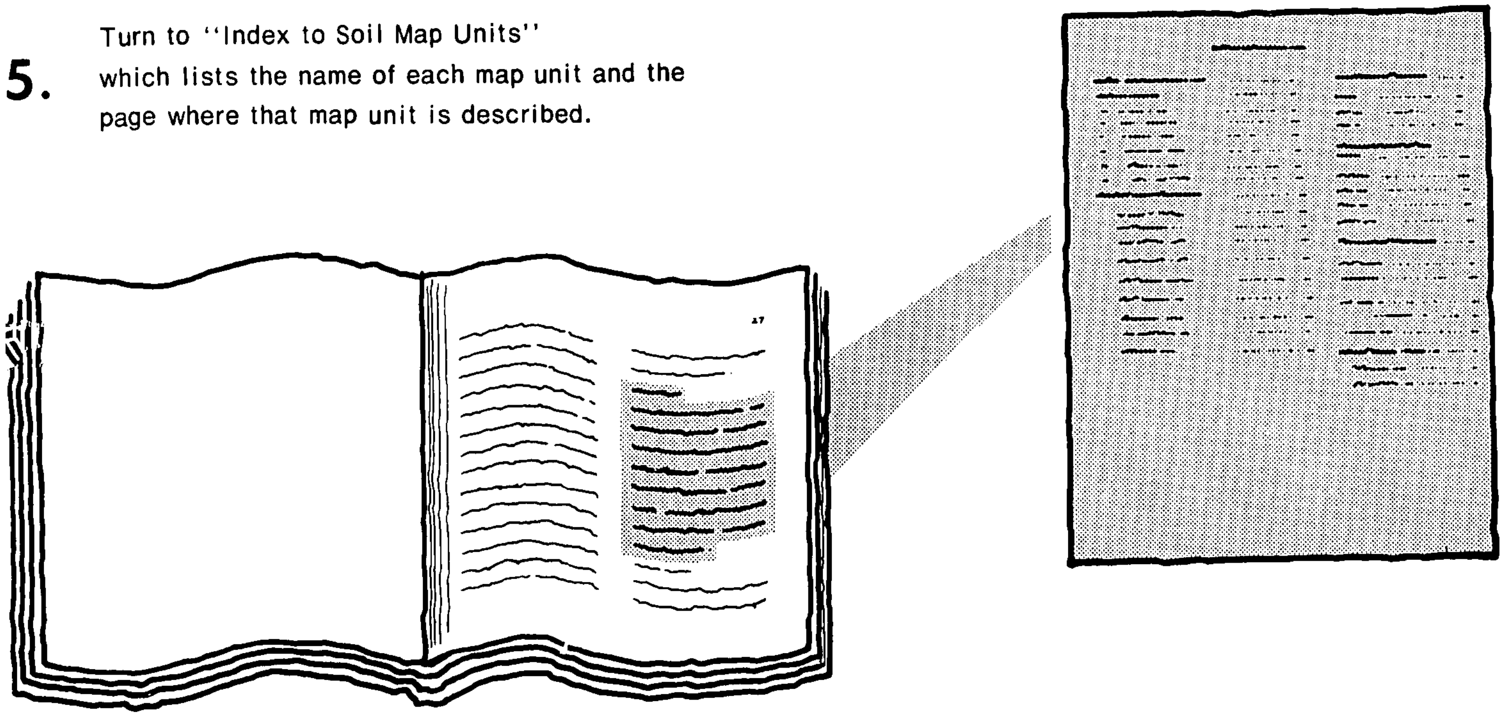


4. List the map unit symbols that are in your area.

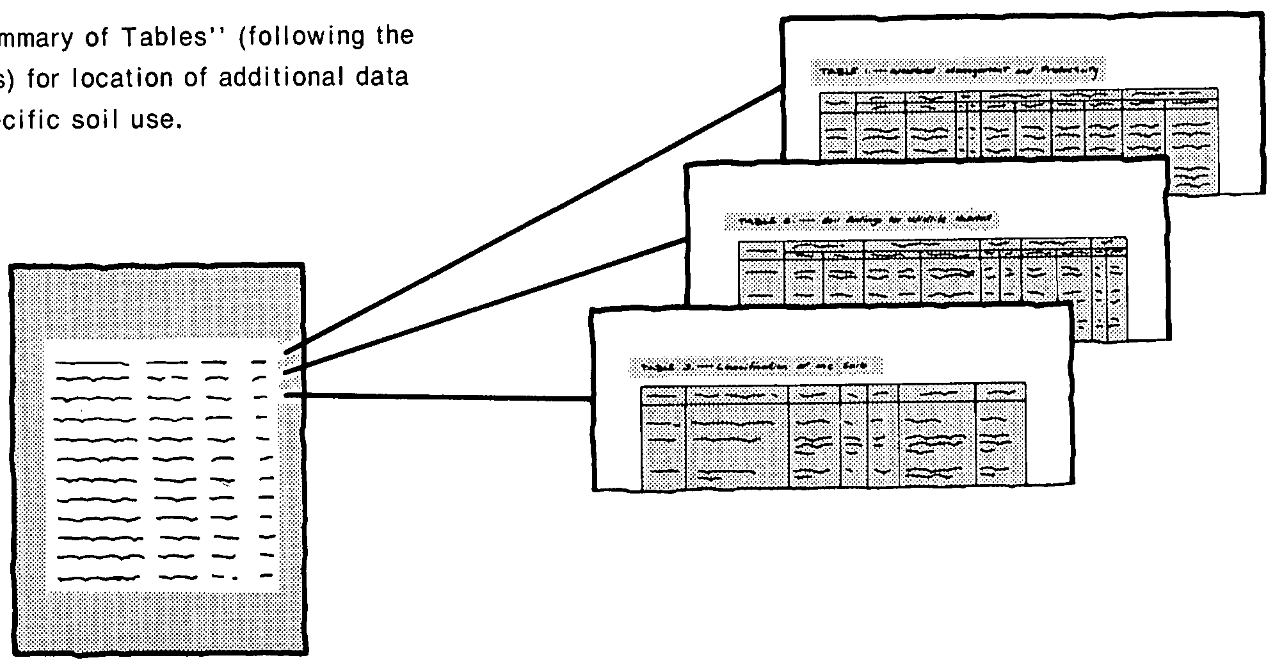


THIS SOIL SURVEY

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 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This soil survey was made cooperatively by the Soil Conservation Service, the Kentucky Natural Resources and Environmental Protection Cabinet, and the Kentucky Agricultural Experiment Station. It is part of the technical assistance furnished to the Todd 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: The Jefferson Davis Monument at Fairview is on Fredonia silt loam, very rocky, 2 to 12 percent slopes. Crider silt loam, 2 to 6 percent slopes (in the foreground) is well suited to use as woodland, hay and pasture, and cropland.

Contents

Soil Series

Issued September 1987

Index to Map Units

Summary of Tables

Foreword

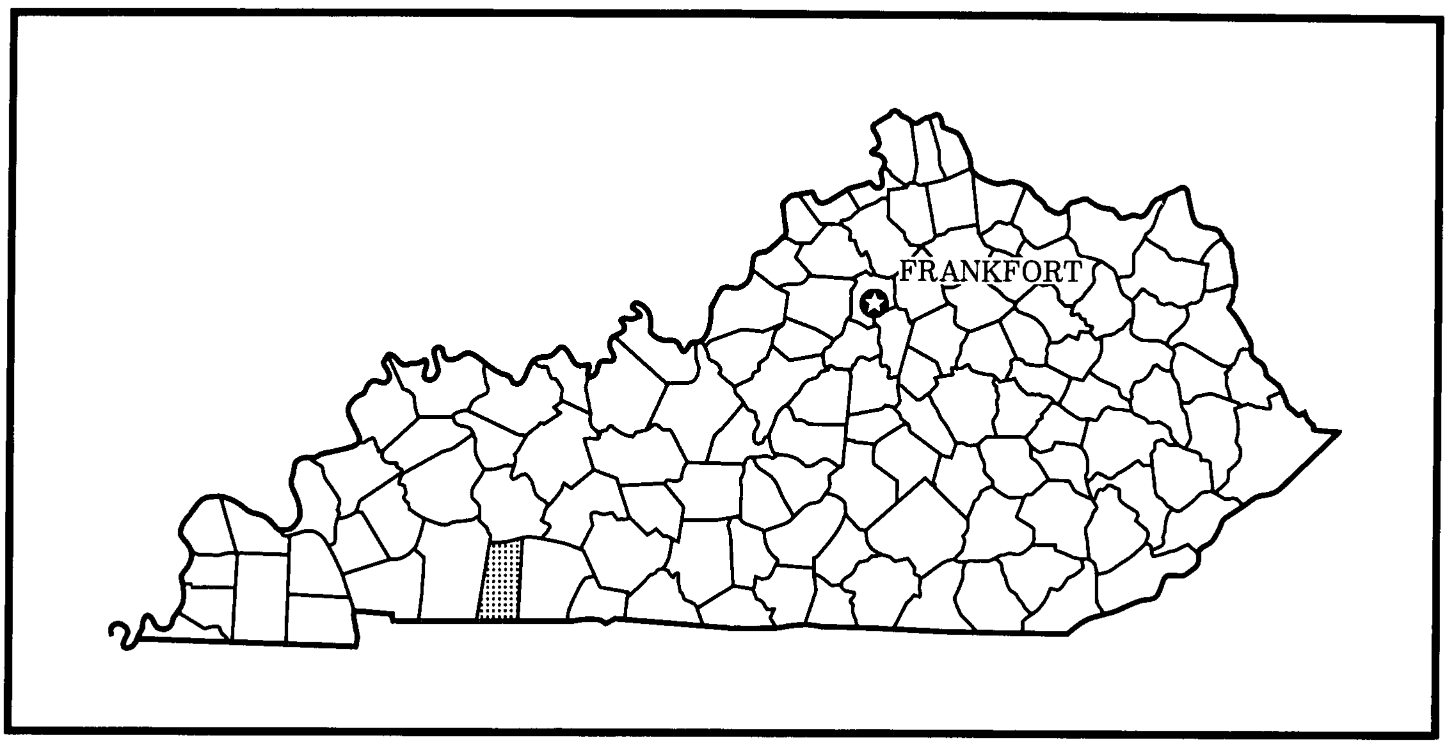
This soil survey contains information that can be used in land-planning programs in Todd County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of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

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

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

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

Randall W. Giessler
State Conservationist
Soil Conservation Service



Location of Todd County in Kentucky.

Soil Survey of Todd County, Kentucky

By James E. Haagen, Soil Conservation Service

Fieldwork by Arlin J. Barton, William H. Craddock, Ronald D. Froedge, James E. Haagen, Michael J. Mitchell, and Darwin L. Newton, Soil Conservation Service
Maps compiled by Lisa W. Carver, Soil Conservation Service

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

TODD COUNTY is in the southwestern part of Kentucky. The area is 241,376 acres, or about 377 square miles. In 1980, Todd County had a population of 11,874. The two largest cities are Elkton and Guthrie. Elkton, the county seat, had a population of 1,815, and Guthrie had 1,361 *(22)*.

Todd County lies within two major physiographic regions. The northeastern part of the county is in the Western Coal Field region and the remainder of the county is in the Western Pennyroyal region *(16)*.

Topography in the northern part of the county consists of steep hillsides, gently sloping to sloping ridgetops, and nearly level flood plains. The soils in this part of the county formed in material that weathered from sandstone, siltstone, shale, limestone, and loess. The area is drained by the East Fork of Pond River on the west and by tributaries of the Mud River on the east.

Topography in the southern part of the county generally consists of undulating to rolling, karst uplands. The area is drained by the West Fork of the Red River on the west, Elk Fork on the east, and by underground streams in karst areas. The soils in this part of the county formed mainly in material weathered from limestone, in loess, or both.

Todd County is mostly rural, and farming is the main enterprise. Industries in the county and in adjacent counties provide jobs for those not employed in farming or farm-related occupations. The climate and soils are favorable for cash grain crops and livestock farming. The main crops are corn, soybeans, small grains, tobacco, hay, and pasture. Livestock enterprises include beef cattle, hogs, and dairy cattle. Soils in the steeper areas are used as woodland.

General Nature of the County

This section provides general information about settlement, farming, climate, natural resources, and geology, relief, and drainage in Todd County.

Settlement

Todd county was formed from parts of Christian and Logan Counties in 1819 *(15)*. The county was named in honor of Colonel John Todd. The first permanent settlement was established about 1792 by settlers mostly from Virginia, North Carolina, Tennessee, and other parts of Kentucky. The northern part of the county was settled first, primarily because timber and water were abundant and the territory was more like the area from which the settlers had migrated. The southern part of the county, in contrast, had numerous sinkholes, was covered with brush, and had few trees. As the population grew, the southern part of the county was eventually developed. By 1900, the county had about 17,300 residents *(25)*.

Farming

Tobacco, corn, hay, pasture, and vegetables were the principal crops when Todd County was first settled. The tobacco was sold for cash, and the other crops were consumed on the farm or the surplus was sold. Cattle, hogs, chickens, horses, and mules were used on the farm or sold for cash.

The sale of farm products still accounts for a substantial part of the income in Todd County. In 1982, 73 percent of the soils in Todd County was used for farming *(23)*. This was a decrease of about 5 percent from 1978. There were 788 farms in the county, a decrease from 871 farms in 1978. The size of the average farm, however, has increased from 218 acres in 1978 to about 224 acres in 1982. The 1982 census also indicated that of the farms, 57 percent was owner-operated, 27 percent was part-owner operated, and 16 percent was tenant-operated. This was a decrease of 14 percent in owner operators and 11 percent in part owner operators since 1978. Tenant operators, however, increased by 16 percent. Of these operators, 35 percent worked 100 days or more off the farm.

The principal crops in Todd County are corn, soybeans, wheat, tobacco, hay, pasture, and timber. At present, corn, soybeans, and tobacco account for about 88 percent of the income from crops. Burley, eastern dark fired (Type 22), and dark air-cured or one sucker (Type 35) tobacco are grown in the county. In 1982, according to the Kentucky Crop and Livestock Reporting

Figure 1.—Soybeans provide a substantial part of the agricultural income to farmers in Todd County. This crop is on Nicholson silt loam, 2 to 6 percent slopes.

Service, Todd County produced about 3.3 million pounds of burley tobacco, 2.0 million pounds of eastern dark fired tobacco, and 1.1 million pounds of dark air-cured tobacco *(11)*. More than 2 million bushels of soybeans (fig. 1) and 4 million bushels of corn were harvested in the county. In recent years, winter wheat acreage has increased substantially, with more than 1.4 million bushels harvested in 1982. Red clover, lespedeza, alfalfa, orchardgrass, Kentucky 31 fescue, and timothy are grown for hay and pasture. Other crops produced in the county include barley, grain sorghum, strawberries, and vegetables.

Livestock enterprises in Todd County include beef cattle and calves, dairy cattle, hogs, pigs, and poultry. Beef and dairy cattle have steadily decreased since 1975 when they peaked at about 42,000 head *(10)*. The number of hogs and pigs has fluctuated over the past 30 years but has averaged about 20,000 head. The highest number was about 30,000 head in 1979. Within the last 20 years, the poultry industry has increased significantly, and in 1982, there were about 194,000 chickens, mainly used as layers for the production of eggs. Sheep, goats, mules, and horses are also raised in the county, but they are of less significance.

Climate

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

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Hopkinsville, Kentucky in the period 1951 to 1980. 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 36 degrees F, and the average daily minimum temperature is 25 degrees. The lowest temperature on record, which occurred at Hopkinsville on February 2, 1951, is -22 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 89 degrees. The highest recorded temperature, which occurred at Hopkinsville on August 17, 1954, 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 49 inches. Of this, 24 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 19 inches. The heaviest 1-day rainfall during the period of record was 5.38 inches at Hopkinsville on September 14, 1979. Thunderstorms occur on about 54 days each year, and most occur in the summer.

The average seasonal snowfall is 12 inches. The greatest snow depth at any one time during the period of record was 15 inches. On an average of 6 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in the spring.

Geology, Relief, and Drainage

Todd County lies within two major physiographic regions, the Western Coal Field region and the Western Pennyroyal region *(16)*. Only the northeastern corner of the county is in the Western Coal Field region. The bedrock in this region is sandstone, siltstone, and shale of the Caseyville Formation. This formation is of lower Pennsylvanian age *(13, 19)*.

The remainder of the county is in the Western Pennyroyal region. This region contains two major subdivisions; the Dripping Springs Escarpment and the Mississippian Plateau. The northern half of the county, except for the Western Coal Field region, is in the Dripping Springs Escarpment. The bedrock is sandstone, siltstone, shale, and limestone of the Chester Formation. The southern half of the county is on the Mississippian Plateau. Bedrock in this area is predominantly Ste. Genevieve Limestone of the Meramec Formation. The bedrock of this region is of Mississippian age *(14)*.

Topography of the Western Coal Field region is nearly level to steep. Hilltops are long, narrow, and gently sloping to sloping. Hillsides are predominantly steep and contain rock escarpments. Flood plains are narrow and nearly level. The elevation ranges from about 830 feet above sea level on some of the hills to less than 450 feet in the valleys.

Long Creek and Clifty Creek are the two main streams draining the Western Coal Field section of the county. Long Creek flows in a northerly direction into Pond River, and Clifty Creek flows in an easterly direction into Mud River. Both Pond River and Mud River are tributaries of the Green River.

Topography of the Western Pennyroyal region is nearly level to steep, and very diverse. The Dripping Springs Escarpment contains a nearly level to sloping plateau surrounded by steep hills. Numerous escarpments are on the hillsides. A geological faulted section is near the Western Coal Field region. Most of the faults run in an east-west direction. Elevation of the Dripping Springs Escarpment ranges from about 800 feet to less than 500 feet above sea level. The East Fork of Pond River and the Whippoorwill Creek are the two major streams draining this section of the Western Pennyroyal region. The East Fork of Pond River and its tributaries drain the western part of the area, flowing in a northerly direction along the boundary of Christian County and Muhlenberg County and eventually into Green River. Whippoorwill Creek drains the eastern part of the area flowing in an easterly direction through Logan County into Red River.

Topography of the Mississippian Plateau section is predominantly nearly level to rolling and has a few hilly areas adjacent to the large streams. The plateau lies 150 to 250 feet below the bordering Dripping Springs Escarpment. Elevation varies less than 100 feet over most of the plateau. In karst areas, drainage is through cavernous sinkholes into underground streams. Surface streams include the West Fork of Red River, Spring Creek, and Elk Fork. These streams flow south into Tennessee where they join the Red River, which drains into the Cumberland River.

Natural Resources

The most important natural resources in Todd County are soil, water, timber, limestone, gas, and oil. Of these, soil is the most important. It is used to grow food and fiber, as a foundation for houses and factories, and as material for dams and roads.

Adequate surface water is available from the numerous ponds, lakes, and streams for agricultural and recreational uses. Limited quantities of ground water are in some parts of the area. In the past, rural residents obtained water for domestic use from wells and cisterns, but water is now piped to many parts of the county.

About 31 percent of the county is commercial woodland *(12)*. These areas are mostly in the northern part of the county on soils that are too wet or too steep to use for farming. Most of the woodland has been logged in the past, and logging continues to be a source of income for the landowner.

Limestone bedrock in the Western Pennyroyal region of the county is an important economic resource. It is quarried for agricultural and industrial uses and for surfacing roads.

Numerous oil and gas wells have been drilled in the county with only limited success. Many of the oil wells were dry holes or produced only a few barrels of oil a day. In a few areas, however, the oil wells have good production. Most of the gas wells drilled in the county produced only enough gas for use by the landowner.

How This Survey Was Made

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

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

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

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

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

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

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

Map Unit Composition

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

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

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

General Soil Map Units

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

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

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

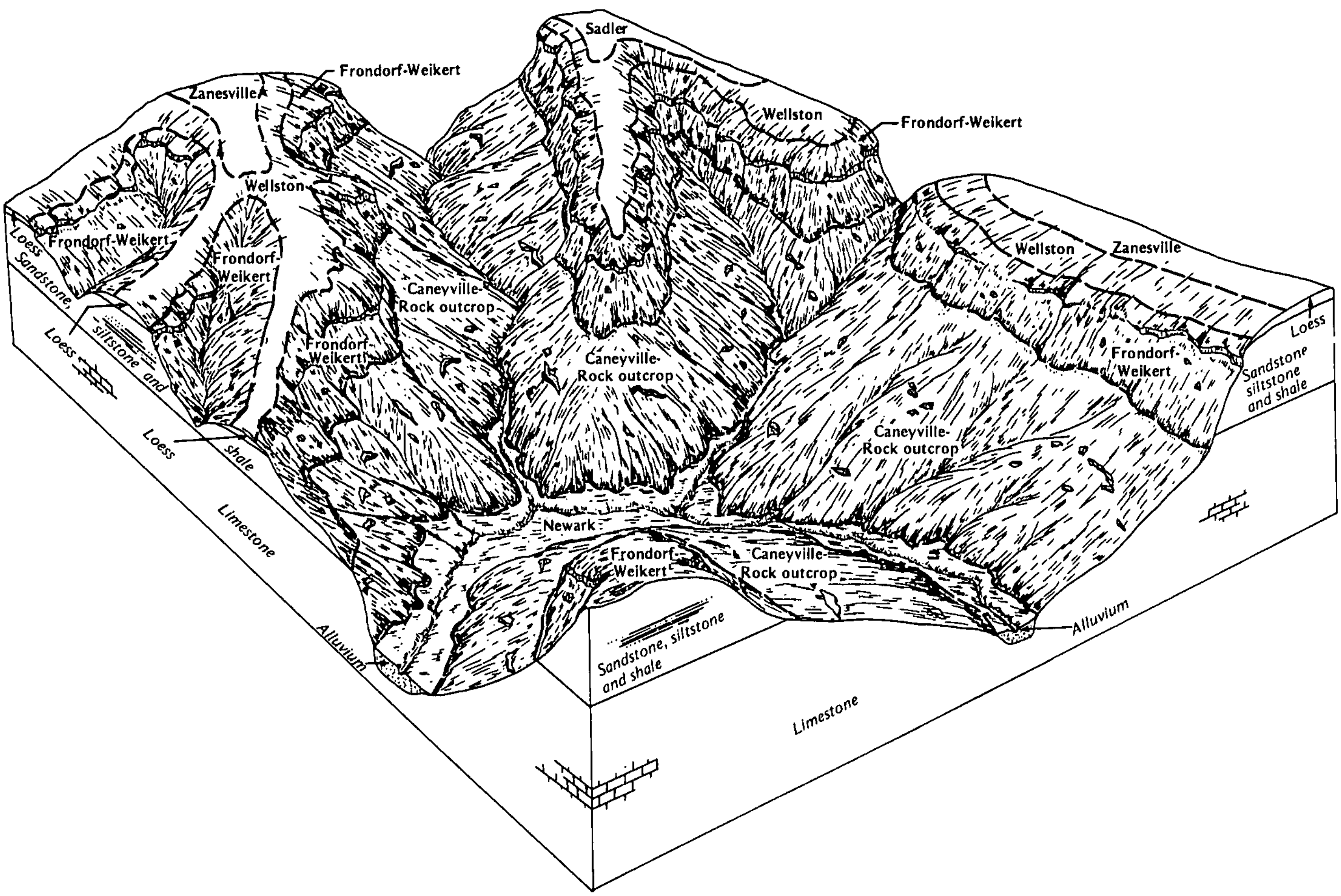


Figure 2.—Relationship of soils to topography and underlying material in the Caneyville-Frondorf-Wellston map unit.

in slope, depth, drainage, and other characteristics that affect management.

The general soil map of Todd County joins the general soil maps of the adjacent counties; however, differences in the names of the general soil map units reflect differences in composition and classification of some soil series.

Well Drained and Moderately Well Drained, Very Steep to Nearly Level Soils; Underlain by Sandstone, Siltstone, Shale, or Limestone

The three map units of this group make up about 47 percent of Todd County. Most of the acreage is in woodland or pasture, but a few areas are used for cultivated crops and hay. Steepness of slope, rock outcrops, depth to rock, and slow permeability are the main limitations for most uses.

1. Caneyville-Frondorf-Wellston

Well drained, steep to sloping, moderately deep and deep soils that are loamy and have a clayey or loamy subsoil; formed in residuum or in loess and residuum from limestone, sandstone, siltstone, or shale; on side slopes and ridges

The soils of this map unit are throughout the northern part of the county. The landscape is characterized by narrow, sloping upland ridges, sloping to steep side slopes, and narrow valleys. Rock outcrops are common on many side slopes. Geologic faults occur in the northern part of the area. The soils are underlain by Mississippian age limestone, sandstone, siltstone, or shale (fig. 2). A few perennial streams, or small rivers, and many intermittent streams are part of this map unit. Floodwater retarding structures impound water on several creeks in this map unit. Most of the ponds are embankment type. This area consists mainly of scattered farmsteads and a few small communities. Roads and farm buildings are the important structures.

This map unit makes up about 19 percent of the county. It is about 40 percent Caneyville soils, 11 percent Frondorf soils, 10 percent Wellston soils, and 39 percent soils of minor extent and Rock outcrop.

The Caneyville soils are mainly on lower side slopes but also on narrow ridgetops and benches. They contain limestone rock outcrops. The surface layer is dark yellowish brown silt loam, and the subsoil is clayey. These soils are moderately deep to bedrock and are well drained and moderately slowly permeable.

The Frondorf soils are on narrow ridgetops and upper side slopes. The surface layer is dark grayish brown silt loam, and the subsoil is loamy and has sandstone fragments in the lower part. The soils are moderately deep to bedrock and are well drained and moderately permeable.

The Wellston soils are mostly on ridgetops. The surface layer is dark grayish brown and brown silt loam, and the subsoil is loamy. These soils are deep to bedrock and are well drained and moderately permeable.

Of minor extent are the Zanesville and Sadler soils on ridgetops, the Weikert and Frondorf soils on side slopes, and the Nolin, Lindside, and Newark soils on flood plains. The Zanesville soils are well drained to moderately well drained, and the Sadler soils are moderately well drained. The Weikert and Frondorf soils are well drained, and the Nolin, Lindside, and Newark soils are well drained to somewhat poorly drained. Rock outcrop is mapped in a complex with the Caneyville soils.

The soils of this map unit are used mostly as woodland. On some gently sloping and strongly sloping areas and flood plains, they have been cleared and are used for cultivated crops or hay and pasture.

Most of the soils of this map unit are poorly suited to farming and urban uses. Steepness of slope, rock outcrops, slow permeability, and moderate depth to bedrock are the main limitations. These limitations are very difficult to overcome.

The soils of this map unit are suited to use as woodland. Steep slopes, rock outcrops, and the clayey subsoil are limitations for harvesting operations. However, some of these limitations can be eliminated by harvesting during dry periods.

2. Frondorf-Weikert-Zanesville

Well drained and moderately well drained, very steep to gently sloping, deep to shallow soils that are loamy and have a loamy subsoil; formed in loess and residuum or in residuum from sandstone, siltstone, or shale; on ridges and side slopes

The soils of this map unit are in the northeastern and west central parts of the county. The landscape is characterized by narrow, gently sloping to sloping upland ridges, moderately steep to very steep side slopes, and narrow valleys. Rock outcrops and escarpments are common on many side slopes. The soils are underlain by sandstone, siltstone, or shale of Pennsylvanian and Mississippian age (fig. 3). A few creeks and many intermittent streams are part of this map unit. Floodwater retarding structures impound water on several creeks in this map unit. Most of the ponds are embankment type. Most of this area consists of scattered farmsteads, and a few small communities. Roads and farm buildings are the important structures.

This map unit makes up about 15 percent of the county. It is about 30 percent Frondorf soils, 15 percent Weikert soils, 15 percent Zanesville soils, and 40 percent soils of minor extent.

The Frondorf soils are on sloping shoulders of hills and are intermingled with Weikert soils on moderately steep to very steep side slopes. Frondorf soils are moderately deep to bedrock and are well drained. The surface layer is dark grayish brown silt loam, and the

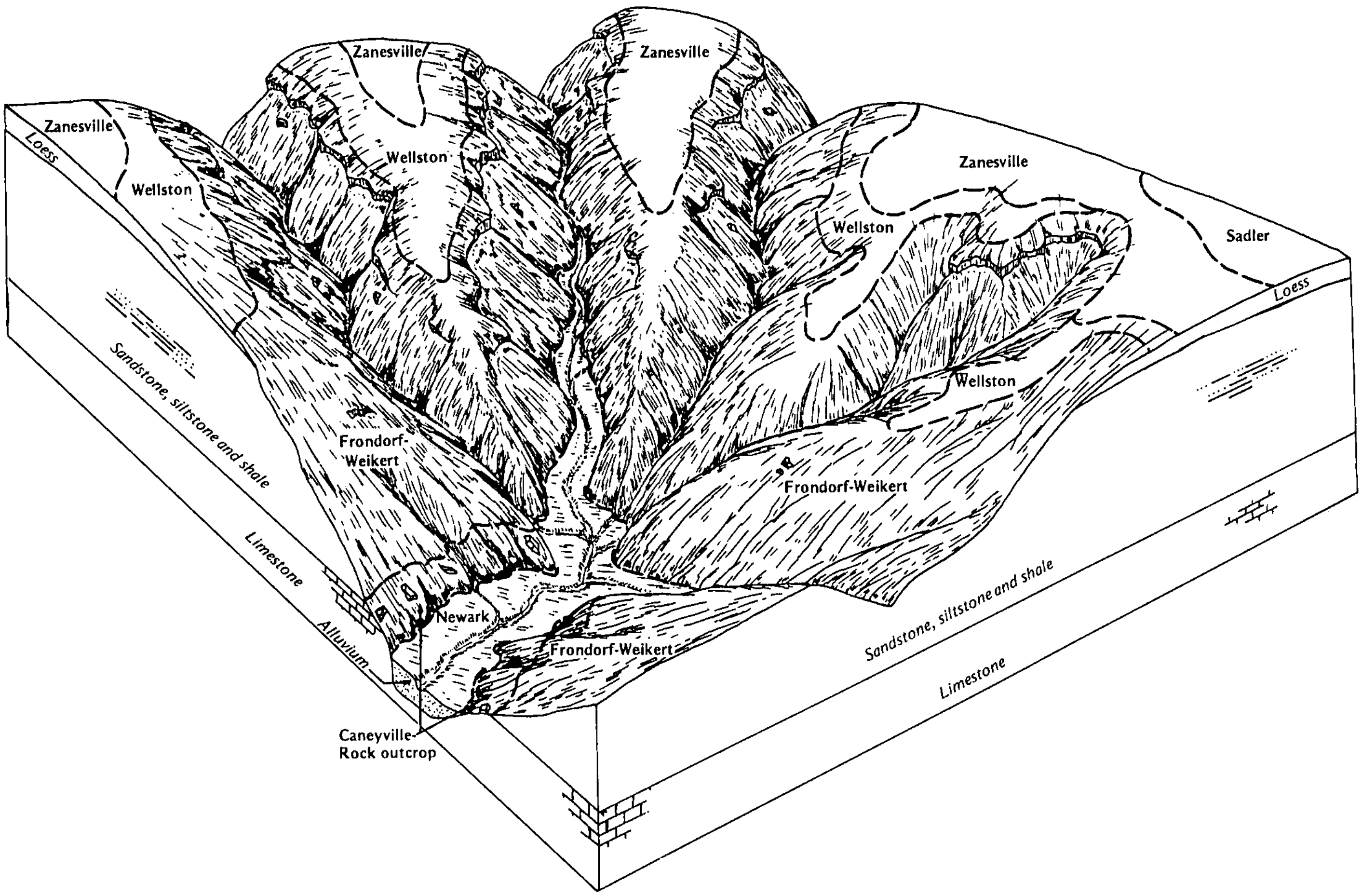


Figure 3.—Relationship of soils to topography and underlying material in the Frondorf-Weikert-Zanesville map unit.

subsoil is loamy and contains sandstone fragments in the lower part.

The Weikert soils are intermingled with Frondorf soils on moderately steep to very steep side slopes. Weikert soils generally are near rock outcrops or rock escarpments. They are shallow to bedrock and are well drained. The surface layer is dark grayish brown channery silt loam, and the subsoil is loamy and contains sandstone channers.

Zanesville soils are on narrow, gently sloping to sloping ridgetops. They are deep to bedrock, and are well drained to moderately well drained. The surface layer is dark grayish brown silt loam, and the subsoil is loamy and contains a fragipan at a depth of about 2 feet.

Of minor extent are the Wellston and Sadler soils on ridgetops; the Caneyville and DeKalb soils on side slopes; and the Newark soils on narrow flood plains. Wellston, Caneyville, and DeKalb soils are well drained, Sadler soils are moderately well drained, and Newark soils are somewhat poorly drained.

In this map unit the soils on side slopes are used mostly as woodland, and the soils on ridgetops and flood plains are used for cultivated crops or hay and pasture.

Most soils of this map unit are poorly suited to farming and urban uses. The gently sloping and sloping soils are better suited to these uses than the steeper soils. Steepness of slope and depth to bedrock are severe limitations for most uses.

These soils are suited to woodland. Steepness of slope, occasional rock outcrops, and escarpments are the main limitations.

3. Sadler-Zanesville

Moderately well drained and well drained, nearly level to sloping, deep soils that are loamy and have a loamy subsoil; formed in loess and residuum from sandstone, *siltstone, or shale; on ridges*

The soils of this map unit are in the north central and northeastern parts of the county. The landscape is characterized by broad, nearly level upland flats and sloping ridges. The soils are underlain by sandstone, siltstone, shale, and limestone bedrock of the Pennsylvanian and Mississippian age (fig. 4). Many intermittent streams are part of this map unit. Embankment ponds and dug or pit ponds are used. Most of this area consists of scattered farmsteads and a few small communities. Roads, gas and power transmission lines, and farm buildings are the important structures.

This map unit makes up about 13 percent of the county. It is about 45 percent Sadler soils, 18 percent Zanesville soils, and 37 percent soils of minor extent.

The Sadler soils are mostly on broad, nearly level to gently sloping, upland flats. They are moderately well drained. The surface layer is brown silt loam, and the subsoil is loamy and has a slowly permeable fragipan at a depth of about 2 feet.

The Zanesville soils are on gently sloping, narrow ridges and sloping side slopes. They are well drained to moderately well drained. The surface layer is dark grayish brown silt loam. The subsoil is loamy and has a slowly permeable fragipan at a depth of about 2 feet.

Of minor extent are the Wellston, Frondorf, Weikert, and Caneyville soils on uplands; the Nolin and Newark soils on flood plains; and the Johnsburg soils on stream terraces and uplands. The Wellston, Frondorf, Weikert, Caneyville, and Nolin soils are well drained, and the Newark and Johnsburg soils are somewhat poorly drained.

The soils of this map unit are used mainly as cropland or pasture and hay. In the wetter areas, they are used as woodland.

The soils are suited to most crops commonly grown in the area, including corn, soybeans, wheat, tobacco, hay,

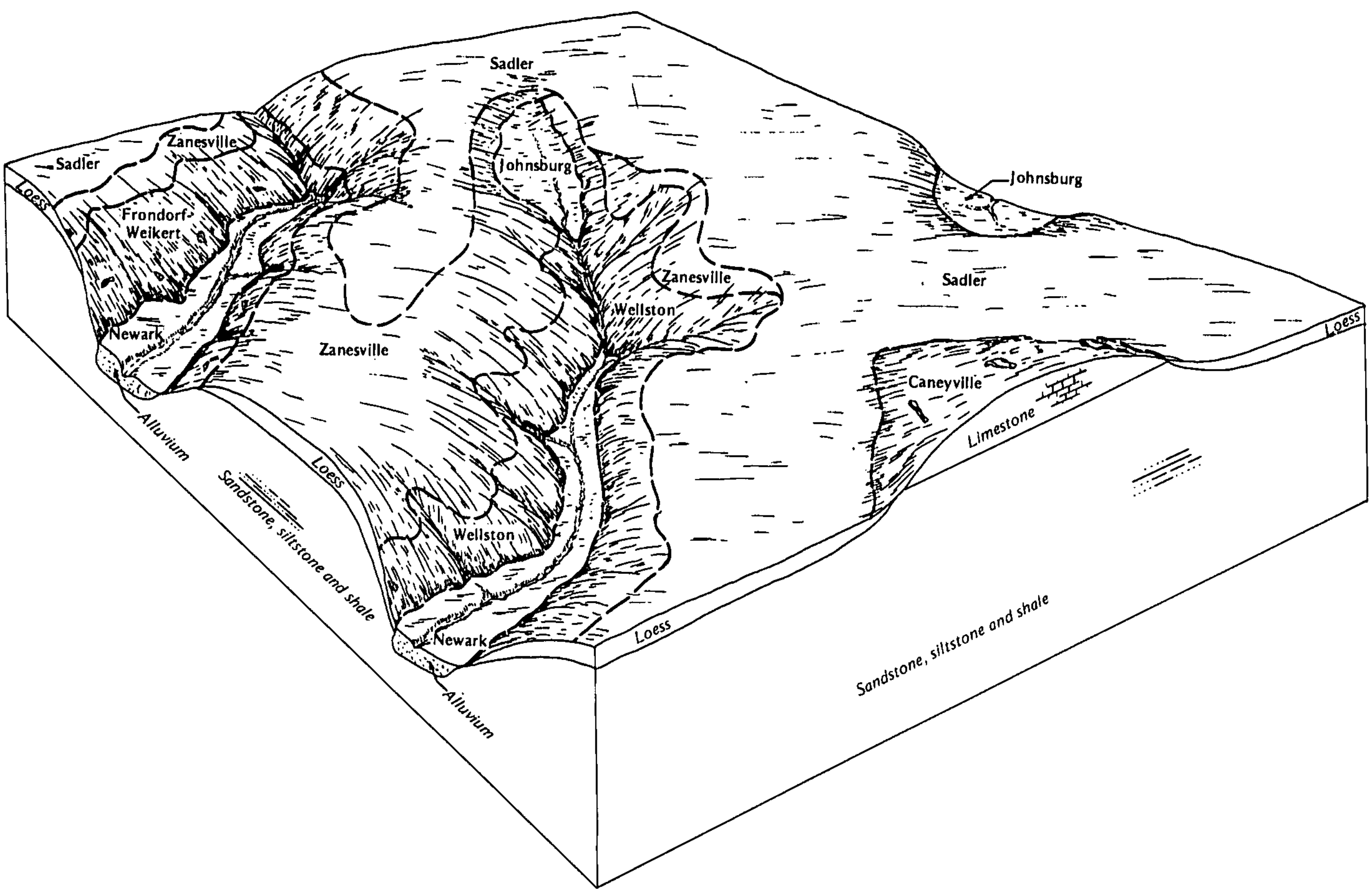


Figure 4.—Relationship of soils to topography and underlying material in the Sadler-Zanesville map unit.

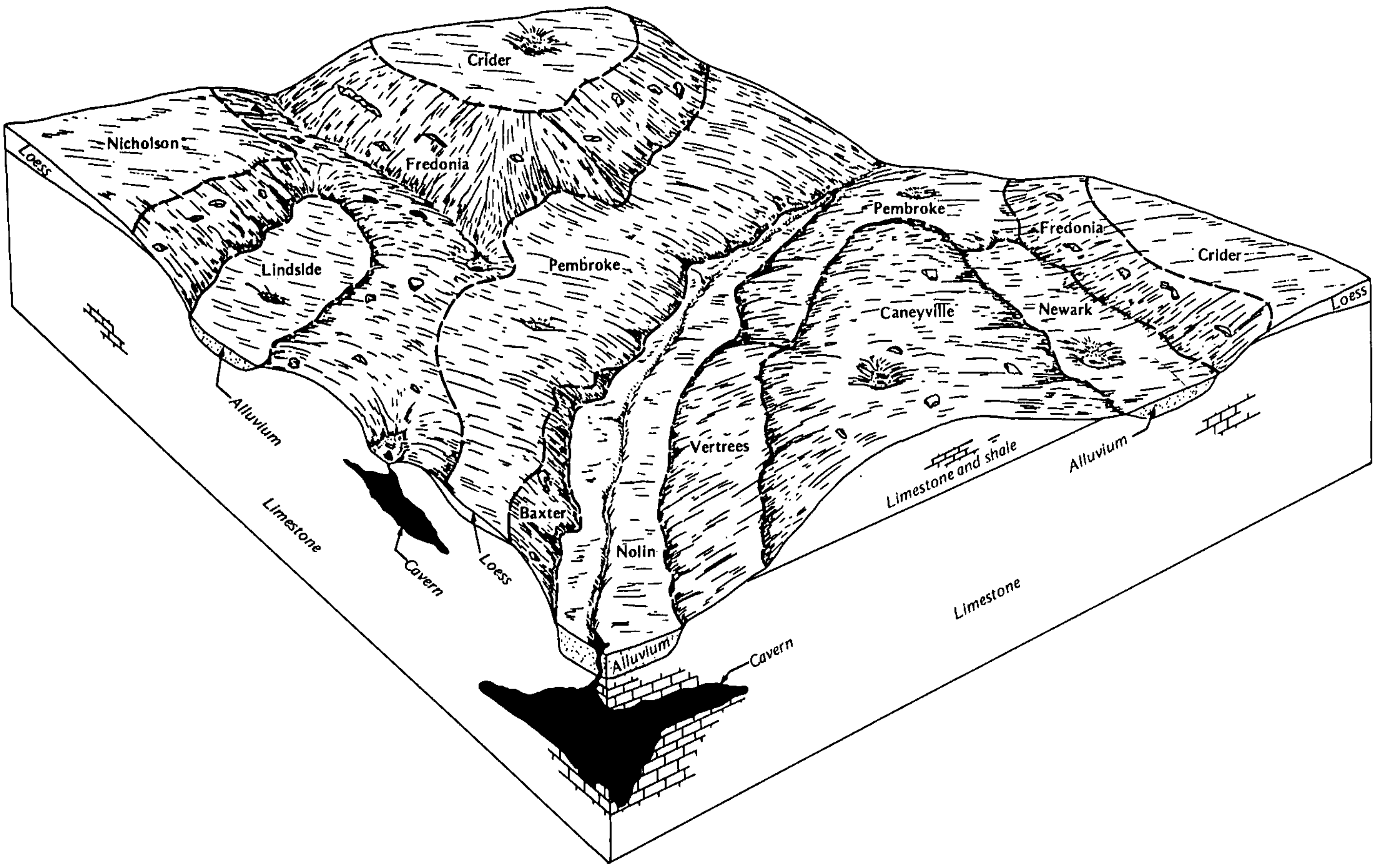


Figure 5.—Relationship of soils to topography and underlying material in the Fredonia-Pembroke-Caneyville map unit.

and pasture. The gently sloping and sloping soils are subject to erosion, and erosion control practices are needed if the soils are cultivated. Wetness, slow permeability, and a moderately deep rooting depth are also limitations for farming.

These soils are well suited to woodland. Because of the wetness and slow permeability, these soils are poorly suited to most urban uses.

Well Drained to Poorly Drained, Nearly Level to Moderately Steep Soils; Underlain by Limestone

The five map units of this group make up about 53 percent of Todd County. Most of the acreage is in cultivated crops or pasture and hay. A few scattered tracts are in woodland. Wetness, slow permeability, steepness of slope, depth to rock, and rock outcrops are the main limitations for most uses.

4. Fredonia-Pembroke-Caneyville

Well drained, gently sloping and sloping, moderately deep and deep soils that are loamy and have a loamy or clayey subsoil; formed in residuum or in loess and residuum from limestone; on broad karst upland plains

The soils of this map unit are in the central part of the county. The landscape is characterized by broad, undulating plains and rolling, karst areas. The soils are underlain by Mississippian age limestone (fig. 5). Intermittent streams and cavernous sinks provide drainage. The ponds are mostly dug or pit ponds. Scattered farmsteads and a few small communities are throughout the area. Roads and farm buildings are the important structures.

This map unit makes up about 3 percent of the county. It is about 26 percent Fredonia soils, 24 percent Pembroke soils, 11 percent Caneyville soils, and 39 percent soils of minor extent.

The Fredonia soils are mostly in karst rolling areas. They are moderately deep. The surface layer is dark brown silt loam that has a few rock outcrops. The subsoil is clayey.

The Pembroke soils are deep and are on broad upland plains between areas of Fredonia and Caneyville soils. The surface layer is dark brown silt loam, and the subsoil is loamy in the upper part and clayey in the lower part.

The Caneyville soils are on sloping ridges or are intermingled with Fredonia soils in karst areas. They are moderately deep. The surface layer is generally dark yellowish brown silt loam, but in severely eroded areas, it is silty clay. The subsoil is clayey.

Of minor extent are the Crider, Vertrees, and Nicholson soils on uplands and the Nolin and Lindside soils on flood plains and in upland depressions. Crider, Nolin, and Vertrees soils are well drained, and Nicholson and Lindside soils are moderately well drained.

The soils of this map unit are used mostly as cropland or hay and pasture. In a few areas, they are used as woodland. Some areas are idle.

The soils are suited to hay and pasture. They are also suited to cultivated crops and specialty crops. The moderate depth to bedrock, hazard of erosion, clayey subsoil, and rock outcrops are limitations for cultivated crops and specialty crops.

The soils in this map unit are suited to use as woodland.

These soils are suited to urban uses. The moderate depth to bedrock, low strength and hazard of erosion are limitations, but they can be overcome by careful planning and good design.

5. Pembroke-Nicholson-Crider

Well drained and moderately well drained; nearly level to sloping, deep soils that are loamy and have dominantly a

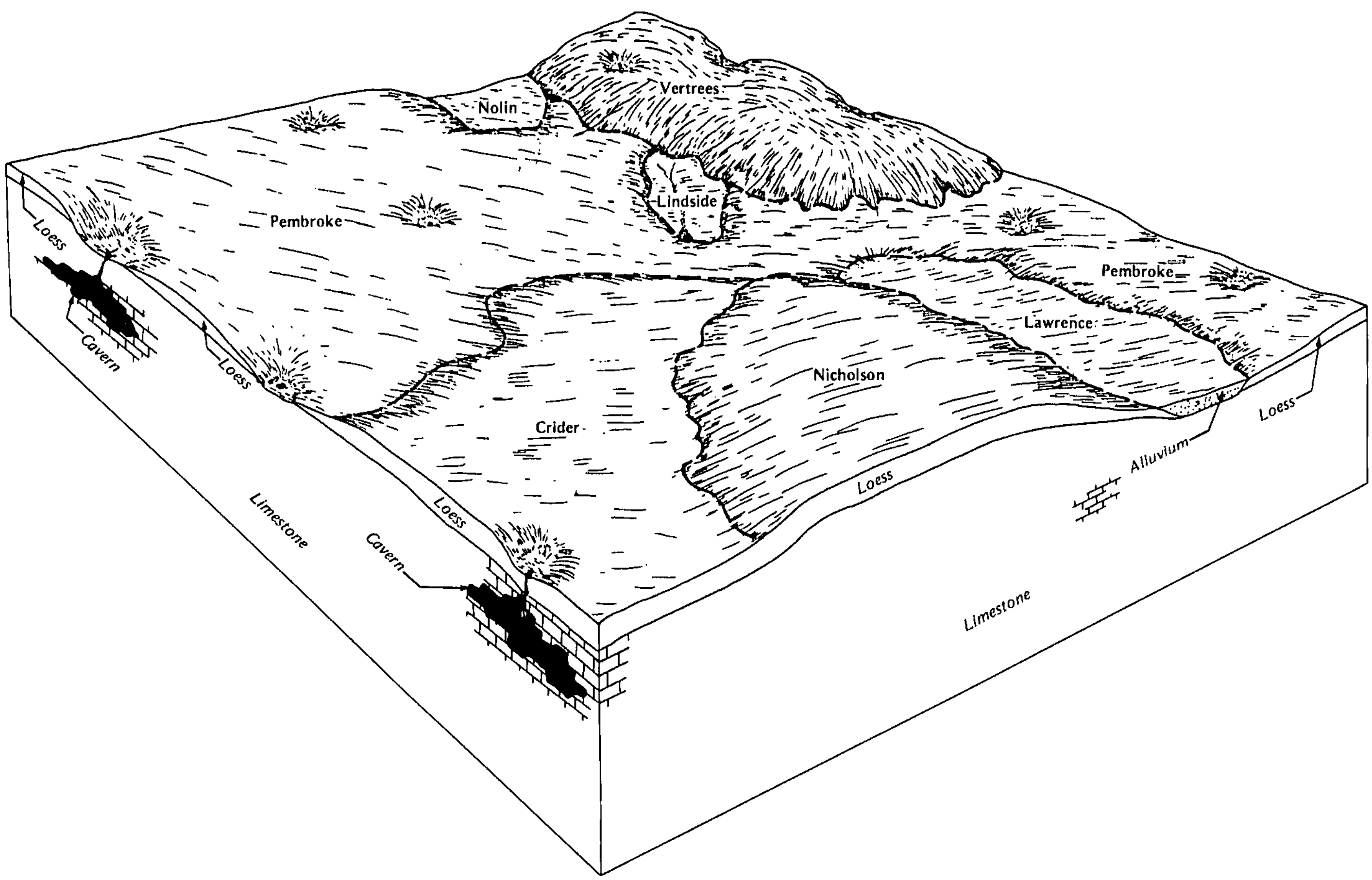


Figure 6.—Relationship of soils to topography and underlying material in the Pembroke-Nicholson-Crider map unit.

loamy subsoil; formed in loess and residuum from limestone; on broad upland plains

The soils of this map unit dominate most of the southern half of the county. The landscape is characterized by broad, undulating, upland plains and rolling, karst topography. The soils are underlain by limestone bedrock of Mississippian age (fig. 6). A few creeks or perennial streams, intermittent streams, and cavernous sinks provide drainage. Ponds are mostly dug or pit. Scattered farmsteads, many small communities and most of the larger towns in the county are constructed on these soils. A small air field, roads, railroads, oil transmission lines, factories, urban buildings, and farm buildings are the important structures.

This map unit makes up about 38 percent of the county. It is about 42 percent Pembroke soils, 15 percent Nicholson soils, 13 percent Crider soils, and 30 percent soils of minor extent.

The Pembroke soils are mostly on broad, nearly level to gently sloping plains and in rolling, karst areas. They are well drained and moderately permeable. The surface layer is dark brown silt loam, and the subsoil is loamy in the upper part and clayey in the lower part.

The Nicholson soils are mostly on broad, smooth ridges. They are moderately well drained. Permeability is moderate above the fragipan and slow in the fragipan. The surface layer is brown silt loam, and the subsoil is loamy and has a fragipan at a depth of about 2 feet.

The Crider soils are on broad, smooth, nearly level to sloping ridges and plains. They are well drained and moderately permeable. The surface layer is brown silt loam, and the subsoil is loamy.

Of minor extent are the Hammack, Baxter, and Vertrees soils on karst uplands; the Lawrence soils in upland depressions or on stream terraces; and the Nolin and Lindside soils on flood plains and in upland depressions. The Hammack, Baxter, Vertrees, and Nolin soils are well drained, the Lawrence soils are somewhat poorly drained, and the Lindside soils are moderately well drained.

The soils of this map unit are used extensively for cultivated crops, specialty crops, and hay and pasture. In a few areas, they remain in use as native woodland.

These soils are well suited to most farm uses. Erosion is a hazard. Most farms in the area use an intensive cropping system that produces 3 crops in 2 years. By using conservation tillage farming methods, this intensive cropping system can be used without severe erosion losses.

These soils are well suited to woodland. Plant competition is the main concern in management.

The soils of this map unit are well suited to most urban uses. Slope, wetness, and the clayey texture of the subsoil are the main limitations. Most of these limitations can be overcome by good design and installation.

6. Hammack-Baxter-Crider

Well drained, gently sloping to moderately steep, deep soils that are loamy and have a loamy or clayey subsoil; formed in loess and residuum or in residuum from cherty limestone; on karst upland plains

The soils of this map unit are in the southwestern and southeastern parts of the county. The landscape is characterized by karst, rolling, upland plains. The soils are underlain by cherty limestone bedrock of Mississippian age (fig. 7). Cavernous sinks provide most of the drainage; however, a few perennial streams dissect the areas. Ponds are mostly dug or pit. Scattered farmsteads make up most areas of this map unit. Roads and farm buildings are the important structures.

This map unit makes up about 6 percent of the county. It is about 23 percent Hammack soils, 21 percent Baxter soils, 20 percent Crider soils, and 36 percent soils of minor extent.

The Hammack soils are generally intermingled with Baxter soils on narrow ridges around cavernous sinks. The surface layer is brown silt loam, and the subsoil is loamy in the upper part, clayey in the lower part, and contains chert. The Hammack soils are deep, well drained, and moderately permeable.

The Baxter soils are intermingled with Hammack soils on side slopes around cavernous sinks in karst areas. The surface layer is brown cherty silt loam, and the subsoil is cherty and clayey. The Baxter soils are deep, well drained, and moderately permeable.

The Crider soils are on broad ridges between karst areas. The surface layer is brown silt loam, and the subsoil is loamy. These soils are deep, well drained, and moderately permeable.

Of minor extent are the Pembroke and Nicholson soils on adjoining ridges; the Vertrees soils on karst, irregular side slopes; the Elk soils on stream terraces; and the Nolin soils on flood plains and in upland depressions. The Pembroke, Vertrees, Elk, and Nolin soils are well drained, and the Nicholson soils are moderately well drained.

The soils of this map unit are used for pasture, hay, and cultivated crops. In a few areas, they are used as woodland.

These soils are suited to cultivated crops and specialty crops. The hazard of erosion and chert fragments on the surface are the main limitations. Erosion control practices are needed if the soils are to be cultivated. In areas where irregular slopes prevent the use of some erosion control practices, the soils are better suited to hay and pasture than to row crops.

The soils of this map unit are suited to woodland. Plant competition is the main concern in management.

The soils in this map unit are suited to most urban uses. Steepness of slope, moderate shrink-swell potential, and the high clay content in the subsoil are the main limitations.

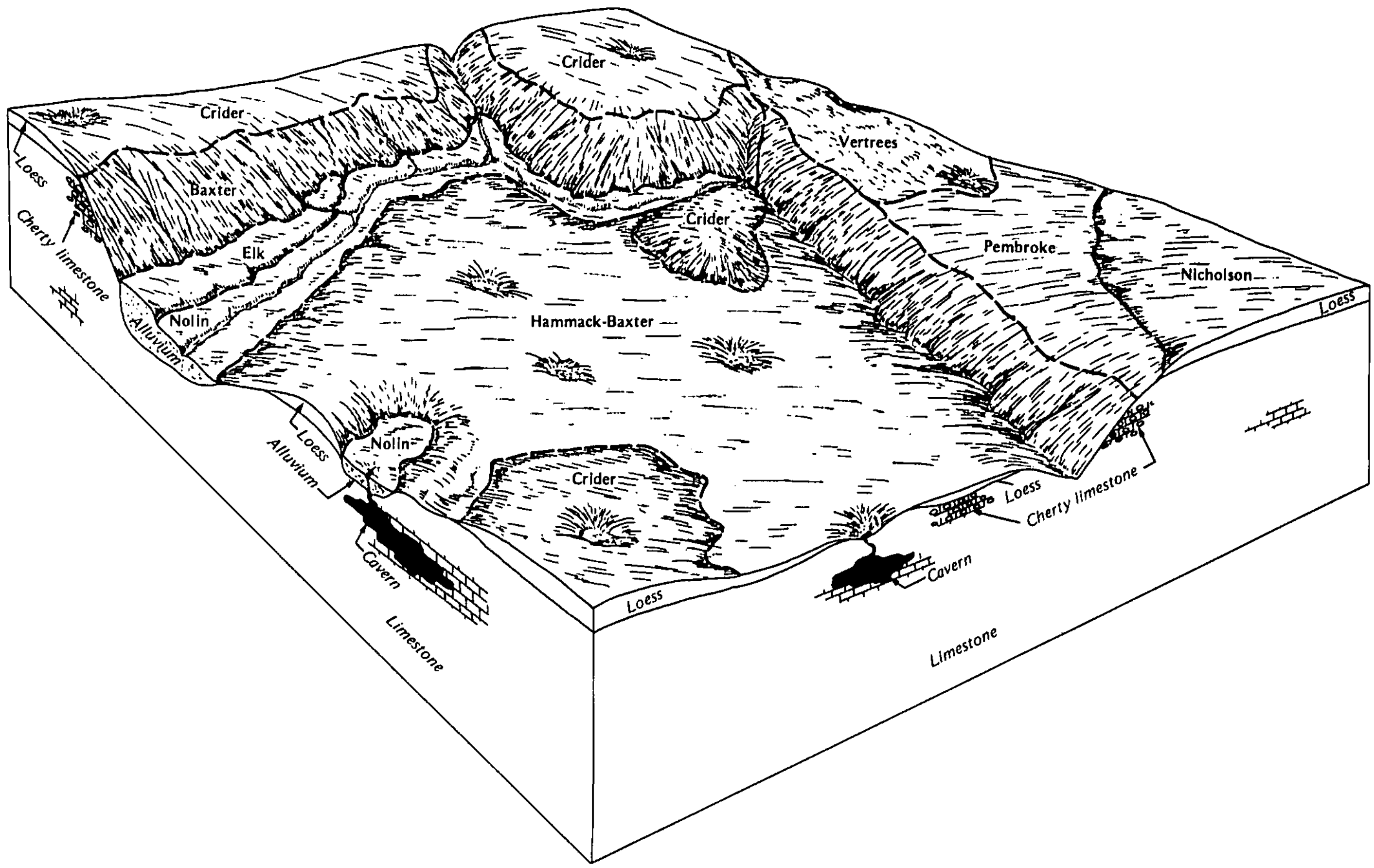


Figure 7.—Relationship of soils to topography and underlying material in the Hammack-Baxter-Crider map unit.

7. Pembroke-Vertrees

Well drained, nearly level to sloping, deep soils that are loamy and have a loamy or clayey subsoil; formed in loess and residuum or in residuum from limestone; on karst upland plains

This map unit is in the southeastern part of the county. The landscape is characterized by karst, rolling, upland areas and broad, gently sloping, interconnecting ridges. The soils are underlain by limestone bedrock of Mississippian age (fig. 8). Cavernous sinks provide most of the drainage; however, a perennial stream dissects the area. Ponds are mostly dug or pit. Scattered farmsteads and a few small communities are constructed on these soils. Roads, railroads, and farm buildings are the important structures.

This map unit makes up about 3 percent of the county. It is about 45 percent Pembroke soils, 26 percent Vertrees soils, and 29 percent soils of minor extent.

The Pembroke soils are on broad, nearly level to sloping ridges. The surface layer is dark brown silt loam, and the subsoil is loamy in the upper part and clayey in the lower part. Permeability is moderate.

The Vertrees soils are on irregular side slopes along streams and in karst areas. The surface layer is reddish brown silty clay loam, and the subsoil is clayey. Permeability is moderately slow.

Of minor extent are the Hammack and Baxter soils in karst areas, the Crider soils on broad upland ridges, the Elk soils on stream terraces, and the Nolin and Lindside soils on flood plains and in upland depressions. The Hammack, Baxter, Crider, Elk, and Nolin soils are well drained, and the Lindside soils are moderately well drained.

The soils of this map unit are used mostly for cultivated crops, specialty crops, and hay and pasture. In a few areas, they are used as woodland.

These soils are suited to cultivated crops and specialty crops and well suited to hay and pasture. Erosion is a hazard. In areas of karst topography where slopes are irregular and some erosion control practices are difficult to apply, the soils are better suited to hay and pasture than to cultivated crops.

The soils in this map unit are well suited to woodland. Plant competition is a concern in management.

The soils of this map unit are suited to urban uses. The clayey texture of the subsoil, hazard of erosion, and moderate shrink-swell potential are the main concerns.

8. Robertsville-Lawrence

Poorly drained and somewhat poorly drained, nearly level, deep soils that are loamy and have a loamy subsoil; formed in alluvium or colluvium; on concave upland basins or stream terraces

The soils of this map unit are in the southern part of the county. The landscape is characterized by concave upland basins and nearly level stream terraces. The soils are underlain by limestone bedrock of Mississippian age. A few intermittent streams are part of this map unit. A few ponds, mostly dug or pit, are part of the map unit. Very few farmsteads are in areas of this map unit. Roads and urban buildings are the important structures.

This map unit makes up about 3 percent of the county. It is about 54 percent Robertsville soils, 20 percent Lawrence soils, and 26 percent soils of minor extent.

The Robertsville soils are mostly in concave basins and along sluggish streams. They are poorly drained. The surface layer is very dark gray silt loam, and the subsoil is loamy and has a slowly permeable fragipan at a depth of about 1.5 feet. Clayey material is about 4 feet below the surface.

The somewhat poorly drained, Lawrence soils are on slightly higher stream terraces and on nearly level plains between areas of Robertsville soils. They are somewhat poorly drained. The surface layer is dark grayish brown silt loam, and the subsoil is loamy and has a slowly permeable fragipan at a depth of about 2 feet.

The Robertsville and Lawrence soils are deep to bedrock and moderately slowly permeable. They are

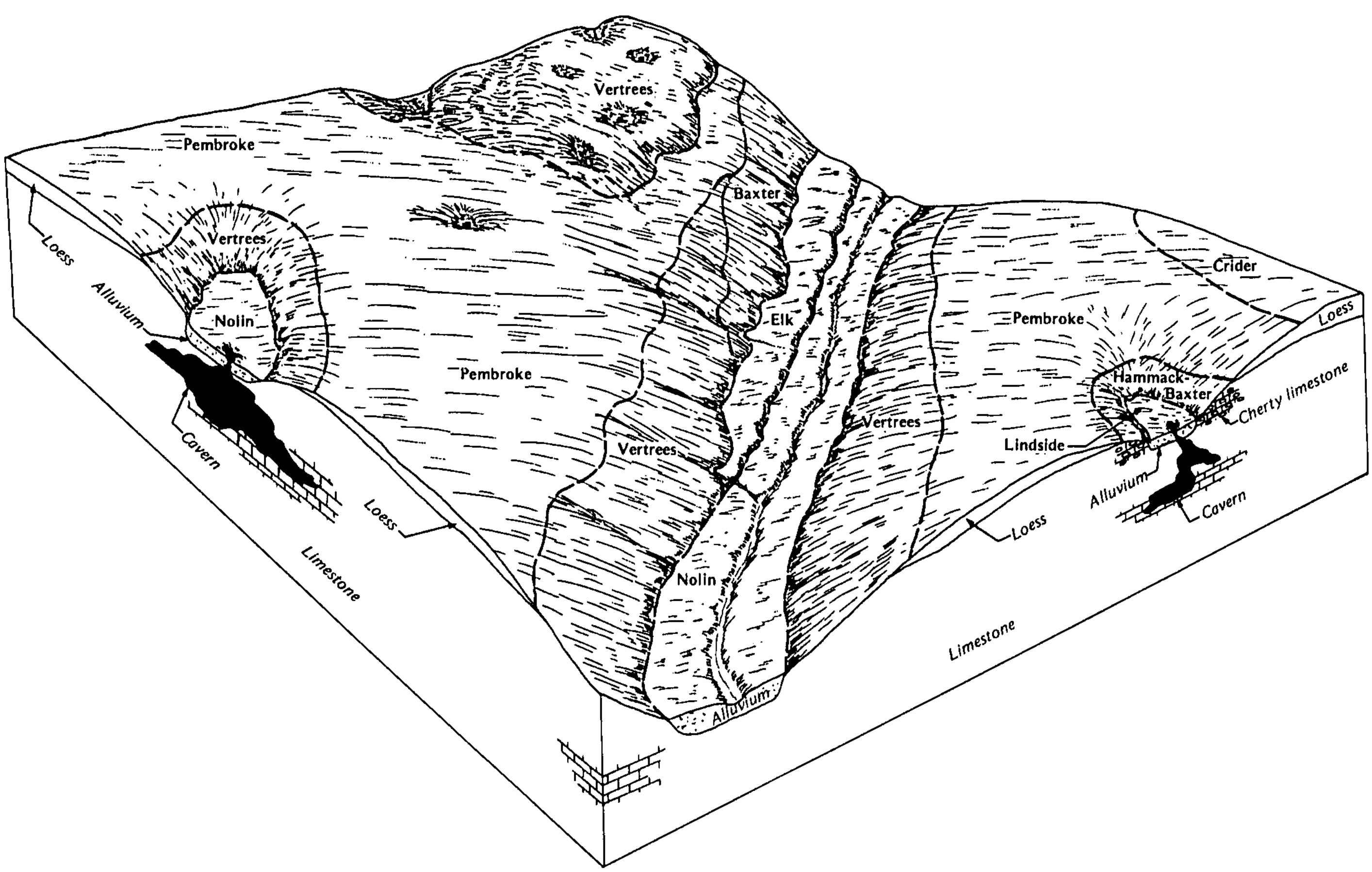


Figure 8.—Relationship of soils to topography and underlying material in the Pembroke-Vertrees map unit.

subject to occasional flooding and are saturated for long periods during winter and spring.

Of minor extent are the Crider, Pembroke, and Nicholson soils on uplands, and the Newark soils on flood plains. The Crider and Pembroke soils are well drained, the Nicholson soils are moderately well drained, and the Newark soils are somewhat poorly drained.

The soils of this map unit are used mainly for farming. In areas that have been drained, they are used mostly for soybeans (fig. 9). In a few areas, these soils are used as pasture, and some of the large basins are still in woodland.

Unless drained, these soils are poorly suited to farming and most other uses. They are well suited to use as woodland. Wetness is the main limitation for most uses. Flooding and ponding delay planting and harvesting of crops. The soils that have outlets and are adequately drained are better suited to crops. Flooding and a seasonal high water table are severe limitations for most urban uses.

Broad Land Use Considerations

Decisions about how the land in Todd County will be used are becoming more important every year. As the county grows more and more land is being converted from farmland to urban and industrial uses. Most of this converted land is used for house sites and industrial sites along the major roads and near the small towns. An increasing number of people who work in industries in the adjacent counties are buying lots or small tracts for residences.

The general soil map is helpful in making broad land use decisions; however, it can not be used for the selection of specific sites for various structures. The section "Detailed Soil Map Units" and the section "Use and Management of the Soils" are more helpful in the selection of specific sites.

In Todd County some areas are well suited to cultivated crops or urban uses, while other areas are more suited to woodland, wildlife, or recreation. In general those areas that are well suited to farming are also well suited to urban development. Soils in the

Figure 9.—Soybeans are one of the main crops grown in the Robertsville-Lawrence map unit. If adequately drained, these soils are suited to row crops.

Pembroke-Nicholson-Crider unit are well suited to cultivated crops and most areas are intensively farmed. This unit is also well suited to urban development. Wetness, however, is a limitation on the Nicholson soil. The Hammack-Baxter-Crider and Pembroke-Vertrees units are also suited to urban development; however, steepness of slope and the clayey texture of the subsoil are limitations for some urban uses.

Some parts of the county are unsuited to urban development. Flooding is a severe limitation on the Robertsville-Lawrence map unit and on soils on flood plains in the other map units. Steep soils that have hard bedrock within a few feet of the surface are in the Caneyville-Frondorf-Wellston and Frondorf-Weikert-Zanesville map units. Urban development is very costly on these soils.

Many parts of the county can be developed without excessive costs. Some areas of the Caneyville-Frondorf-Wellston and Frondorf-Weikert-Zanesville units are less steep than others. The Sadler-Zanesville and Fredonia-Pembroke-Caneyville units are also suitable for urban uses. Most of the soils in these two units, however, have some limitations for urban uses. The Sadler and Zanesville soils have a slowly permeable fragipan that is a severe limitation for septic tank absorption fields. The Fredonia and Caneyville soils are also moderately slowly permeable and they are only moderately deep to bedrock.

Most of the soils in Todd County are suitable for woodland; however, it is more economical to use the most productive soils for farming. The largest acreage of woodland is in the Caneyville-Frondorf-Wellston and Frondorf-Weikert-Zanesville map units. Other areas of woodland are in the wetter areas of the Robertsville-Lawrence map unit, and in scattered tracts throughout the county.

All of the map units in the county have habitat elements suitable for providing food and cover for a variety of wildlife. Most of the map units have good potential as habitat for openland or woodland wildlife. Undrained areas of the Robertsville-Lawrence map unit have good potential as habitat for wetland wildlife.

Soils throughout the county can be used for recreational purposes. Most of the soils on uplands are suitable for extensive and intensive recreational uses. The steeper areas, however, are poorly suited to intensive recreational uses because of the steep slopes and moderate depth to bedrock. The more gently sloping soils are better suited to intensive recreational uses. The soils on flood plains and terraces are well suited to extensive recreational uses but they are not as well suited to intensive recreational uses. These soils are limited because of the hazard of flooding and wetness.

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, Wellston silt loam, 2 to 6 percent slopes, is one of several phases in the Wellston series.

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Hammack-Baxter 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. Rock outcrop 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.

The detailed soil map units in Todd County join with most of the detailed soil map units in the adjacent counties. However, a few map units in Logan County, Kentucky, and Montgomery and Robertson Counties, Tennessee, do not join. These differences reflect changes in the concept and classification of some soil series and different combinations of some map units. Some small map units in Robertson and Montgomery Counties, Tennessee, could not be joined with those of Todd County because of the scale selected for mapping.

BaD—Baxter cherty silt loam, 12 to 20 percent slopes. This soil is deep, well drained, and moderately steep. It is on side slopes and ridgetops of karst limestone uplands. Slopes are irregular and generally dissected by drainageways. Areas of this map unit range from 4 to 60 acres.

Typically, the surface layer is brown cherty silt loam about 9 inches thick. The subsoil extends to a depth of 65 inches. It is strong brown cherty silty clay loam in the upper 7 inches, yellowish red cherty silty clay between depths of 16 and 32 inches, and dark red cherty silty clay and cherty clay to a depth of 65 inches.

This soil has medium natural fertility, and the permeability is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. Surface runoff is rapid. The root zone is deep, and the available water capacity is high. The organic matter content in the surface layer is moderate. The soil has only fair tilth because of the chert fragments; however, it can be worked throughout a wide range of moisture content. The shrink-swell potential is moderate.

Included with this soil in mapping are a few small areas of Vertrees soils and a soil that has a thin silt mantle underlain by cherty residuum. Also included are a few severely eroded areas of this Baxter soil, a few small areas that have slopes of more than 20 percent, and a few areas that have slopes of less than 12 percent. A few areas of a soil that have less than 15 percent chert content, by volume, are also included. The included soils make up about 20 percent of the map unit. Individual areas are less than 4 acres.

This Baxter soil is used mainly as pasture and hayland and as woodland. In a few areas, it is used occasionally for cultivated crops.

This soil is poorly suited to cultivated crops. The content of chert fragments in the surface layer and moderately steep slopes cause problems in preparing a seedbed. The hazard of erosion is very severe when this soil is cultivated.

This soil is suited to hay and pasture. The very severe erosion hazard and rapid runoff are the major concerns in management. Most grasses and legumes that are grown in the area grow well, including deep-rooted plants such as alfalfa. Proper seeding rates and mixtures, lime and fertilizer, rotation grazing, and renovation of old stands without turning the soil help to produce good yields while controlling erosion.

This soil is well suited to use as woodland, and productivity is high. Trees suitable for planting include black oak, chestnut oak, white oak, yellow-poplar, eastern white pine, Virginia pine, loblolly pine, and shortleaf pine. The hazard of erosion, equipment limitations, and plant competition are concerns in producing and harvesting good quality timber.

This soil is poorly suited to most urban uses. The moderately steep slope is a severe limitation that is difficult and costly to overcome. Low strength is a limitation for local roads and streets.

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

CaB—Caneyville silt loam, 2 to 6 percent slopes. This soil is moderately deep, well drained, and gently sloping. It is on narrow ridgetops and benches of the uplands in the northern part of the county and is underlain by limestone. Slopes are smooth and convex. A few areas are karst and some areas have an occasional rock outcrop. Areas of this map unit range from 4 to 25 acres.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of about 33 inches. It is yellowish red silty clay to a depth of 30 inches and dark yellowish brown clay below that. Limestone bedrock is at a depth of 33 inches.

This soil has medium natural fertility. It is very strongly acid to neutral in the surface layer and upper part of the subsoil, and medium acid to mildly alkaline in the lower part. The root zone is moderately deep. Permeability is moderately slow, and the available water capacity is moderate. Surface runoff is medium. The surface layer is moderate in organic matter content, and tilth is good. The shrink-swell potential is moderate. Bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are a few small areas of Fredonia soils and some areas of soils that are less than 20 inches or more than 40 inches deep to bedrock. The included soils make up about 15 percent of the map unit. Individual areas are generally less than 3 acres.

This Caneyville soil is used mainly as hayland and pasture and as cropland. In a few areas, it is used as woodland.

This soil is suited to cultivated crops, small grains, and hay and pasture. In most years this soil produces good yields. The moderate depth to bedrock and the clayey subsoil, however, are limitations for some uses. Crop residue returned to the soil, cover crops, lime and fertilizer, and rotation to pasture or hay reduce runoff, help to control erosion, maintain organic matter content, and improve tilth.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include Virginia pine, eastern white pine, loblolly pine, white oak, black oak, and white ash. Plant competition and trafficability for logging equipment are limitations for woodland use and management.

This soil is poorly suited to most urban uses. Moderate depth to bedrock and shrinking and swelling of the soil are the main limitations. Some of these limitations can be overcome by good design and proper installation. This soil has severe limitations for septic tank absorption fields because of the depth to bedrock and moderately slow permeability. These limitations are difficult to overcome.

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

CaC—Caneyville silt loam, 6 to 12 percent slopes. This soil is moderately deep and well drained. It is on ridgetops, benches, and side slopes of the uplands and is underlain by limestone. Most areas of this soil are in the northern part of the county. Slopes are smooth and irregular and are dissected by drainageways. Some areas have a few rock outcrops. Areas of this map unit range from 5 to 130 acres.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is yellowish red silty clay to a depth of 30 inches and dark yellowish brown clay to a depth of 33 inches. Bedrock of hard, gray limestone is below that.

This soil has medium natural fertility. It is very strongly acid to neutral in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part. The root zone is moderately deep. Permeability is moderately slow, and the available water capacity is moderate. Surface runoff is moderately rapid. The surface is moderate in organic matter content, and tilth is moderately good. The shrink-swell potential is moderate. Bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are soils that are yellowish brown and clayey and are less than 20 inches to limestone bedrock, small areas of a soil similar to Caneyville soil but is more than 40 inches to bedrock, a few small areas of Wellston soils, and areas of a clayey soil that developed from shale and is yellowish brown to gray. Also included is some Caneyville soil that has slopes of more than 12 percent. The included soils make up about 15 to 20 percent of the map unit. Individual areas are generally less than 4 acres.

This Caneyville soil is used mainly as hayland and pasture and as woodland. In a few areas, it is used for cultivated crops.

This soil is poorly suited to cultivated crops. The severe hazard of erosion, and the irregular slopes are limitations. The moderate depth to bedrock and clayey subsoil limit the available water capacity. Contour tillage is difficult to apply in some areas of this soil because of irregular slopes. Conservation tillage, contour cultivation, crop residue returned to the soil, cover crops, and the use of grasses and legumes in the cropping system help to control erosion and improve tilth.

This soil is suited to pasture and hay. Limitations are the moderate available water capacity and depth to bedrock. Crops respond well to lime and fertilizer. Proper seeding mixtures and rates, rotation grazing, and renovation of old stands help to produce good yields.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include white oak, black oak, white ash, Virginia pine, eastern white pine, and loblolly pine. The use of logging equipment is limited by the clayey subsoil. Plant competition is moderate in establishing new stands.

This soil is poorly suited to most urban uses because of the moderate depth to bedrock, slope, and moderate shrink-swell potential. Most of these limitations can be overcome by good design and proper installation. Depth to bedrock and moderately slow permeability are severe limitations for septic tank absorption fields. These limitations are difficult to overcome.

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

CnD3—Caneyville silty clay, 6 to 20 percent slopes, severely eroded. This soil is moderately deep, well drained, and sloping to moderately steep. It is on ridgetops and side slopes of the uplands and is underlain by limestone. Most areas are in the northern part of the county. Because of past erosion, most of the original topsoil has been removed and small gullies are common. Some areas have a few rock outcrops. Slopes are smooth, irregular, and dissected by drainageways. Areas of this map unit range from 6 to 160 acres.

Typically, the surface layer consists mainly of subsoil and is reddish brown silty clay about 5 inches thick. The subsoil extends to a depth of 28 inches. It is yellowish red silty clay to a depth of 25 inches and dark yellowish brown clay below that. Limestone bedrock is at a depth of 28 inches.

This soil has low natural fertility. Reaction ranges from very strongly acid to neutral in the surface layer and the upper part of the subsoil, and from medium acid to mildly alkaline in the lower part. The root zone is moderately deep, permeability is moderately slow, and the available water capacity is moderate. Surface runoff is rapid. The surface is low in organic matter content, and tilth is poor. This soil is very difficult to work without clodding and crusting because of the low organic matter content and the clayey texture. The shrink-swell potential is moderate. Bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are a few areas of clayey soils less than 20 inches to bedrock, a few areas of Caneyville soils that are not eroded, and a few areas of Wellston and Frondorf soils that are severely eroded. A few areas of a clayey soil that developed from shale and is yellowish brown to gray are also included. The included soils make up less than 20 percent of the map unit.

This Caneyville soil is mainly in second growth timber, or in scrub pasture, or it is idle. In a few areas, this soil has been renovated to pasture land.

This soil is not suited to cultivated crops and small grains. It is suited to pasture and hay. The severe hazard of erosion, poor tilth, low organic matter content, and irregular terrain are limitations in establishing and maintaining good pasture and for equipment use. Land smoothing before seeding is desirable in some areas. Because of the erosion hazard and poor tilth, pasture or hay need to be seeded late in summer or early in fall. This soil responds well to proper levels of fertilizer and lime. Good cover needs to be established quickly, and overgrazing should be avoided.

This soil is suited to use as woodland, and productivity is moderate. Trees suitable for planting include black oak, white oak, Virginia pine, and loblolly pine. The hazard of erosion and seedling mortality are moderate. Equipment use is severely limited on the steeper slopes.

This soil is poorly suited to most urban uses. The moderate depth to bedrock, moderately slow permeability, moderate shrink-swell potential, and moderately steep slope are severe limitations. These limitations are difficult to overcome.

This Caneyville soil is in capability subclass VIIe and in woodland suitability group 4c

CoD—Caneyville-Rock outcrop complex, 6 to 30 percent slopes. This complex consists of moderately deep, well drained, sloping to steep soils and Rock outcrop on ridgetops and side slopes of uplands. It is underlain by limestone. Some areas are karst. The Caneyville soil and Rock outcrop are so intermingled that they could not be separated at the scale selected for mapping. The Caneyville soils are strips, 50 to 150 feet wide, separated by limestone outcrops, ledges, and boulders. Areas of this map unit range from 10 to 300 acres.

Caneyville silt loam makes up about 40 percent of the map unit. Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of about 33 inches. It is yellowish red silty clay to a depth of 30 inches and dark yellowish brown clay below that. Limestone bedrock is at a depth of 33 inches.

The Caneyville soil has medium natural fertility. The available water capacity is moderate. Organic matter content of the surface layer is moderate. Reaction is very strongly acid to neutral in the surface layer and the upper part of the subsoil and medium acid to mildly alkaline in the lower part. The root zone is moderately deep, and permeability is moderately slow. Surface runoff is rapid. Bedrock is at a depth of 20 to 40 inches. The shrink-swell potential is moderate.

Figure 10.—Limestone outcrops separate strips of Caneyville soil in a wooded area of Caneyville-Rock outcrop complex, 6 to 30 percent slopes.

Rock outcrops of limestone make up about 30 percent of the map unit (fig. 10). They range from 3 feet to more than 15 feet across, are from 10 to 30 feet apart, and cover 25 to 50 percent of the surface.

Included with this complex in mapping are areas of brownish to black clayey soils near rock outcrops. These soils are less than 10 inches to bedrock. Also included are brownish or yellowish brown clayey soils that are 10 to 20 inches deep to bedrock and a few areas of a yellowish brown to gray clayey soil that developed from shale. Small narrow areas of Nolin soils are included along drainageways and small areas of Wellston, Frondorf, and Fredonia soils are included on ridges and side slopes. The included soils make up about 30 percent of the map unit.

The soils of this map unit are used mainly as woodland. In a few areas, they are used as pasture.

The soils of this map unit are not suited to cultivated crops, small grains, or hay because of the steep slopes, moderate depth to rock, and rock outcrops. It is poorly suited to pasture.

The soils are suited to use as woodland. Productivity is moderately high on north slopes and moderate on south slopes. Trees suitable for planting on south slopes include black oak, white oak, Virginia pine, and loblolly pine. Those suitable for planting on the north slopes include yellow-poplar, white ash, black oak, white oak, Virginia pine, and loblolly pine. The use of equipment is severely limited because of rock outcrops and steep slopes. The erosion hazard, plant competition, and seedling mortality are also limitations.

The soils are poorly suited to urban uses. The steep slopes and moderate depth to bedrock, rock outcrops, and clayey subsoil are severe limitations. Low strength is a severe limitation for local roads and streets. Most of these limitations are difficult to overcome.

The Caneyville soil is in capability subclass VIe, and the Rock outcrop is in capability subclass VIIIs. The Caneyville soil is in woodland suitability group 3c (north aspect) and 4c (south aspect). Rock outcrop is not assigned to a woodland suitability group.

CrA—Crider silt loam, 0 to 2 percent slopes. This soil is deep, well drained, and nearly level. It is on broad, smooth, upland ridges. Areas of this map unit range from 4 to 60 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil extends to a depth of 80 inches. To a depth of 13 inches, it is brown silt loam, and to a depth of 36 inches, it is reddish brown silt loam grading to silty clay loam. The lower part of the subsoil is dark red silty clay loam grading to silty clay.

This soil has high natural fertility. The available water capacity is high. The organic matter content in the surface layer is moderate. Reaction is neutral to strongly acid in the surface layer and the upper part of the subsoil and medium acid to very strongly acid in the lower part. The root zone is deep, and surface runoff is slow. Permeability is moderate. This soil has good tilth and can be worked throughout a wide range in moisture content. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part.

Included with this soil in mapping are Pembroke, Nicholson, and Nolin soils. Also included in depressions are a few areas of a soil that has 10 to 20 inches of silt loam overwash. The included soils make up about 10 to 20 percent of the map unit.

This Crider soil is used mainly for cultivated crops and small grains. In a few areas, it is used as hayland and pasture.

This soil is well suited to cultivated crops, small grains, and hay and pasture. This soil has no significant limitation for use as cropland. Crops respond well to lime and fertilizer. Crop residue returned to the soil helps to maintain good tilth and organic matter content. Rotation grazing and renovation help to maintain high yields.

This soil is well suited to use as woodland, and productivity is very high. Plant competition is severe in establishing new stands. Trees suitable for planting include white oak, white ash, northern red oak, black oak, yellow-poplar, black walnut, eastern white pine, and Virginia pine.

This soil is suited to most urban uses. The high clay content in the subsoil is a moderate limitation for buildings, and low strength is a severe limitation for local roads and streets. These limitations can be reduced or overcome with good design and proper installation.

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

CrB—Crider silt loam, 2 to 6 percent slopes. This soil is deep, well drained, and gently sloping. It is on broad, smooth, upland ridges. Areas of this map unit range from 5 to 300 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil extends to a depth of 80 inches. To a depth of 13 inches, it is brown silt loam, and to a depth of 36 inches, it is reddish brown silt loam grading to silty clay loam. The lower part of the subsoil is dark red silty clay loam grading to silty clay.

This soil has high natural fertility. The available water capacity is high. The organic matter content in the surface layer is moderate. Reaction is neutral to strongly acid in the surface layer and upper part of the subsoil and medium acid to very strongly acid in the lower part. The root zone is deep, and surface runoff is medium. Permeability is moderate. This soil has good tilth and can be worked throughout a wide range in moisture content. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part.

Included with this soil in mapping are small areas of Pembroke, Nicholson, and Nolin soils. In some areas, Crider and Pembroke soils are so intermixed that some units of Crider soil may include as much as 20 percent

Pembroke soils. Also included in depressions are a few areas of a soil that has 10 to 20 inches of silt loam overwash. The included soils make up about 10 to 25 percent of the map unit.

This Crider soil is used mainly for cultivated crops and small grains. In a few areas, it is used for hay and pasture.

This soil is well suited to cultivated crops and small grains. It is one of the most productive soils in the county and is used for intensive cropping systems. The hazard of erosion is moderate when cultivated crops are grown. Conservation tillage, stripcropping, and crop residue returned to the soil help to control erosion and reduce runoff while maintaining high yields and good tilth.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well, including deep-rooted plants such as alfalfa. Proper seeding mixtures and rates, lime and fertilizer, weed control, and control of grazing are the major concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Plant competition is severe in establishing new stands. Trees suitable for planting include white oak, white ash, northern red oak, black oak, yellow-poplar, black walnut, eastern white pine, and Virginia pine.

This soil is suited to most urban uses. The high clay content in the subsoil is a moderate limitation for shallow excavations, and low strength is a severe limitation for local roads and streets. The limitations can be reduced or overcome with good design and proper installation.

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

CrC2—Crider silt loam, 6 to 12 percent slopes, eroded. This soil is deep, well drained, and sloping. It is on side slopes of broad, upland ridges, and on benches and toe slopes. Slopes are smooth and convex. Part of the original topsoil of this Crider soil has been removed by erosion. Areas of this map unit range from 4 to 20 acres.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 76 inches. To a depth of 9 inches, it is brown silt loam, and to a depth of 32 inches, it is reddish brown silt loam grading to silty clay loam. The lower part of the subsoil is dark red silty clay loam or silty clay.

Natural fertility is medium, and the available water capacity is high. The organic matter content in the surface layer is moderate. Reaction is neutral to strongly acid in the surface layer and the upper part of the subsoil and medium acid to very strongly acid in the lower part. The root zone is deep, and surface runoff is medium. Permeability is moderate. Tilth is good, and the soil can be worked throughout a wide range in moisture content. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part.

Included with this soil in mapping are a few areas of Nicholson, Pembroke, and Nolin soils. Also included are a few severely eroded spots and a few areas of Crider soil that has slopes of more than 12 percent. The included soils make up about 15 to 20 percent of the map unit. Individual areas are less than 4 acres.

This Crider soil is used mainly for cultivated crops, small grains, and hayland and pasture. In a few areas, it is used as woodland.

This soil is suited to most cultivated crops grown in the area, but the hazard of erosion is severe when cultivated by conventional tillage methods. Conservation tillage, stripcropping, contour terraces, and crop residue returned to the soil help to control erosion and reduce runoff.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well, including deep-rooted plants such as alfalfa. Proper seeding mixtures and rates, lime and fertilizer, weed control, and the control of grazing are the major concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Plant competition is severe in establishing new seedlings. Trees suitable for planting include white oak, white ash, northern red oak, black oak, yellow-poplar, black walnut, eastern white pine, and Virginia pine.

This soil is suited to most urban uses. Slope is a moderate limitation for dwellings, and low strength is a limitation for local roads and streets. These limitations are severe for some uses. They can be reduced or overcome with good design and proper installation.

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

DkF—DeKalb-Frondorf-Rock outcrop complex, 20 to 45 percent slopes. This complex consists of small areas of DeKalb and Frondorf soils and Rock outcrop that are so intermingled that they cannot be separated at the scale selected for mapping. The soils are on long convex side slopes in the northern part of the county. Most areas contain narrow benches and are dissected by drainageways. The soils are moderately deep, well drained, and steep to very steep. Surface runoff is rapid to very rapid. Areas of this map unit range from 10 to 900 acres.

DeKalb channery sandy loam makes up about 30 percent of the map unit. Typically, the surface layer is very dark grayish brown channery sandy loam about 2 inches thick. The subsurface layer to a depth of 8 inches is brown channery sandy loam. The subsoil extends to a depth of 29 inches. To a depth of 12 inches, it is dark yellowish brown channery sandy loam. In the lower part, it is yellowish brown channery sandy loam grading to very channery sandy loam. The substratum is brown very channery sandy loam. Sandstone bedrock is at a depth of 33 inches.

The DeKalb soil has low natural fertility, organic matter content, and available water capacity. It is strongly acid or very strongly acid throughout except where lime has been added. The root zone is moderately deep, and permeability is rapid. Sandstone bedrock is at a depth of 20 to 40 inches.

Frondorf silt loam makes up about 30 percent of the map unit. Typically, the surface layer is dark grayish brown silt loam about 1 inch thick. The subsurface layer to a depth of about 4 inches is yellowish brown silt loam. The subsoil extends to a depth of about 33 inches. The upper part is yellowish brown silt loam, and the lower part is strong brown channery silty clay loam. Thin, bedded, rippable sandstone bedrock is at a depth of 33 inches.

The Frondorf soil has low natural fertility and organic matter content. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is moderately deep, and permeability is moderate. Bedrock is at a depth of 20 to 40 inches.

Sandstone rock outcrops make up 15 percent of the map unit. Most outcrops are on the upper part of the slope. They are composed of small individual outcrops and narrow ledges 3 to 10 feet wide and large escarpments up to 100 feet high.

Included with this complex in mapping are a few small areas of Riney, Weikert, Wellston, and Caneyville soils. Also included are soils that are moderately deep and clayey. These soils formed in material weathered from shale. A soil similar to the DeKalb soil but less than 20 inches to bedrock is also included. In some areas, 10 to 15 percent of the surface is stony. The included soils make up about 25 percent of the map unit. Individual areas are less than 5 acres.

The soils of this map unit are used mainly as woodland. In a few small areas, they have been cleared and are used as pasture.

The soils of this map unit are not suited to farming. The steep and very steep slopes, moderate depth to bedrock, rock outcrops, and escarpments are severe limitations. These limitations are difficult to overcome.

The soils are suited to use as woodland, and most areas are in native hardwoods. Productivity is high on north slopes and moderately high on south slopes. Trees suitable for planting on north slopes include black oak, chestnut oak, white oak, yellow-poplar, eastern white pine, shortleaf pine, and Virginia pine. Those suitable for planting on south slopes include shortleaf pine, loblolly pine, Virginia pine, and the same oak species as on northern slopes. Because of steep and very steep slopes, rock outcrops, and escarpments, some areas are inaccessible to logging equipment (fig. 11). Erosion is a severe hazard on skid trails and haul roads because of the steep slopes.

The soils of this map unit are not suited to most urban uses. The steep and very steep slopes, moderate depth to bedrock, rock outcrops, and escarpments are severe limitations that are difficult to overcome.

The DeKalb and Frondorf soils are in capability subclass VIIe, and the Rock outcrop is in capability subclass VIIIs. The DeKalb soils are in woodland suitability group 2f (north aspect) and 3f (south aspect). The Frondorf soils are in woodland suitability groups 2r (north aspect) and 3r (south aspect). Rock outcrop is not assigned to a woodland suitability group.

Du—Dunning silt loam, occasionally flooded. This soil is deep, very poorly drained to poorly drained, and nearly level. It is on flood plains, stream heads, and in depressional areas throughout the county. Areas of this map unit range from 5 to 45 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer to a depth of 14 inches is very dark gray silty clay loam that has a few light olive brown mottles. The subsoil is silty clay. It extends to a depth of about 41 inches. It is dark gray in the upper part and gray in the lower part. Mottles are in shades of brown and yellow. The substratum extends to a depth of 65 inches or more. It is gray clay that has mottles in shades of brown and gray.

The Dunning soil has high natural fertility and available water capacity. It is medium acid to mildly alkaline throughout. The organic matter content in the surface layer is high. The root zone is deep, and permeability is slow. Surface runoff is slow to very slow. The seasonal high water table is at or near the surface in winter and spring. Flooding occurs occasionally for brief periods from December to May. Tilth is good. The shrink-swell potential is moderate.

Included with this soil in mapping are a few areas of Robertsville, Lawrence, Newark, and Melvin soils. Also included is some Dunning silty clay loam. These inclusions make up about 20 percent of the map unit. Individual areas are generally less than 2 acres.

This Dunning soil has mostly been cleared and is used for cultivated crops and as hayland and pasture. In a few areas, it is used as woodland.

This soil is suited to row crops but is poorly suited to small grains. Wetness and the hazard of flooding are severe limitations. Planting and harvesting operations are generally delayed because of excessive wetness. Tile drainage, open ditches, and improvement of channels help to overcome these limitations. In some areas, diversion ditches can be used to control runoff and overwash from adjacent uplands. Where drained, this soil produces good yields of corn and soybeans. Return of crop residue to the soil improves workability and reduces clodding in the more clayey areas.

This soil is suited to hay and pasture. Grasses and legumes that can tolerate wetness and flooding are more

Figure 11.—Rock escarpment in an area of DeKalb-Frondorf-Rock outcrop complex, 20 to 45 percent slopes. Rock escarpments limit the use of logging equipment in some areas.

suitable. Grazing needs to be restricted in wet periods to keep grazing animals from compacting the soil and causing excessive damage to the plants. Overgrazing results in a thin cover of pasture plants and permits increased competition from weeds.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include pin oak, swamp white oak, American sycamore, baldcypress, and loblolly pine. Wetness, seedling mortality, and plant competition are the main concerns in management.

This soil is poorly suited to most urban uses. Wetness, the hazard of flooding, and slow permeability are limitations. Low strength is a limitation for local roads and streets. Some of these limitations can be overcome by using good design or water management practices. The hazard of flooding, however, is very difficult to overcome.

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

EIA—Elk silt loam, 0 to 2 percent slopes, rarely flooded. This soil is deep, well drained, and nearly level. It is on stream terraces. Areas of this map unit range from 5 to 20 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil extends to a depth of 43 inches. It is brown silt loam in the upper part and brown to strong brown silty clay loam in the lower part. Pale brown mottles are in the lower 14 inches. The substratum to a depth of 60 inches is strong brown silty clay loam and has yellowish brown mottles.

Natural fertility is high, and the organic matter content is moderate. The available water capacity is high. Reaction is neutral to strongly acid in the surface layer and the upper part of the subsoil and strongly acid or medium acid in the lower part. The root zone is deep, and permeability is moderate. Surface runoff is slow. Tilth is good, and this soil can be worked throughout a wide range in moisture content. This soil is subject to rare flooding.

Included with this soil in mapping are a few areas of Crider and Nicholson soils on uplands and Nolin soils on flood plains or in upland depressions. Also included are areas that have 10 to 20 inches of overwash on the surface. The included soils make up about 10 to 25 percent of the map unit.

This Elk soil is used mainly for cultivated crops. In a few areas, it is used as pasture or hayland.

This soil is well suited to most cultivated crops, small grains, and hay and pasture. Crop residue returned to the soil helps to maintain the organic matter content and good tilth.

This soil is well suited to use as woodland, and productivity is high. Trees suitable for planting include black walnut, yellow-poplar, white oak, black oak, and eastern white pine. There are no significant limitations for woodland use and management. If seedlings are planted, control of plant competition is needed.

This soil is poorly suited to most urban uses. The hazard of flooding is a severe limitation for dwellings and small buildings. Low strength is a severe limitation for local roads and streets.

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

EIB—Elk silt loam, 2 to 6 percent slopes, rarely flooded. This soil is deep, well drained, and gently sloping. It is on stream terraces. Slopes are smooth and convex. Areas of this map unit range from 4 to 25 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil extends to a depth of 43 inches. It is brown silt loam in the upper part and brown to strong brown silty clay loam in the lower part. Pale brown mottles are in the lower 14 inches. The substratum to a depth of about 60 inches is strong brown silty clay loam that has yellowish brown mottles.

Natural fertility is high, and the organic matter content is moderate. The available water capacity is high. Reaction is neutral to strongly acid in the surface layer and the upper part of the subsoil and strongly acid or medium acid in the lower part. The root zone is deep, and permeability is moderate. Surface runoff is medium. Tilth is good, and this soil can be worked throughout a wide range in moisture content. This soil is subject to rare flooding of brief duration from January to April.

Included with this soil in mapping are a few areas of Crider, Nicholson, and Nolin soils. Also included are a few eroded soils that have a yellowish brown silty clay loam surface layer. The included soils make up less than 15 percent of the map unit.

This Elk soil is used mainly for cultivated crops and small grains. In a few areas, it is used as hayland or pasture.

This soil is well suited to cultivated crops, small grains, and hay and pasture. Erosion is a moderate hazard if the soil is cultivated by conventional tillage methods. Conservation tillage, stripcropping, cover crops, and crop residue returned to the soil help to control erosion and maintain the organic matter content. Hay and pasture fit well into a cropping system with grain crops. This cropping system supplements other practices in controlling erosion, maintaining organic matter content, and improving tilth.

This soil is well suited to use as woodland, and productivity is high. Trees suitable for planting include black walnut, yellow-poplar, white oak, black oak, and eastern white pine. There are no significant limitations for woodland use and management. If seedlings are planted, control of plant competition is needed.

This soil is poorly suited to most urban uses. The hazard of flooding is a severe limitation for dwellings and small buildings. Low strength is a severe limitation for local roads and streets.

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

EIC—Elk silt loam, 6 to 12 percent slopes, rarely flooded. This soil is deep, well drained, and sloping. It is on terraces, toe slopes, and benches of the larger streams in the county. Slopes are smooth, short, and convex. Areas of this map unit range from 4 to 65 acres.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil extends to a depth of 43 inches. It is brown silt loam in the upper part and brown or strong brown silty clay loam in the lower part. Pale brown mottles are in the lower 14 inches. The substratum to a depth of about 60 inches is strong brown silty clay loam that has yellowish brown mottles.

Natural fertility is high, and the organic matter content is moderate. The available water capacity is high. Reaction is neutral to strongly acid in the surface layer and upper part of the subsoil and strongly acid or medium acid in the lower part. The root zone is deep and permeability is moderate. Surface runoff is medium. Tilth is good, and this soil can be worked throughout a moderate range in moisture content. This soil is subject to rare flooding.

Included with this soil in mapping are a few areas of Crider, Nicholson, and Nolin soils. Also included are a few eroded soils that have a yellowish brown silty clay loam surface layer. The included soils make up less than 15 percent of the map unit.

This Elk soil is used mainly for cultivated crops and small grains. In a few areas, it is used as hayland and pasture.

This soil is suited to cultivated crops and small grains. Most crops grow well, but the hazard of erosion is severe when this soil is cultivated by conventional tillage methods. Conservation tillage, stripcropping, cover crops, and crop residue returned to the soil help to control erosion, maintain organic matter content, and improve tilth.

This soil is well suited to hay and pasture. The commonly grown grasses and legumes grow well, including deep-rooted crops such as alfalfa. Most areas of this soil are above flood level, but in a few areas perennial grasses and legumes can be damaged by floodwaters. Proper seeding mixtures and rates, lime and fertilizer, weed control, and control of grazing are the major concerns in management.

Although most areas of this soil are cleared, it is well suited to use as woodland, and productivity is high. Trees suitable for planting include black walnut, yellow-poplar, white oak, black oak, and eastern white pine. Plant competition is a moderate limitation in establishing new stands. This limitation is the main concern in woodland management.

This soil is poorly suited to most urban uses. The hazard of flooding is a severe limitation for dwellings and small buildings. Low strength is a severe limitation for local roads and streets. Slope is a limitation for sanitary facilities.

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

EpB—Epley silt loam, 2 to 6 percent slopes. This soil is deep, moderately well drained, and gently sloping. It is on broad ridgetops and in bench-like positions on uplands. Slopes are smooth and slightly convex. Areas of this map unit range from 8 to 50 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of about 43 inches. To a depth of about 18 inches, it is yellowish brown silt loam that has pale brown mottles. To a depth of 22 inches, the subsoil is yellowish brown silty clay loam that is mottled with light brownish gray. Below that, it is yellowish brown silty clay that has gray mottles. The substratum to a depth of 60 inches is mottled yellowish brown, grayish brown, and light brownish gray clay.

The natural fertility is medium, and the available water capacity is high. Organic matter content in the surface layer is low to moderate. Reaction ranges from medium acid to very strongly acid in the surface layer and subsoil except where lime has been added. The substratum ranges from medium acid to neutral. The root zone is deep. The seasonal high water table is within 18 to 30 inches of the surface during winter and spring. Permeability is moderate to a depth of about 2 feet and slow below that. Tilth is good. The shrink-swell potential is moderate below a depth of about 2 feet.

Included with this soil in mapping are a few small areas of Sadler and Johnsburg soils. Also included are a few small areas of soils that are eroded. The included soils make up 5 to 10 percent of the map unit.

This Epley soil has mostly been cleared and is used for cultivated crops, small grains, and hay and pasture.

This soil is well suited to cultivated crops, small grains, and hay and pasture. Most crops that are grown in the area grow well on this soil. When this soil is cultivated by conventional tillage methods, erosion is a moderate hazard. Conservation tillage, stripcropping, cover crops, and grasses and legumes included in the cropping system slow runoff, help to control erosion, and maintain the organic matter content.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include white oak, black oak, white ash, eastern white pine, Virginia pine, and loblolly pine. Plant competition is moderate in establishing new seedlings.

This soil is suited to most urban uses. Wetness is a severe limitation for dwellings with basements and septic tank absorption fields. Low strength of the soil material is a severe limitation for local roads and streets. These limitations can be reduced or eliminated by good design and proper installation.

This Epley soil is in capability subclass IIe and in woodland suitability group 3o.

FdC—Fredonia silt loam, very rocky, 2 to 12 percent slopes. This soil is moderately deep, well drained, and gently sloping and sloping. It is on ridgetops, benches, and side slopes of karst uplands and is underlain by limestone. Rock outcrops make up 2 to 10 percent of the map unit. Slopes are smooth and irregular. Areas of this map unit range from 5 to 800 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil extends to a depth of about 31 inches. It is red silty clay in the upper part and dark red clay in the lower part. The substratum extends to a depth of about 33 inches. It is mottled reddish brown and yellowish brown clay. Limestone bedrock is at a depth of 33 inches.

Natural fertility is medium, and the organic matter content is moderate. The available water capacity is moderate. Reaction is strongly to slightly acid in the surface layer except where lime has been added and is strongly acid to neutral in the subsoil. The root zone is moderately deep, and permeability is moderately slow to slow. Surface runoff is medium. Tilth is fair, and occasional rock outcrops are a limitation to tillage implements. The shrink-swell potential is moderate. Bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Pembroke, Vertrees, and Caneyville soils and areas of a clayey soil that is less than 20 inches deep to bedrock. Also included are a few areas of Fredonia soils that have more than 10 percent rock outcrops, areas that have slopes of more than 12 percent, and a few severely eroded spots. The included soils make up about 20 percent of the map unit.

This Fredonia soil is used mainly as pasture, or it is idle. In a few areas, this soil is used for cultivated crops.

This soil is poorly suited to cultivated crops. The severe hazard of erosion, moderate depth to bedrock, moderate available water capacity, and rock outcrops are limitations to tillage and production of cultivated crops.

This soil is suited to hay and pasture. Most grasses and legumes that grow in the area grow well on this soil. The severe hazard of erosion, moderate depth to bedrock, moderate available water capacity, and rock outcrops are limitations in producing good yields. Renovating or seeding late in summer or early in fall reduces the hazard of erosion. Rock outcrops interfere with renovation and seedbed preparation. In dry periods, the clayey subsoil limits available water to the plants, which reduces yields. The moderate depth to bedrock restricts the use of deep-rooted plants such as alfalfa. Rotation grazing and lime and fertilizer help to obtain good yields while controlling erosion.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include white oak, black oak, and Virginia pine. Plant competition and equipment use limitations are moderate in managing woodland on this soil.

This soil is poorly suited to urban uses. The moderate depth to bedrock, steepness of slope, slow permeability, rock outcrops, and moderate shrink-swell potential are limitations. Good design and careful installation can overcome some of these limitations.

This Fredonia soil is in capability subclass VIs and in woodland suitability group 3x.

FnC2—Frondorf silt loam, 6 to 12 percent slopes, eroded. This soil is moderately deep, well drained, and sloping. It is on narrow, convex ridges, side slopes, and benches in the northern part of the county (fig. 12). Most slopes are irregular, but some side slopes and benches are smooth and slightly convex. Part of the original topsoil of this Frondorf soil has been removed by erosion. Areas of this map unit range from 5 to 120 acres.

Typically, the surface layer is yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of about 30 inches. The upper part is yellowish brown silt loam and the lower part is strong brown channery silty clay loam. Thin, bedded, rippable sandstone bedrock is at a depth of 30 inches.

The Frondorf soil has low natural fertility and organic matter content. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is moderately deep, and permeability is moderate. Surface runoff is medium, and tilth is good. Bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are a few areas of Wellston, Zanesville, Riney, and Weikert soils. Also included are a few areas of severely eroded Frondorf soils, areas of Frondorf soils that are not eroded, and a few areas of soils that have slopes less than 6 percent. The included soils make up about 15 to 25 percent of the map unit. Individual areas are less than 3 acres.

This Frondorf soil is used mostly for cultivated crops, small grains, and hay and pasture. In a few areas, it is used as woodland.

This soil is poorly suited to cultivated crops. The main limitations are the severe hazard of erosion and moderate depth to bedrock. If cultivated crops are grown, contour farming, stripcropping, conservation tillage, cover crops, and crop residue returned to the soil are needed to reduce runoff and help control erosion. These practices also help to maintain the organic matter content and improve tilth.

This soil is suited to hay and pasture. The main concerns in management are moderate depth to bedrock, moderate available water capacity, and the severe hazard of erosion. Grasses and legumes that can withstand short periods of drought are more suitable. Rotation grazing, proper seeding mixtures and rates, and lime and fertilizer maintain good growth and help control erosion. To control erosion, renovation of old stands need to be done without turning the soil.

This soil is well suited to use as woodland, and productivity is high. Plant competition is moderate in establishing new stands. Trees suitable for planting include black oak, northern red oak, white oak, shortleaf pine, and eastern white pine.

This soil is suited to urban uses. Slope and depth to rock are moderate limitations for dwellings and severe for sanitary facilities. These limitations can be overcome by good design and careful installation.

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

FnC3—Frondorf silt loam, 6 to 12 percent slopes, severely eroded. This soil is moderately deep, well drained, and sloping. It is on narrow ridges, side slopes, and benches in the northern part of the county. Slopes are irregular, convex, and dissected by drainageways.

Figure 12.—Frondorf silt loam, 6 to 12 percent slopes, eroded, is on the ridgetops and upper part of the side slopes in this area. This soil is used mainly for crops and pasture, and it is well suited to use as woodland.

Because of past erosion, most of the original surface layer, and in places part of the subsoil, has been removed. Rills and small gullies are common. Areas of this map unit range from 6 to 110 acres.

Typically, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of about 25 inches. The upper part is yellowish brown silt loam and the lower part is strong brown channery silty clay loam. Rippable sandstone bedrock is at a depth of 25 inches.

This soil has low natural fertility and organic matter content. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is moderately deep, and permeability is moderate. Surface runoff is medium, and tilth is fair. Bedrock is at a depth of 20 to 40 inches.

Included with this soil in mapping are a few areas of Wellston, Weikert, Zanesville, and Riney soils. Also included is a soil that is moderately deep and clayey and that formed in material weathered from shale. The included soils make up 15 to 20 percent of the map unit. Individual areas are less than 3 acres.

This Frondorf soil is used mainly as hayland and pasture and as woodland. In a few areas, it is cultivated or is growing brush.

This soil is poorly suited to cultivated crops. Erosion is a very severe hazard. If cultivated, conservation tillage, crop residue returned to the soil, and cover crops are needed to help control erosion and improve the organic matter content.

This soil is suited to hay and pasture. Except for some deep-rooted plants, most grasses and legumes that are grown in the area are suitable. The very severe erosion hazard, low organic matter content, moderate depth to bedrock, and fair tilth are limitations in establishing and maintaining good production. In some areas, land smoothing is desirable before seeding. Proper seeding rates and mixtures, lime and fertilizer, rotation grazing, and renovation without turning the soil help to produce good yields.

This soil is suited to use as woodland, and productivity is high. Plant competition is the main concern in management. Trees suitable for planting include white oak, northern red oak, black oak, Virginia pine, and eastern white pine.

This soil is suited to most urban uses. Slope and moderate depth to bedrock are moderate limitations for dwellings and severe for sanitary facilities. These limitations can be overcome by good design and careful installation.

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

FwD—Frondorf-Weikert complex, 12 to 20 percent slopes. This complex consists of small areas of Frondorf and Weikert soils that are so intermingled they can not be separated at the scale selected for mapping. These soils are on moderately wide, convex side slopes in the northern part of the county. They are well drained, moderately steep, and moderately deep to shallow. Most areas are dissected by small drainageways. Areas of this map unit range from 5 to 360 acres, but most are less than 100 acres.

Frondorf silt loam makes up about 55 percent of the map unit. Typically, the surface layer is dark grayish brown silt loam about 1 inch thick. The subsurface layer to a depth of about 4 inches is yellowish brown silt loam. The subsoil extends to a depth of about 33 inches. The upper part is yellowish brown silt loam and the lower part is strong brown channery silty clay loam. Thin, bedded, rippable sandstone bedrock is at a depth of 33 inches.

The Frondorf soil has low natural fertility and organic matter content. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is moderately deep, and permeability is moderate. Surface runoff is rapid. Bedrock is at a depth of 20 to 40 inches.

Weikert channery silt loam makes up about 20 percent of the map unit. Typically, the surface layer is dark grayish brown channery silt loam about 2 inches thick. The subsurface layer to a depth of about 5 inches is light yellowish brown channery silt loam. The subsoil extends to a depth of about 14 inches. It is brownish yellow very channery silt loam. The substratum is brownish yellow very channery loam. Fractured sandstone bedrock is at a depth of 19 inches.

The Weikert soil has low natural fertility, organic matter content, and available water capacity. Surface runoff is rapid. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is shallow, and permeability is moderately rapid. Bedrock is at a depth of 10 to 20 inches.

Included with this complex in mapping are a few areas of Riney, Wellston, DeKalb, and Caneyville soils on side slopes and Nolin and Skidmore soils in narrow valleys. Also included is a moderately deep, clayey soil that formed in material weathered from shale; a few rock outcrops and small escarpments; and a few severely eroded spots. In a few areas, 10 to 15 percent of the surface is stony. The included soils make up about 25 percent of this map unit. Individual areas are less than 5 acres.

The soils of this map unit are mainly used as woodland. In a few areas, they have been cleared and are used as pasture.

The soils of this map unit are poorly suited to farming. The moderately steep slopes, severe erosion hazard, shallow depth, surface stoniness, and low available water capacity are severe limitations. If these soils are used as pasture, control of grazing and optimum fertility levels are needed.

The soils in this complex are suited to use as woodland. Productivity of the Frondorf soil is high on north slopes and moderately high on south slopes. Productivity of the Weikert soil is moderate on north slopes and low on south slopes. Trees suitable for planting on north slopes include white oak, black oak, chestnut oak, eastern white pine, Virginia pine, and shortleaf pine. Those suitable for planting on south slopes include black oak, white oak, chestnut oak, shortleaf pine, and loblolly pine. Steepness of slope, the severe erosion hazard, plant competition, and equipment use limitations are the main concerns in management.

This map unit is poorly suited to urban uses. The moderately steep slopes, moderately deep and shallow depth to bedrock, and rock outcrops are severe limitations for building sites and sanitary facilities.

This complex is in capability subclass VIe. The Frondorf soil is in woodland suitability group 2r (north aspect) and 3r (south aspect). The Weikert soil is in woodland suitability group 4d (north aspect) and 5d (south aspect).

FwF—Frondorf-Weikert complex, 20 to 45 percent slopes. This complex consists of small areas of Frondorf and Weikert soils that are so intermingled they could not be separated at the scale selected for mapping. These soils are on moderately wide, convex side slopes in the northern part of the county. They are well drained, steep to very steep, and moderately deep to shallow. Most areas are dissected by small drainageways. Areas of this map unit range from 5 to 950 acres.

Frondorf silt loam makes up about 50 percent of the map unit. Typically, the surface layer is dark grayish brown silt loam about 1 inch thick. The subsurface layer to a depth of about 4 inches is yellowish brown silt loam. The subsoil extends to a depth of about 33 inches. The upper part is yellowish brown silt loam and the lower part is strong brown channery silty clay loam. Thin, bedded, rippable sandstone bedrock is at a depth of 33 inches.

The Frondorf soil has low natural fertility and organic matter content. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is moderately deep, and permeability is moderate. Surface runoff is rapid. Bedrock is at a depth of 20 to 40 inches.

Weikert channery silt loam makes up about 25 percent of the map unit. Typically, the surface layer is dark grayish brown channery silt loam about 2 inches thick. The subsurface layer to a depth of about 5 inches is light yellowish brown channery silt loam. The subsoil extends to a depth of about 14 inches. It is brownish yellow very channery silt loam. The substratum is brownish yellow very channery loam. Fractured sandstone bedrock is at a depth of 19 inches.

The Weikert soil has low natural fertility, organic matter content, and available water capacity. It is strongly acid or very strongly acid throughout except where lime has been added. The root zone is shallow, and permeability is moderately rapid. Surface runoff is rapid. Bedrock is at a depth of 10 to 20 inches.

Included with this complex in mapping are a few areas of Riney, Wellston, DeKalb, and Caneyville soils on side slopes and Nolin and Skidmore soils in narrow valleys. Also included is a moderately deep, clayey soil that formed in material weathered from shale and a few rock outcrops and escarpments. In a few areas, 10 to 15 percent of the surface is stony. The included soils make up about 25 percent of the map unit. Individual areas are less than 5 acres.

The soils of this map unit are used mainly as woodland. In a few areas, they have been cleared and are used as pasture.

These soils are poorly suited to farming. The steep slopes, severe erosion hazard, shallow depth, surface stoniness, and low available water capacity are severe limitations.

The soils in this complex are suited to use as woodland. Productivity of the Frondorf soil is high on north slopes and moderately high on south slopes. Productivity of the Weikert soil is moderate on north slopes and low on south slopes. Trees suitable for planting on north slopes include white oak, black oak, chestnut oak, eastern white pine, Virginia pine, and shortleaf pine. Those suitable for planting on south slopes include black oak, white oak, chestnut oak, shortleaf pine, and loblolly pine. Steepness of slope, the severe erosion hazard, plant competition, and equipment use limitations are the main concerns in management.

These soils are poorly suited to urban uses. The steep to very steep slopes, moderately deep and shallow depth to bedrock, and rock outcrops and escarpments are severe limitations for building sites and sanitary facilities.

This complex is in capability subclass VIIe. The Frondorf soil is in woodland suitability groups 2r (north aspect) and 3r (south aspect). The Weikert soil is in woodland suitability groups 4d (north aspect) and 5d (south aspect).

HbB—Hammack-Baxter complex, 2 to 6 percent slopes. This map unit is made up of Hammack and Baxter soils that are deep and well drained. These soils are so intermingled that they can not be separated at the scale selected for mapping. They are in relatively broad, karst, irregular areas in the southern part of the county. The Baxter soils are mostly on the gentle side slopes around shallow depressions, and the Hammack soils are on the interconnecting ridges. Areas of each soil are 100 to 300 feet across. Areas of this map unit range from 4 to 40 acres.

Hammack silt loam makes up about 50 percent of the map unit. Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 84 inches. It is brown silty clay loam to a depth of 28 inches and extremely cherty silty clay loam to a depth of 42 inches. Between depths of 42 and 84 inches, the subsoil is red very cherty silty clay in the upper part grading to red cherty clay in the lower part.

The Hammack soil has high natural fertility and available water capacity. The root zone is deep. Permeability and organic matter content are moderate. Surface runoff is medium. Tilth is good. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part. Reaction is medium acid to very strongly acid throughout except where lime has been added.

Baxter cherty silt loam makes up about 35 percent of the map unit. Typically, the surface layer is brown cherty silt loam about 9 inches thick. The subsoil extends to a depth of 65 inches. It is strong brown cherty silty clay loam in the upper 7 inches and yellowish red cherty silty clay between depths of 16 and 32 inches. It is dark red cherty silty clay and cherty clay to a depth of 65 inches.

The Baxter soil has medium natural fertility. The available water capacity is high. The root zone is deep. Permeability and organic matter content are moderate. Surface runoff is medium. This soil has only fair tilth but can be worked throughout a wide range in moisture content. The shrink-swell potential is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The shrink-swell potential is moderate.

Included with this complex in mapping are a few small areas of Vertrees and Nolin soils. Also included are areas of a soil similar to the Hammack soil but is less than 20 inches to a very cherty layer. The included soils make up about 15 percent of the map unit.

The soils of this complex are used mainly for cultivated crops, small grains, and hay and pasture. In a few areas, they are used as woodland.

These soils are well suited to cultivated crops. The moderate erosion hazard and fair tilth are the main limitations. Conservation tillage, crop residue returned to the soil, cover crops, grassed waterways, and inclusion of grasses and legumes in the rotation help to control erosion and maintain the organic matter content. Most crops respond well to lime and fertilizer.

The soils in this complex are well suited to hay and pasture if good management practices are used. Most grasses and legumes, including deep-rooted plants, grow well.

Although most of these soils are cleared, they are well suited to use as woodland, and productivity is high. Plant competition is the major concern in producing quality timber. The Hammack soil is suited to black oak, white oak, shortleaf pine, eastern white pine, and Virginia pine. The Baxter soil is suited to the same hardwood species and to eastern white pine, loblolly pine, and Virginia pine.

This complex is suited to most urban uses. The high clay content and moderate shrink-swell potential are limitations to some uses. Low strength is a limitation for local roads and streets. Most of these limitations can be eliminated through good design and proper installation.

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

HbC2—Hammack-Baxter complex, 6 to 12 percent slopes, eroded. This map unit consists of Hammack and Baxter soils that are deep and well drained. These soils are so intermingled that they can not be separated at the scale selected for mapping. They are on relatively broad, karst, rolling upland areas in the southern part of the county. The mapped areas include small depressions and sinks. Erosion has removed part of the original topsoil from these soils. Slopes are irregular and 100 to 300 feet long. Areas of this map unit range from 5 to 50 acres.

Hammack silt loam makes up about 45 percent of the map unit. Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 81 inches. It is brown silty clay loam to a depth of 25 inches and brown extremely cherty silty clay loam to a depth of 39 inches. Between depths of 39 and 81 inches, the subsoil is red cherty silty clay in the upper part grading to red cherty clay in the lower part.

The Hammack soil has medium natural fertility. The available water capacity is high. The root zone is deep. Permeability and organic matter content are moderate. Surface runoff is medium. Tilth is good. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part. Reaction is medium acid to very strongly acid throughout except where lime has been added.

Baxter cherty silt loam makes up about 40 percent of the map unit. Typically, the surface layer is brown cherty silt loam about 5 inches thick. The subsoil extends to a depth of 64 inches. It is strong brown cherty silty clay loam in the upper 7 inches and yellowish red cherty silty clay between depths of 12 to 25 inches. The subsoil is dark red cherty silty clay and cherty clay to a depth of 64 inches.

The Baxter soil has medium natural fertility. The available water capacity is high. The root zone is deep. Permeability and organic matter content are moderate. Surface runoff is medium. This soil has only fair tilth but can be worked throughout a wide range in moisture content. It is strongly acid or very strongly acid throughout except where lime has been added. The shrink-swell potential is moderate.

Included with this complex in mapping are a few small areas of Nolin soils in depressions, a few areas of Vertrees soils, and areas of severely eroded Hammack and Baxter soils. Also included is a soil similar to the Hammack soil but is less than 20 inches to a very cherty layer. The included soils make up about 15 percent of the map unit.

The soils of this complex are used mainly as hayland and pasture and occasionally for cultivated crops. In a few areas, they are used as woodland.

These soils are suited to cultivated crops and small grains. Most crops grown in the area grow well, but erosion is a severe hazard when the soils are cultivated by conventional tillage methods. Contour cultivation is difficult because of the irregular slopes. Conservation tillage, crop residue returned to the soil, and cover crops help to slow runoff and control erosion. With proper management, this soil produces good yields.

The soils in this complex are well suited to hayland and pasture (fig. 13). Deep-rooted grasses and legumes grow well on these soils. Proper seeding rates, proper seeding time, lime and fertilizer, rotation grazing, and renovation without turning the soil help to produce good yields while controlling erosion.

These soils are well suited to use as woodland, and productivity is high. Plant competition is the major concern in producing high quality timber. The Hammack soil is suited to white oak, black oak, shortleaf pine, eastern white pine, and Virginia pine. The Baxter soil is suited to the same oak species, and to eastern white pine, loblolly pine, and yellow-poplar.

These soils are suited to most urban uses. The moderate shrink-swell potential, slope, and high clay content are moderate limitations for most building sites. Low strength is a severe limitation for local roads and

Figure 13.—Fescue pastureland in an area of Hammack-Baxter complex, 6 to 12 percent slopes, eroded. Contour cultivation is difficult on the soils of this map unit because of sinks and irregular topography.

streets. Most of these limitations can be overcome by proper design and construction.

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

HbC3—Hammack-Baxter complex, 6 to 12 percent slopes, severely eroded. This map unit consists of Hammack and Baxter soils that are deep and well drained. These soils are so intermingled that they can not be separated at the scale selected for mapping. They are in karst, rolling upland areas in the southern part of the county. The Hammack soil is generally on narrow rolling ridgetops, and the Baxter soil is on irregular side slopes around sinks or depressions. Most of the original topsoil has been removed from these soils by excessive erosion, and small rills and gullies are common. Areas of this map unit range from 5 to 50 acres.

Hammack silty clay loam makes up about 40 percent of the map unit. Typically, the surface layer is brown silty clay loam about 7 inches thick. The subsoil extends to a depth of 80 inches. It is brown silty clay loam to a depth of 22 inches and brown extremely cherty silty clay loam to a depth of 36 inches. Between depths of 36 and 80 inches, the subsoil is red cherty silty clay in the upper part grading to red cherty clay in the lower part.

The Hammack soil has low natural fertility and organic matter content. It is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep. Permeability is moderate, and the available water capacity is high. Tilth is fair. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part.

Baxter cherty silty clay loam makes up about 40 percent of the map unit. Typically, the surface layer is strong brown cherty silty clay loam about 7 inches thick. The subsoil extends to a depth of 64 inches. It is yellowish red cherty silty clay to a depth of 23 inches and dark red cherty silty clay and cherty clay below that.

The Baxter soil has low natural fertility and organic matter content. It is strongly acid or very strongly acid throughout except where lime has been added. The root zone is deep. Permeability is moderate, and the available water capacity is high. Surface runoff is rapid. This soil has fair tilth. The shrink-swell potential is moderate.

Included with this complex in mapping are a few small areas of Nolin soils in depressions, a few Vertrees soils, and areas of Hammack and Baxter soils that are not eroded. Also included are areas of a soil similar to the Hammack soil but is less than 20 inches to a very cherty layer. The included soils make up about 20 percent of the map unit.

The soils of this complex are used mainly as hayland and pasture and occasionally for cultivated crops. In a few areas, they are used as woodland.

These soils are poorly suited to cultivated crops and small grains. Erosion is a very severe hazard when cultivated crops are grown. If cultivated, conservation tillage, cover crops, and grasses and legumes in the cropping system help to slow runoff and control erosion.

The soils in this complex are better suited to hay and pasture than to most other uses, but erosion is a very severe hazard. Deep-rooted grasses and legumes grow well. Proper seeding rates and mixtures, proper seeding time, lime and fertilizer, rotation grazing, and renovation without turning the soil help to produce good yields while controlling erosion.

These soils are well suited to use as woodland, and productivity is moderately high. Plant competition is the main concern in management. The Hammack soil is suited to black oak, shortleaf pine, eastern white pine, and Virginia pine. The Baxter soil is suited to white oak, black oak, eastern white pine, loblolly pine, and shortleaf pine.

These soils are suited to most urban uses. The moderate shrink-swell potential, slope, and high clay content are limitations. Low strength is a severe limitation for local roads and streets. Most of these limitations can be overcome by proper design and careful installation.

This complex is in capability subclass IVe. The Hammack soil is in woodland suitability group 3o, and the Baxter soil is in woodland suitability group 3c.

Jo—Johnsburg silt loam. This soil is deep, somewhat poorly drained, and nearly level. It is on stream terraces and in concave upland areas in the northern part of the county. Slopes range from 0 to 3 percent. Areas of this map unit range from 5 to 150 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of about 46 inches. The upper 10 inches is light yellowish brown silt loam mottled with light brownish gray and strong brown. From 10 to 22 inches, the subsoil is light olive brown silt loam that has light brownish gray and light yellowish brown mottles. A fragipan is between 22 and 46 inches. It is firm, brittle and compact silty clay loam that is light brownish gray and has yellowish brown mottles. The substratum to a depth of 60 inches is brownish yellow loam that has strong brown and light brownish gray mottles.

This soil has medium natural fertility, and the available water capacity is moderate. It is strongly acid or very strongly acid throughout except where lime has been added. Organic matter content in the surface layer is moderate. The root zone is moderately deep to a fragipan at a depth of about 2 feet. A seasonal high water table is within 12 to 24 inches of the surface during winter and spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is slow, and tilth is good.

Included with this soil in mapping are a few small areas of Sadler, Zanesville, Robertsville, and Nicholson soils. Also included is a soil similar to this Johnsburg soil, but it does not have a fragipan. The included soils make up 10 to 20 percent of the map unit. Individual areas are less than 3 acres.

This Johnsburg soil is used mainly for cultivated crops and as hayland and pasture. In a few areas, it is used as woodland.

This soil is suited to cultivated crops. The moderately deep rooting depth, wetness, and moderate available water capacity are the main limitations. Wetness generally delays planting and sometimes delays harvesting operations. The dense fragipan limits the rooting depth and available water capacity. Where adequate outlets are available, artificial drainage increases the effective growing season and improves the suitability of some crops. Cover crops and crop residue returned to the soil help to maintain the organic matter content and tilth.

This soil is suited to hay and pasture. Grasses and legumes that can withstand wetness are more suitable than other varieties. The dense fragipan limits the use of some deep-rooted plants. Proper seeding mixtures and rates, lime and fertilizer, weed control, and controlled grazing are the main concerns in management.

This soil is well suited to use as woodland, and productivity is high. Plant competition, seedling mortality, and equipment use limitations during wet periods are the main concerns in management. These limitations can be eliminated by using good management practices and by harvesting timber during dry periods. Trees suitable for planting include eastern white pine, white ash, black oak, pin oak, red maple, baldcypress, and American sycamore.

This soil is poorly suited to most urban uses. Wetness, the seasonal high water table, and slow permeability are severe limitations for building sites and sanitary facilities.

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

La—Lawrence silt loam, occasionally flooded. This soil is deep, somewhat poorly drained, and nearly level. It is on stream terraces and in concave upland areas mostly in the southern part of the county. Slopes range from 0 to 2 percent. Areas of this map unit range from 4 to 130 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches. To a depth of 25 inches, it is brownish yellow to light yellowish brown silt loam mottled in shades of brown and gray. A fragipan is between 25 and 52 inches. It is firm, brittle and compact silty clay loam that is mottled in shades of gray and brown. The lower part of the subsoil to a depth of 60 inches is mottled strong brown, gray, and brownish gray silty clay loam.

This soil has medium natural fertility, and the available water capacity is moderate. Reaction is strongly acid or very strongly acid through the fragipan except where lime has been added. Below the fragipan, it ranges from very strongly acid to neutral. Organic matter content in the surface layer is moderate. The root zone is moderately deep to the fragipan. A seasonal high water table is within 12 to 24 inches of the surface during winter and spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is slow, and tilth is good. This soil is subject to occasional flooding of brief duration from January to April.

Included with this soil in mapping are a few small areas of Robertsville and Nicholson soils. Also included is a soil similar to Lawrence soil, but it does not have a fragipan. The included soils make up 10 to 20 percent of the map unit. Individual areas are less than 3 acres.

This soil is used mainly for cultivated crops and as hayland and pasture. In a few areas, it is used as woodland.

This soil is suited to cultivated crops. The moderately deep rooting depth, wetness, and moderate available water capacity are the main limitations. Wetness generally delays planting and sometimes delays harvesting. The dense fragipan limits the rooting depth and available water capacity for some plants. Artificial drainage increases the growing season and improves the suitability of some crops. Flooding of very brief duration occurs mostly during winter when crops are not growing. Cover crops and crop residue returned to the soil help to maintain the organic matter content and tilth.

This soil is suited to hay and pasture. Grasses and legumes that can withstand wetness and flooding for very brief periods are more suitable than other varieties. The dense fragipan limits the use of some deep-rooted plants. Proper seeding mixtures and rates, lime and fertilizer, weed control, and controlled grazing are the main concerns in management.

This soil is well suited to use as woodland, and productivity is high. Plant competition and equipment use limitations during wet periods are the main concerns in management. These limitations can be eliminated by using good management practices and by harvesting timber during dry periods. Trees suitable for planting include yellow-poplar, white ash, black oak, white oak, sweetgum, loblolly pine, and American sycamore.

This soil is poorly suited to most urban uses. Wetness, flooding, and slow permeability are severe limitations for building sites and sanitary facilities.

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

Ln—Lindside silt loam, occasionally flooded. This soil is deep, moderately well drained, and nearly level. It is on flood plains and in upland depressions. Slopes range from 0 to 2 percent. Areas of this map unit range from 5 to 150 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 39 inches. It is dark yellowish brown silt loam that has grayish brown mottles below a depth of 18 inches. The substratum to a depth of 60 inches is yellowish brown silt loam that has grayish brown mottles. It has a few thin stratified layers of fine sandy loam.

This soil has high natural fertility and available water capacity. Organic matter content in the surface layer is moderate. Reaction is medium acid to neutral throughout. The root zone is deep. A seasonal high water table is within 18 to 36 inches of the surface during winter and spring. Permeability is moderate, and surface runoff is slow. Tilth is good. This soil is subject to occasional flooding of brief duration from December to May.

Included with this soil in mapping are a few areas of Nolin and Newark soils. Also included is a soil that is 20 inches or more of brown silt loam that has gray mottles. This soil is underlain by yellowish brown residuum from limestone. A soil that is more acid in the subsoil than the Lindside soil and a soil that has a loam or fine sandy loam texture throughout are also included. The included soils make up 10 to 25 percent of the map unit.

This Lindside soil is used intensively for cultivated crops. In a few areas, it is used as pasture and hayland or as woodland.

This soil is well suited to cultivated crops. It is not subject to erosion and can be cropped intensively without losing soil from erosion. Tilth is good, and the soil can be worked throughout a wide range in moisture content without clodding or crusting. Wetness and the hazard of flooding are limitations. Most floods occur during the winter and spring when crops are not grown. In some years, wetness delays planting for a few days. Subsurface drainage is not necessary for most crops, but it can lengthen the time for field work and improve the suitability of some crops. Diversion ditches are effective in preventing overwash from adjacent uplands. Cover crops and crop residue returned to the soil help to maintain the organic matter content and good tilth.

This soil is well suited to hay and pasture. Most grasses and legumes grown in the area grow well on this soil. Flooding is the main limitation, and in some years perennials can be damaged. Proper seeding mixtures and rates, fertilizers, controlled grazing, and weed control are the main concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include white ash, white oak, black oak, black walnut, yellow-poplar, eastern white pine, shortleaf pine, and Virginia pine. Plant competition is severe in establishing new seedlings.

This soil is poorly suited to most urban uses. The hazard of flooding and seasonal high water table are severe limitations for building sites and sanitary facilities.

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

Me—Melvin silt loam, occasionally flooded. This soil is deep, poorly drained, and nearly level. It is on flood plains and in upland depressions. Areas of this map unit range from 5 to 65 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is dark grayish brown silt loam mottled with light brownish gray and brown. It is about 8 inches thick. The subsoil is gray silt loam that has brownish gray and brown mottles. It extends to a depth of 22 inches. The substratum to a depth of 60 inches is dark gray to neutral silty clay loam. It has pale olive mottles in the upper part.

This soil has medium natural fertility. The root zone is deep, and the organic matter content in the surface layer is moderate. Reaction is medium acid to mildly alkaline throughout. The available water capacity is high, and permeability is moderate. Runoff is slow. A seasonal high water table is at the surface or within a depth of 12 inches for long periods during winter and early in spring. Occasional flooding of brief duration occurs from December to May. Tilth is good.

Included with this soil in mapping are small areas of Newark and Dunning soils. Also included are a few areas of a soil that is mainly silty clay or clay and a soil that is more acid than the Melvin soil. The included soils make up about 5 to 15 percent of the map unit.

This Melvin soil is used mainly for cultivated crops and as hayland and pasture. In a few areas, it is used as woodland.

This soil is poorly suited to cultivated crops unless drained. Wetness and flooding delay planting and harvesting operations in most years. Surface and subsurface drainage reduce wetness and lengthen the effective growing season. Where drained, this Melvin soil is suited to row crops. In some areas, subsurface drainage is not feasible because suitable outlets are not available. Winter crops are generally not suitable because of the flooding hazard and seasonal high water table. Cover crops and crop residue returned to the soil help to maintain the organic matter content and improve tilth.

This soil is suited to hay and pasture. Grasses and legumes that can withstand wetness and flooding are more suitable than other varieties. Drainage improves the suitability of some species. Proper seeding mixtures and rates, fertilizer, weed control, and controlled grazing are the main concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include pin oak, willow oak, American sycamore, sweetgum, baldcypress, and loblolly pine. Wetness is a severe limitation for equipment use. By using equipment during dry periods, this concern can be eliminated. Wetness is also a moderate limitation if seedlings are planted. Plant competition is severe in establishing new stands.

This soil is poorly suited to urban uses. Wetness and the hazard of flooding are severe limitations for building sites and sanitary facilities. These limitations are difficult to overcome.

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

Ne—Newark silt loam, occasionally flooded. This soil is deep, somewhat poorly drained, and nearly level. It is on flood plains and in upland depressions. Slopes range from 0 to 2 percent. Areas of this map unit range from 5 to 115 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of about 36 inches. In the upper part, it is yellowish brown silt loam that has light brownish gray mottles, and in the lower part, it is light brownish gray silty clay loam that has mottles in shades of brown and gray. The substratum to a depth of 60 inches is mottled light brownish gray, light gray, and yellowish brown silt loam.

This Newark soil has high natural fertility and available water capacity. The organic matter content in the surface layer is moderate. Reaction is medium acid to mildly alkaline throughout. The root zone is deep. A seasonal high water table is within 6 to 18 inches of the surface during winter and spring. Occasional flooding of brief

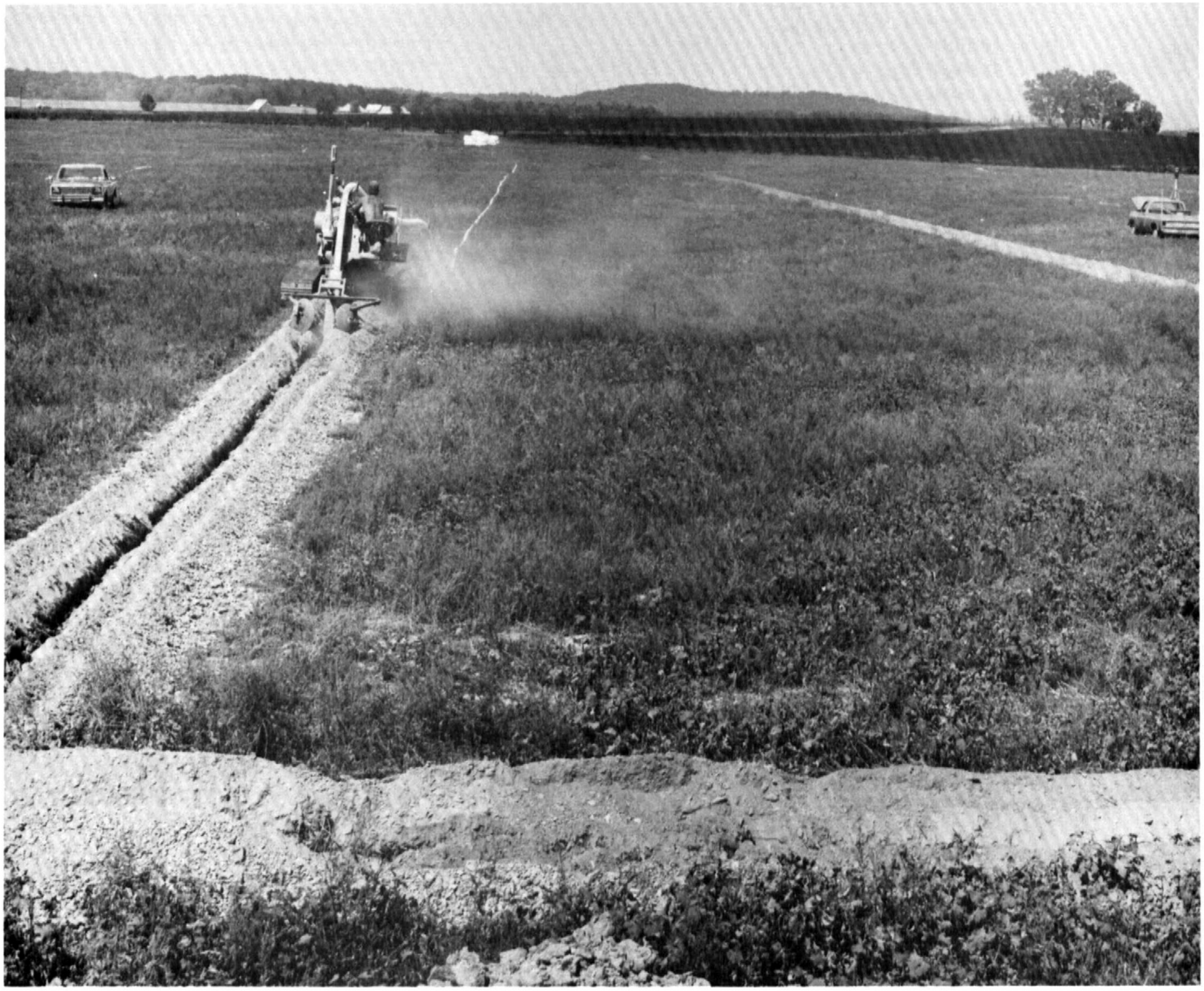


Figure 14.—This tile drainage system in an area of Newark silt loam, occasionally flooded, will lengthen the effective growing season of this soil.

duration occurs from December to May. Permeability is moderate, and the surface runoff is slow. Tilth is good.

Included with this soil in mapping are a few areas of Lindside, Melvin, and Dunning soils, and a soil that is 8 to 16 inches of brown silt loam overwash underlain by gray silt loam. Also included is a soil that is more acid in the subsoil than the Newark soil. The included soils make up about 10 to 20 percent of the map unit.

This Newark soil is used mainly for cultivated crops and as hayland and pasture. In a few areas, it is used as woodland.

This soil is suited to cultivated crops. Wetness and the hazard of flooding are the main limitations. Most floods occur during the winter and spring when crops are not grown, but occasionally they occur during the growing season. Wetness delays planting in most years and sometimes delays harvesting. Good water management practices are needed to increase the effective length of the growing season and widen the range of suitable plants (fig. 14). In some areas, tile drainage is not suitable where adequate outlets are not available. Cover crops and crop residue returned to the soil help to maintain the organic matter content and good tilth.

This soil is suited to hay and pasture. Grasses and legumes that can withstand wetness and flooding for brief periods are more suitable than other varieties. Proper seeding mixtures and rates, fertilizer, weed control, and controlled grazing are the main concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include eastern cottonwood, cherrybark oak, pin oak, sweetgum, loblolly pine, eastern white pine, and American sycamore. Plant competition is severe in establishing new seedlings. Wetness is a moderate limitation in using equipment.

This soil is poorly suited to most urban uses. The hazard of flooding and seasonal high water table are severe limitations for building sites and sanitary facilities.

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

NhA—Nicholson silt loam, 0 to 2 percent slopes. This soil is deep, moderately well drained, and nearly level. It is on broad upland ridges mostly in the southern part of the county. Areas of this map unit range from 4 to 75 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches. It is yellowish brown and brown silt loam to a depth of about 24 inches. A fragipan is between depths of 24 and 42 inches. It is firm, brittle and compact silt loam that is brown and has strong brown and light brownish gray mottles. Beneath the fragipan, the subsoil is yellowish brown silty clay that has strong brown and grayish brown mottles.

This Nicholson soil has medium natural fertility. The available water capacity is moderate. Organic matter content in the surface layer is moderate. Reaction is slightly acid to very strongly acid through the fragipan except where lime has been added. Below the fragipan, it ranges from slightly acid to strongly acid. The root zone is moderately deep to the fragipan at a depth of about 2 feet. A seasonal high water table is within 18 to 30 inches of the surface during winter and spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is slow. Tilth is good. The shrink-swell potential is low above the fragipan and moderate below the fragipan.

Included with this soil in mapping are a few areas of Lawrence and Crider soils and a soil along streams that is similar to this Nicholson soil except it is underlain by old stratified alluvium. Also included are a few areas of a soil that is clayey in the lower part of the subsoil and does not have a fragipan. The included soils make up 5 to 15 percent of the map unit.

This Nicholson soil is used for cultivated crops, small grains, and hay and pasture.

This soil is suited to most cultivated crops commonly grown in the county. Wetness is a moderate limitation that delays planting in the spring. The moderately deep rooting depth and moderate available water capacity, caused by the dense fragipan, result in droughtiness during extended dry periods. Good tilth is easily maintained by returning crop residue to the soil. Conservation tillage, cover crops, and grasses and legumes in the cropping system help to maintain good productivity.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well. The moderately deep rooting depth limits the use of some deep-rooted plants. Rotation grazing, optimum fertility levels, and renovation help to produce good yields of high quality forage.

This soil is suited to use as woodland, and productivity is high. Trees suitable for planting include yellow-poplar, white oak, black oak, northern red oak, eastern white pine, shortleaf pine, and white ash. Plant competition is the main concern in establishing new stands.

This soil is suited to most urban uses. Wetness is a severe limitation for septic tank absorption fields and for dwellings with basements. Low strength is a severe limitation for local roads and streets. Some of these limitations can be overcome by good design and proper installation.

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

NhB—Nicholson silt loam, 2 to 6 percent slopes. This soil is deep, moderately well drained, and gently sloping. It is on broad upland ridges throughout the county. Areas of this map unit range from 4 to 370 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches. It is yellowish brown and brown silt loam to a depth of about 24 inches. A fragipan is between 24 and 42 inches. It is firm, brittle and compact silt loam that is brown and has strong brown and light brownish gray mottles. Beneath the fragipan, the subsoil is yellowish brown silty clay that has strong brown and grayish brown mottles.

This Nicholson soil has medium natural fertility. The available water capacity is moderate. Organic matter content in the surface layer is moderate. Reaction is slightly acid to very strongly acid through the fragipan except where lime has been added. Below the fragipan, it ranges from slightly acid to strongly acid. The root zone is moderately deep to the fragipan. A seasonal high water table is within 18 to 30 inches of the surface during winter and spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium, and tilth is good. The shrink-swell potential is low above the fragipan and moderate below the fragipan.

Included with this soil in mapping are a few areas of Lawrence and Crider soils. Also included near streams are a few areas of soils similar to this Nicholson soil except they are underlain by old alluvium. A few areas of eroded soils are included mostly on the steeper slopes within the map unit. The included soils make up 15 to 20 percent of the map unit.

This Nicholson soil is used mainly for cultivated crops, small grains, and hay and pasture. In a few areas, it is used as woodland.

This soil is suited to most cultivated crops commonly grown in the county. Erosion is a moderate hazard if this soil is cultivated by conventional tillage methods. The moderately deep rooting depth and moderate available water capacity, caused by the dense fragipan, result in droughtiness during extended dry periods. Crops respond well to lime and fertilizer. Crop residue returned to the soil, conservation tillage, cover crops, and grasses and legumes included in the cropping system help to control erosion, improve tilth, and maintain good productivity.

This soil is well suited to hay and pasture, and most commonly grown grasses and legumes grow well. The moderately deep rooting depth limits the use of some deep-rooted plants. Rotation grazing, optimum fertility levels, and renovation help to produce good yields of high quality forage.

This soil is suited to use as woodland, and productivity is high. Trees suitable for planting include yellow-poplar, white oak, black oak, northern red oak, eastern white pine, shortleaf pine, and white ash. Plant competition is the main concern in establishing new stands.

This soil is suited to most urban uses. Wetness is a severe limitation for septic tank absorption fields and for dwellings with basements. Low strength is a severe limitation for local roads and streets. Some of these limitations can be overcome with good design and proper installation.

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

NhC2—Nicholson silt loam, 6 to 12 percent slopes, eroded. This soil is deep, moderately well drained, and sloping. It is on side slopes of broad upland ridges. Most slopes are smooth, convex, and elongated. Areas of this map unit range from 4 to 45 acres. Part of the original topsoil of this Nicholson soil has been removed by erosion.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches. It is yellowish brown and brown silt loam to a depth of about 20 inches. A fragipan is between 20 and 38 inches. It is firm, brittle and compact silt loam that is brown and has strong brown and light brownish gray mottles. Beneath the fragipan, the subsoil is yellowish brown silty clay that has strong brown and grayish brown mottles.

This Nicholson soil has medium natural fertility. The available water capacity is moderate. Organic matter content in the surface layer is low. Reaction is slightly acid to very strongly acid through the fragipan except where lime has been added. Below the fragipan, it ranges from slightly acid to strongly acid. The root zone is moderately deep to the fragipan. A seasonal high water table is within 18 to 30 inches of the surface during winter and spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium, and tilth is good. The shrink-swell potential is low above the fragipan and moderate below the fragipan.

Included with this soil in mapping are small areas of Crider soils, a few areas of gently sloping Nicholson soils, and some small spots of severely eroded soils that have a yellowish brown silt loam surface layer. Also included are a few areas of Nicholson soils that are not eroded. The included soils make up 10 to 20 percent of the map unit.

This Nicholson soil is used mainly for cultivated crops, small grains, and hay and pasture. In a few areas, it is used as woodland.

This soil is suited to most cultivated crops commonly grown in the county. Most crops grow well on this soil, but erosion is a severe hazard when this soil is cultivated by conventional tillage methods. Conservation tillage, contour farming, stripcropping, cover crops, and grasses and legumes in the cropping system help to slow runoff, maintain good tilth, and control erosion. During extended dry periods, this soil can become droughty because of the moderately deep rooting depth and moderate available water capacity. Crops respond well to lime and fertilizer.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well on this soil. The moderately deep rooting depth limits the use of some deep-rooted plants. Seeding stands of cool-season grasses late in summer or early in fall generally produces better stands than seeding in the spring. There is also less competition from weeds and better erosion control. Rotation grazing, optimum fertility levels, and renovation also help to produce good yields of high quality forage.

This soil is well suited to use as woodland, and productivity is high. Trees suitable for planting include yellow-poplar, white oak, black oak, northern red oak, eastern white pine, shortleaf pine, and white ash. Plant competition is moderate in establishing new stands.

This soil is suited to most urban uses. Slope is a severe limitation for building sites. Wetness and slow permeability are severe limitations for buildings with basements and septic tank absorption fields. The low strength of the soil material is a severe limitation for local roads and streets. Some of these limitations can be overcome with good design and proper installation.

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

No—Nolin silt loam, occasionally flooded. This soil is deep, well drained, and nearly level. It is on flood plains and in upland depressions. Slopes range from 0 to 3 percent. Areas of this map unit range from 5 to 220 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil to a depth of 60 inches is brown silt loam.

This Nolin soil has high natural fertility and available water capacity. The organic matter content in the surface layer is moderate. Reaction is medium acid to mildly alkaline throughout. The root zone is deep. A seasonal high water table is within 36 to 60 inches of the surface during winter and spring. Permeability is moderate, and the surface runoff is slow. This soil is subject to flooding of brief to long duration from December to May. Tilth is good.

Included with this soil in mapping are a few areas of Lindside, Newark, and Dunning soils. Also included are a few areas of soils that have 20 inches or more of brown silt loam underlain by dark gray silty clay loam, some soils that are loam or fine sandy loam throughout, and a few soils that are strongly acid or very strongly acid throughout. The included soils make up about 10 to 20 percent of the map unit.

This Nolin soil is used intensively for cultivated crops. In a few areas, it is used for pasture and hay or as woodland.

This soil is well suited to cultivated crops. Most crops grown in the area grow well on this soil, and yields are high. Erosion is a slight hazard. This soil can be worked throughout a wide range in moisture content without clodding or crusting. Flooding is a hazard, but in most years summer crops are not affected (fig. 15). Winter

Figure 15.—Most flooding occurs on Nolin silt loam, occasionally flooded, in winter and early in spring.

crops, such as small grains, are not suitable because of flooding. Cover crops and crop residue returned to the soil help to maintain the organic matter content and good tilth.

This soil is well suited to hay and pasture. Most grasses and legumes grown in the area grow well on this soil. In some years, perennials can be damaged by flooding. Proper seeding mixtures and rates, fertilizer, controlled grazing, and weed control are the main concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak, and black walnut. Plant competition is severe in establishing new stands, and proper site preparation is necessary.

This soil is poorly suited to most urban uses because of the flooding hazard and seasonal high water table. In some places, dikes and levees can be used to protect urban structures. The limitations to the use of this soil for building sites and sanitary facilities are severe.

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

PmA—Pembroke silt loam, 0 to 2 percent slopes. This soil is deep, well drained, and nearly level. It is on broad upland ridges. Areas of this map unit range from 5 to 95 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is reddish brown and yellowish red silty clay loam to a depth of 33 inches and dark red silty clay loam and silty clay to a depth of 63 inches.

The Pembroke soil has high natural fertility, and the organic matter content is moderate. The available water capacity is high. Reaction is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. Surface runoff is slow. Tilth is good, and this soil can be worked throughout a wide range in moisture content. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part.

Included with this soil in mapping are a few areas of Crider and Nicholson soils and a few small areas of Nolin soils in depressions. The included soils make up 5 to 15 percent of the map unit.

Most of this Pembroke soil has been cleared and is used for cultivated crops, small grains, and hay and pasture.

This soil is well suited to all crops commonly grown in the county, and there are no significant limitations to its use. Cover crops, crop residue returned to the soil, and grasses and legumes in the cropping system help to maintain the organic matter content and good tilth. Rotation grazing and renovation help to maintain high yields.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include yellow-poplar, black oak, black walnut, white ash, northern red oak, white oak, eastern white pine, shortleaf pine, and loblolly pine. Plant competition is severe in establishing new stands.

This soil is suited to most urban uses. Low strength is a severe limitation for local roads and streets. Shrinking and swelling is a moderate limitation for dwellings with basements. Good design and careful installation can overcome these limitations.

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

PmB—Pembroke silt loam, 2 to 6 percent slopes. This soil is deep, well drained, and gently sloping. It is on broad upland ridges. Some areas are karst. Slopes are somewhat irregular and the topography is undulating. This map unit is the largest in the county. Areas of this map unit range from 6 to 900 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 63 inches. It is reddish brown and yellowish red silty clay loam to a depth of 33 inches. From 33 to 63 inches, it is dark red silty clay loam in the upper part and dark red silty clay in the lower part.

This Pembroke soil has high natural fertility, and the organic matter content is moderate. The available water capacity is high. This soil is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. Surface runoff is medium. Tilth is good, and this soil can be worked throughout a wide range in moisture content. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part.

Included with this soil in mapping are a few areas of Crider soils on ridgetops, Fredonia and Vertrees soils around sinks, and Nolin soils in upland depressions. In some areas, the Crider soil makes up as much as 20 percent of the map unit. The included soils make up less than 15 percent of the map unit.

Most of this Pembroke soil has been cleared and is used for cultivated crops, small grains, and hay and pasture.

This soil is well suited to cultivated crops. It is one of the more productive soils in the county and is used for intensive cropping systems (fig. 16). Erosion is a moderate hazard. Conservation tillage, stripcropping, and crop residue returned to the soil help to control erosion and reduce runoff while maintaining high yields and good tilth.

This soil is suited to hay and pasture. Most commonly grown grasses and legumes grow well, including deep-rooted plants such as alfalfa. Proper seeding mixtures and rates, lime and fertilizer, weed control, and controlled grazing are the major concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include yellow-poplar, black walnut, white ash, northern

Figure 16.—No-till soybeans are double cropped into wheat stubble in this area of Pembroke silt loam, 2 to 6 percent slopes.

red oak, white oak, black oak, eastern white pine, shortleaf pine, and loblolly pine. Plant competition is severe in establishing new stands.

This soil is suited to most urban uses. Slope is a moderate limitation for small commercial buildings. Low strength is a severe limitation for local roads and streets. Shrinking and swelling is a moderate limitation for buildings with basements. Good design and careful installation can overcome these limitations.

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

PmC2—Pembroke silt loam, 6 to 12 percent slopes, eroded. This soil is deep, well drained, and sloping. It is on narrow side slopes of broad upland ridges and on rolling karst topography. Slopes are smooth and irregular. Part of the original topsoil of this Pembroke soil has been removed by erosion. Areas of this map unit range from 5 to 190 acres.

Typically, the surface layer is dark reddish brown silt loam about 6 inches thick. The subsoil extends to a depth of 63 inches. It is reddish brown and yellowish red silty clay loam in the upper part. The lower part of the subsoil is dark red silty clay loam that grades to dark red silty clay.

This soil has moderate natural fertility and high available water capacity. The organic matter content in the surface layer is moderate. Reaction is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. Surface runoff is medium, and tilth is good. The shrink-swell potential is low in the upper part of the subsoil and moderate in the lower part.

Included with this soil in mapping are a few areas of Vertrees, Baxter, and Fredonia soils. Also included are a few areas of Pembroke soils that are severely eroded and areas that are not eroded. The included soils make up less than 15 percent of this map unit.

Most of this Pembroke soil has been cleared and is used for cultivated crops, small grains, and hay and pasture. In a few areas, it is used as woodland.

This soil is suited to cultivated crops. Most crops grow well on this soil, but erosion is a severe hazard when this soil is cultivated by conventional tillage methods. Because of the irregular slopes and karst topography, some erosion control practices are difficult to apply. Conservation tillage, cover crops, and crop rotation with grasses and legumes help to slow runoff, maintain good tilth, and control erosion.

This soil is well suited to hay and pasture. The commonly grown grasses and legumes grow well on this soil, including deep-rooted plants such as alfalfa. Seeding stands of cool-season grasses late in summer or early in fall generally produces better stands than stands seeded in the spring. There is also less competition from weeds and better erosion control. Rotation grazing, lime and fertilizer, weed control, and renovation are the main concerns in management.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include yellow-poplar, black oak, black walnut, white ash, northern red oak, white oak, eastern white pine, shortleaf pine, and loblolly pine. Plant competition is severe in establishing new stands.

This soil is suited to most urban uses. Slope and the moderate shrink-swell potential are moderate limitations for dwellings. Low strength is a severe limitation for local roads and streets. Protection from further erosion is needed during construction.

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

ReC2—Riney loam, 6 to 12 percent slopes, eroded. This soil is deep, well drained, and sloping. It is on ridges, side slopes, and benches of sandstone uplands. Most slopes are convex and dissected by drainageways. Part of the topsoil has been removed by erosion. Areas of this map unit range from 5 to 70 acres.

Typically, the surface layer is yellowish brown loam about 7 inches thick. The subsoil to a depth of 60 inches is yellowish red clay loam in the upper part grading to red clay loam that has yellowish brown mottles in the lower part.

This soil has medium to low natural fertility and high available water capacity. The organic matter content in the surface layer is low. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderately rapid. Surface runoff is medium, and tilth is good.

Included with this soil in mapping are a few small areas of Wellston and Frondorf soils. Also included are a few severely eroded spots, some Riney soils that are moderately deep to soft sandstone bedrock, and some that have slopes of less than 6 percent. A soil that has a yellowish brown or strong brown subsoil is also included. The included soils make up 15 to 25 percent of the map unit.

This Riney soil is used mainly as hayland and pasture or as woodland. In a few areas, it is used for cultivated crops.

This soil is suited to cultivated crops. Erosion is a severe hazard if this soil is cultivated by conventional tillage methods. If cultivated crops are grown, conservation tillage, contour farming, stripcropping, cover crops, and crop residue returned to the soil are needed to reduce runoff and help control erosion.

This soil is suited to hay and pasture. Most grasses and legumes grown in the area grow well on this soil. The severe erosion hazard and low organic matter content are limitations for establishing and maintaining good production. Establishing new stands of cool-season grasses late in summer or early in fall produces faster growth with less risk of erosion. Optimum fertility levels, controlling weeds, rotation grazing, and renovation without turning the soil are concerns in management.

This soil is suited to use as woodland, and productivity is high. Trees suitable for planting include black oak, chestnut oak, northern red oak, yellow-poplar, white ash, shortleaf pine, and eastern white pine. Plant competition is the main concern in management.

This soil is suited to urban uses. Slope is a moderate limitation for most uses and is a severe limitation for small commercial buildings. Low strength is a limitation for local roads and streets. Good design can overcome some of these limitations.

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

ReD2—Riney loam, 12 to 20 percent slopes, eroded. This soil is deep, well drained, and moderately steep. It is on side slopes and benches of sandstone uplands. Most slopes are convex and are dissected by drainageways. Part of the original topsoil has been removed by erosion. Areas of this map unit range from 5 to 20 acres.

Typically, the surface layer is yellowish brown loam about 7 inches thick. The subsoil to a depth of 60 inches is yellowish red clay loam in the upper part grading to red clay loam that has yellowish brown mottles in the lower part.

This soil has medium to low natural fertility and high available water capacity. The organic matter content in the surface layer is low. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderately rapid. Surface runoff is rapid and tilth is good.

Included with this soil in mapping are a few small areas of Wellston and Frondorf soils. Also included are a few severely eroded spots, areas of Riney soils that are moderately deep to soft sandstone bedrock, and areas of a soil that is similar in texture to this Riney soil but has a yellowish brown or strong brown subsoil. The included soils make up 15 to 25 percent of the map unit.

This Riney soil is used mainly as woodland. In a few areas, it has been cleared and is used as pasture.

This soil is poorly suited to cultivated crops. Erosion is a very severe hazard and permits only occasional cultivation without excessive soil loss. If cultivated crops are grown, conservation tillage, contour farming, stripcropping, cover crops, and crop residue returned to the soil are needed to reduce runoff and help control erosion.

This soil is suited to hay and pasture. Most grasses and legumes grown in the area are suited. The very severe erosion hazard and low organic matter content are limitations for establishing and maintaining good production. Establishing new stands of cool-season grasses late in summer or early in fall produces faster growth with less risk of erosion than stands established in the spring. Optimum fertility levels, control of weeds, rotation grazing, and renovation without turning the soil are concerns in management.

This soil is suited to use as woodland, and productivity is high. Trees suitable for planting include black oak, chestnut oak, northern red oak, yellow-poplar, white ash, shortleaf pine, and eastern white pine. Plant competition is the main concern in management.

This soil is poorly suited to most urban uses. The moderately steep slopes are a severe limitation for building sites and sanitary facilities.

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

RmE3—Riney gravelly loam, 12 to 30 percent slopes, severely eroded. This soil is deep, well drained, and sloping to steep. It is on side slopes and benches of the sandstone uplands. Most of the original topsoil, and in places part of the subsoil, has been removed by excessive erosion. Most slopes are convex and dissected by drainageways. Areas of this map unit range from 5 to 40 acres.

Typically, the surface layer is yellowish brown gravelly loam about 2 inches thick. The subsoil extends to a depth of about 44 inches. It is strong brown gravelly sandy loam in the upper part and grades to strong brown sandy clay loam that has yellowish red mottles in the lower part. The substratum is brownish yellow loamy sand. Sandstone bedrock is at a depth of about 48 inches.

This soil has low natural fertility and high available water capacity. Organic matter content in the surface layer is low. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderately rapid. Surface runoff is rapid, and tilth is fair.

Included with this soil in mapping are a few small areas of Wellston, Frondorf, and DeKalb soils. Also included are a few areas of Riney soils that are moderately deep to soft sandstone bedrock, and areas of a soil that is similar in texture to this Riney soil but it has yellowish brown subsoil. The included soils make up about 15 to 25 percent of the map unit.

This Riney soil is used mainly as woodland or is growing brush. In a few areas, it has been cleared and is used as pasture.

This soil is poorly suited to cultivated crops. Erosion is a very severe hazard when this soil is cultivated. If cultivated crops are grown, all possible erosion control practices should be used including conservation tillage, contour farming, stripcropping, and returning crop residue to the soil.

This soil is suited to hay and pasture. The very severe erosion hazard, low organic matter content, and steep slopes are limitations for establishing and maintaining good production. Establishing new stands of cool-season grasses late in summer or early in fall produces faster growth with less risk of erosion. In some areas, land grading is needed before a seedbed can be prepared. Optimum fertility, controlled weeds, rotation grazing, and renovation without turning the soil are concerns in management.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include black oak, chestnut oak, white oak, loblolly pine, Virginia pine, shortleaf pine, and eastern white pine. Plant competition, seedling mortality, and equipment use limitations are the main concerns in management.

This soil is poorly suited to urban uses. The steepness of slope is a severe limitation.

This Riney soil is in capability subclass VIe and in woodland suitability group 3r.

Ro—Robertsville silt loam, occasionally flooded. This soil is deep, poorly drained, and nearly level. It is on stream terraces and in concave upland areas mostly in the southern part of the county. Slopes range from 0 to 2 percent. Areas of this map unit range from 4 to 630 acres, but most are less than 100 acres.

Typically, the surface layer and subsurface layer are very dark gray and light gray silt loam, and the subsurface layer has light brownish gray and dark brown mottles. The surface layer is about 2 inches thick, and the subsurface layer extends to a depth of about 8 inches. The subsoil extends to a depth of about 53 inches. To a depth of about 20 inches, it is light brownish gray silt loam that has dark brown mottles. A fragipan is at a depth of 20 to 43 inches. It is firm, brittle and compact, gray silty clay loam that has brown mottles. Below that, the subsoil is mottled gray and brown silty clay. The substratum to a depth of 70 inches is mottled gray, brown, and light olive brown silty clay.

This soil has medium natural fertility and moderate available water capacity. The organic matter content in the surface layer is low. Reaction is strongly acid or very strongly acid through the fragipan except where lime has been added. Below the fragipan, it ranges from very strongly acid to neutral. The root zone is moderately deep to the fragipan. A seasonal high water table is at the surface or within a depth of 12 inches during winter and spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is slow, and tilth is good. This soil is subject to flooding of brief duration from December to April.

Included with this soil in mapping are a few areas of Lawrence and Melvin soils. Also included is a soil that has a surface layer of dark gray silt loam underlain by a subsoil of gray silty clay or clay. This soil does not have a fragipan. The included soils make up 10 to 20 percent of the map unit. Individual areas are less than 3 acres.

Most of this Robertsville soil has been cleared and is used for cultivated crops and hay and pasture. In a few of the larger areas and those that cannot be drained, it is still used as native woodland.

This soil is poorly suited to cultivated crops and small grains. The seasonal high water table, hazard of flooding, and slowly permeable fragipan are the main limitations. Wetness delays planting and sometimes delays harvesting operations in most years. Winter grain crops usually receive severe damage from flooding. Where adequate outlets are available, artificial drainage increases the effective length of the growing season and improves the suitability of some crops.

This soil is poorly suited to hay and pasture. Wetness and flooding limit the suitable plant varieties and length of livestock grazing.

This soil is well suited to use as woodland, and productivity is very high. Trees suitable for planting include pin oak, willow oak, sweetgum, baldcypress, loblolly pine, and American sycamore. Plant competition is severe, and the equipment use limitation and seedling mortality are moderate. Some limitations can be eliminated by good forest management.

This soil is poorly suited to urban uses. Wetness and flooding are severe limitations that are difficult to overcome. Slow permeability is a severe limitation for septic tank absorption fields, and low strength is a severe limitation for local roads and streets.

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

SaA—Sadler silt loam, 0 to 2 percent slopes. This soil is deep, moderately well drained, and nearly level. It is on broad ridgetops. Areas of this map unit range from 6 to 65 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches. To a depth of about 22 inches, it is yellowish brown silty clay loam. Below that, to a depth of about 26 inches, the subsoil is light brownish gray silt loam coatings on yellowish brown peds. A fragipan is at a depth of 26 to 44 inches. It is mottled yellowish brown, light olive brown, and light brownish gray silt loam that is firm, brittle and compact. Below that, the subsoil is mottled light olive brown and light brownish gray silty clay loam.

This soil has medium natural fertility and moderate available water capacity. It is strongly acid or very strongly acid throughout except where lime has been added. The organic matter content in the surface layer is moderate. The root zone is moderately deep to the fragipan. A seasonal high water table is within 18 to 24 inches of the surface in winter and early in spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is slow, and tilth is good.

Included with this soil in mapping are a few small areas of Johnsburg, Zanesville, Epley, and Wellston soils. The included soils make up 5 to 15 percent of the map unit. Individual areas are less than 2 acres.

This Sadler soil is used mainly for cultivated crops, small grains, and hay and pasture.

This soil is suited to most cultivated crops and small grains commonly grown in the county. Wetness is a moderate limitation that delays planting in the spring. The moderately deep rooting depth and moderate available water capacity, caused by the dense fragipan, result in droughtiness during extended dry periods. Because erosion is a slight hazard, this soil can be cultivated intensively without significant soil loss. Crops respond well to lime and fertilizer. Cover crops and crop residue returned to the soil help to maintain the organic matter content and tilth.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well on this soil. Some deep-rooted plants, however, are limited by the moderately deep root zone. Proper seeding mixtures and rates, lime and fertilizer, weed control, and control of grazing are the main concerns in management.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and loblolly pine. Plant competition is the main limitation.

This soil is suited to most urban uses. Wetness and slow permeability are severe limitations for sanitary facilities and dwellings with basements. The low strength of the soil material is a moderate limitation for local roads and streets. Some of these limitations can be eliminated by good design and proper installation.

This Sadler soil is in capability subclass IIw and in woodland suitability group 3o.

SaB—Sadler silt loam, 2 to 6 percent slopes. This soil is deep, moderately well drained, and gently sloping. It is on broad ridgetops. Areas of this map unit range from 5 to 870 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches. To a depth of about 22 inches, it is yellowish brown silty clay loam. Below that, to a depth of about 26 inches, the subsoil is light brownish gray silt loam coatings on yellowish brown peds. A fragipan is at a depth of 26 to 44 inches. It is mottled yellowish brown, light olive brown, and light brownish gray silt loam that is firm, brittle and compact. Below that, the subsoil is mottled light olive brown and light brownish gray silty clay loam.

This soil has medium natural fertility and moderate available water capacity. It is strongly acid or very strongly acid throughout except where lime has been added. The organic matter content in the surface layer is moderate. The root zone is moderately deep to the fragipan. A seasonal high water table is within 18 to 24 inches of the surface in winter and early in spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium, and tilth is good.

Included with this soil in mapping are a few small areas of Johnsburg, Zanesville, Epley, and Wellston soils. The included soils make up 10 to 20 percent of the map unit. Individual areas are less than 3 acres.

This Sadler soil is used mainly for cultivated crops (fig. 17), small grains, and hay and pasture.

This soil is suited to most cultivated crops and small grains commonly grown in the county. Wetness is a moderate limitation that delays planting in the spring. The moderately deep rooting depth and moderate available water capacity, caused by the dense fragipan, results in droughtiness during extended dry periods. Erosion is a moderate hazard when this soil is cultivated by conventional tillage methods. Conservation tillage, contour farming, and grasses and legumes in the cropping system help slow runoff and control erosion. Crops respond well to lime and fertilizer. Cover crops and return of crop residue to the soil help to maintain the organic matter content and tilth.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well on this soil. Some deep-rooted plants, however, are limited by the moderately deep root zone. Proper seeding mixtures and rates, lime and fertilizer, weed control, and control of grazing are the main concerns in management.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include black oak, white oak, eastern white pine, shortleaf pine,

Figure 17.—This crop of dark-fired and burley tobacco is on Sadler silt loam, 2 to 6 percent slopes.

Virginia pine, and loblolly pine. Plant competition is the main limitation.

This soil is suited to most urban uses. Wetness and slow permeability are severe limitations for sanitary facilities and dwellings with basements. The low strength of the soil material is a moderate limitation for local roads and streets. Some limitations can be eliminated by good design and proper installation.

This Sadler soil is in capability subclass IIe and in woodland suitability group 3o.

Sk—Skidmore gravelly loam, occasionally flooded. This soil is deep, well drained, and nearly level. It is on narrow flood plains. This soil is subject to flooding of very brief duration on an average of once every 2 to 5 years from December to May. Slopes range from 0 to 3 percent. Areas of this map unit range from 6 to 60 acres, but most are less than 20 acres.

Typically, the surface layer is brown gravelly loam about 8 inches thick. The subsoil extends to a depth of about 30 inches. To a depth of about 16 inches, it is dark yellowish brown gravelly sandy loam or very gravelly sandy loam. Below that, it is yellowish brown very gravelly sandy loam that has pale brown mottles. The substratum is mottled yellowish brown and grayish brown gravelly clay loam. Limestone bedrock is at a depth of about 47 inches.

This soil has medium natural fertility and moderate available water capacity. The organic matter content in the surface layer is moderate. Reaction is medium acid to mildly alkaline throughout. The root zone is deep, and permeability is moderately rapid. Runoff is slow. A seasonal high water table is within 3 to 4 feet of the surface in winter and early in spring. Tilth is poor because of the content of coarse fragments in the surface layer.

Included with this soil in mapping are a few areas of Nolin and Lindside soils. Also included is a soil that has a silt loam surface layer but otherwise is similar to this Skidmore soil and a few areas of soils that have reaction ranging from mildly alkaline to strongly acid. The included soils make up 10 to 20 percent of the map unit.

This Skidmore soil is used mainly for cultivated crops, hay, and pasture.

This soil is suited to cultivated crops. Flooding is an occasional hazard, generally during non-crop seasons. Floods that occur during the crop season are very brief and seldom cause severe damage. Coarse fragments in the plow layer interfere with tillage in some areas. Cover crops and crop residue returned to the soil help to maintain the organic matter content and improve tilth.

This soil is suited to hay and pasture, and it produces good yields from established stands. Coarse fragments in the surface layer cause problems in preparing a good seedbed and in mowing. Because of the moderate available water capacity and moderately rapid permeability, this soil is droughty during extended dry periods. Plant varieties that can withstand very brief flooding are the most suitable. Proper seeding mixtures and rates, fertilizer, controlled grazing, and weed control are the main concerns in management.

This soil is suited to use as woodland, and productivity is very high. Plant competition is the main concern in management. Trees suitable for planting include black oak, white oak, yellow-poplar, white ash, eastern white pine, and loblolly pine.

This soil is poorly suited to most urban uses. The hazard of flooding is a severe limitation for sanitary facilities and building site development.

This Skidmore soil is in capability subclass IIs and in woodland suitability group 1f.

VeC2—Vertrees silty clay loam, 6 to 12 percent slopes, eroded. This soil is deep, well drained, and sloping. It is on side slopes of karst uplands and is underlain by limestone. Most slopes are short and irregular. Areas of this map unit range from 5 to 100 acres, but most are less than 30 acres. Part of the original topsoil has been removed by erosion.

Typically, the surface layer is reddish brown silty clay loam about 5 inches thick. The subsoil extends to a depth of 70 inches. To a depth of 20 inches, it is red silty clay. Below that, the subsoil is red clay grading to dark red clay that has strong brown mottles.

This soil has medium natural fertility and high available water capacity. It is medium acid to very strongly acid throughout except where lime has been added. The organic matter content in the surface layer is low. The root zone is deep, and permeability is moderately slow. Surface runoff is medium, and tilth is poor. This soil can only be worked in a relatively narrow range of moisture content without forming clods. The shrink-swell potential is moderate.

Included with this soil in mapping are a few small areas of Pembroke and Baxter soils. Also included are areas of soils that have a silt loam surface layer, soils that have slopes of less than 6 percent, and areas of severely eroded soils that have a silty clay surface layer. The included soils make up 20 to 30 percent of the map unit, but they do not affect use and management. Individual areas are less than 3 acres.

This Vertrees soil is used mainly for cultivated crops, hay, and pasture. In a few areas, it is used as woodland.

This soil is suited to cultivated crops; however, erosion is a severe hazard if the soil is cultivated by conventional tillage methods. Because of the irregular slopes and karst topography, some erosion control practices are difficult to apply. Conservation tillage, contour farming, cover crops, crop residue returned to the soil, and grasses and legumes in the cropping system slow runoff, control erosion, and improve tilth.

This soil is well suited to hay and pasture. Most locally grown grasses and legumes grow well, including deep-rooted plants such as alfalfa (fig. 18). Hay and pasture crops respond well to lime and fertilizer. Because of the severe hazard of erosion, seedbeds should be prepared late in summer or early in fall to establish quick growth when the risk of erosion is less. Old stands can be renovated without turning the soil. Weed control and control of grazing are concerns in management.

This soil is well suited to use as woodland, and productivity is high. Trees suitable for planting include yellow-poplar, white oak, black oak, northern red oak, white ash, and Virginia pine. Plant competition is moderate in establishing new stands. When this soil is wet, the surface becomes slick and the use of equipment is restricted.

This soil is suited to urban uses. The moderate shrink-swell potential is a limitation for dwellings. Low strength of the soil material is a severe limitation for local roads and streets. The moderately slow permeability is a severe limitation for septic tank absorption fields. Some of these limitations can be overcome by good design and proper installation.

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

WeB—Wellston silt loam, 2 to 6 percent slopes. This soil is deep, well drained, and gently sloping. It is on narrow ridgetops and benches of the uplands and is underlain by sandstone. Slopes are smooth and convex. Areas of this map unit range from 4 to 40 acres.

Typically, the surface layer is brown and dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of about 48 inches. To a depth of 30 inches, it is yellowish brown silt loam grading to strong brown silty clay loam. Below that, the subsoil is yellowish brown silt loam that has brown mottles in the lower part. The substratum is yellowish brown channery loam. Sandstone bedrock is at a depth of 55 inches.

This soil has medium natural fertility and moderate organic matter content in the surface layer. It is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. The available water capacity is high. Surface runoff is medium, and tilth is good. Sandstone or shale bedrock is at a depth of 40 to 65 inches.

Figure 18.—Alfalfa and orchardgrass are harvested for hay in this area of Vertrees silty clay loam, 6 to 12 percent slopes, eroded.

Included with this soil in mapping are a few areas of Zanesville, Frondorf, and Riney soils. Also included are a few Wellston soils that are severely eroded and areas of a soil that has a clayey subsoil below a depth of about 20 inches and that formed in material weathered from shale. The included soils make up 10 to 20 percent of the map unit. Individual areas are less than 3 acres.

This Wellston soil is used mainly for cultivated crops, small grains, and hay and pasture. In a few areas, it is used as woodland.

This soil is well suited to cultivated crops and small grains. Erosion is a moderate hazard if this soil is cultivated by conventional tillage methods. Conservation tillage, contour farming, stripcropping, cover crops, crop residue returned to the soil, and grasses and legumes in the cropping system help to control erosion and maintain good tilth. Crops respond well to lime and fertilizer.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well, including deep-rooted plants. Seeding or renovating late in summer or early in fall generally produces better stands, reduces competition from weeds, and improves erosion control. To prevent erosion, renovation needs to be done without turning the soil. Lime and fertilizer, control of weeds, and controlled grazing also help to maintain good yields of high quality forage.

This soil is well suited to use as woodland, and productivity is high. Plant competition is moderate in establishing new stands. Trees suitable for planting include black walnut, white oak, black oak, northern red oak, yellow-poplar, white ash, Virginia pine, and shortleaf pine.

This soil is well suited to most urban uses. Slope is a moderate limitation for small commercial buildings. Depth to bedrock is a moderate limitation for septic tank absorption fields and dwellings with basements. Low strength of the soil material is a moderate limitation for local roads and streets. Some of these limitations can be overcome by good design and proper installation.

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

WeC2—Wellston silt loam, 6 to 12 percent slopes, eroded. This soil is deep and well drained. It is on narrow, sloping ridgetops and side slopes. Slopes are somewhat irregular and convex. They are dissected by intermittent drainageways. Areas of this map unit range from 4 to 120 acres, but most are less than 50 acres. Part of the original topsoil has been removed by erosion.

Typically, the surface layer is brown silt loam about 4 inches thick. The subsoil extends to a depth of about 44 inches. To a depth of 26 inches, it is yellowish brown silt loam grading to strong brown silty clay loam. Below that, the subsoil is yellowish brown silt loam that has brown mottles in the lower part. The substratum is light yellowish brown channery loam. Sandstone bedrock is at a depth of 51 inches.

This soil has medium natural fertility and moderate organic matter content in the surface layer. It is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. The available water capacity is high. Surface runoff is medium, and tilth is good. Sandstone or shale bedrock is at a depth of 40 to 65 inches.

Included with this soil in mapping are a few areas of Zanesville, Frondorf, and Riney soils. Also included are a few Wellston soils that are severely eroded and areas that are not eroded. A soil that has a clayey subsoil below a depth of 20 inches and that formed in material weathered from shale is also included. The included soils make up 15 to 20 percent of the map unit. Individual areas are less than 3 acres.

This Wellston soil is used for cultivated crops, small grains, woodland, and hay and pasture.

This soil is suited to cultivated crops and small grains. The severe hazard of erosion and the low organic matter content are the main limitations. If this soil is cultivated, it needs to be protected from further erosion by conservation tillage, contour farming, stripcropping, cover crops, crop residue returned to the soil, and grasses and legumes in the cropping system.

This soil is suited to hay and pasture. Most commonly grown grasses and legumes grow well on this soil, including deep-rooted plants. Good management practices are needed to establish and maintain hay and pasture (fig. 19). Seeding or renovation late in summer or early in fall generally produces better stands, reduces competition from weeds and improves erosion control. To prevent erosion, renovation needs to be done without turning the soil. Lime and fertilizer, weed control, and controlled grazing also help to produce and maintain good yields of high quality forage.

This soil is well suited to use as woodland, and productivity is high. Plant competition is moderate in establishing new stands. Trees suitable for planting include black walnut, white oak, black oak, northern red oak, yellow-poplar, white ash, Virginia pine, and shortleaf pine.

This soil is suited to most urban uses. Slope is a moderate limitation for dwellings. Depth to bedrock is a moderate limitation for septic tank absorption fields. Low strength of the soil material is a moderate limitation for local roads and streets. Some of these limitations can be overcome by good design and proper installation.

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

WeD—Wellston silt loam, 12 to 20 percent slopes. This soil is deep and well drained. It is on side slopes of uplands and is underlain by sandstone. Slopes are irregular and dissected by intermittent drainageways. Areas of this map unit range from 5 to 45 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 48 inches. To a depth of 30 inches, it is yellowish brown silt

Figure 19.—Hay and other close-growing crops help prevent further erosion of this area of Wellston silt loam, 6 to 12 percent slopes, eroded.

loam grading to strong brown silty clay loam. Between depths of 30 and 48 inches, the subsoil is yellowish brown silt loam that has brown mottles in the lower part. The substratum to a depth of 55 inches is yellowish brown channery loam. Sandstone bedrock is at a depth of 55 inches.

This soil has medium natural fertility, and the organic matter content is moderate. The soil is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. The available water capacity is high. Surface runoff is rapid, and tilth is good. Sandstone or shale bedrock is at a depth of 40 to 65 inches.

Included with this soil in mapping are a few small areas of Frondorf and Riney soils. Also included are a few Wellston soils that are severely eroded and areas of a soil that has a clayey subsoil below a depth of about 20 inches and that formed in material weathered from shale. The included soils make up 15 to 25 percent of the map unit. Individual areas are less than 3 acres.

This Wellston soil is used mainly as woodland. In a few areas, it is used as hayland or pasture.

This soil is poorly suited to cultivated crops and small grains because erosion is a very severe hazard and the slopes are moderately steep. If this soil is cultivated, it needs to be protected from erosion by conservation tillage, contour farming, stripcropping, cover crops, crop residue returned to the soil, and grasses and legumes in the cropping system.

This soil is suited to hay and pasture. Most commonly grown grasses and legumes grow well, including deep-rooted plants. When establishing and maintaining hay and pasture, good management practices are needed to avoid excessive soil loss. Seeding or renovating late in summer or early in fall generally produces better stands and reduces competition from weeds and the risk of erosion. To prevent erosion, renovation needs to be done without turning the soil. Lime and fertilizer, controlling weeds, and controlled grazing help to produce and maintain good yields of high quality forage.

This soil is suited to use as woodland. Productivity is high on north slopes and moderately high on south slopes. Plant competition is moderate in establishing new stands. The moderately steep slopes are also a concern in management. Trees suitable for planting on north-facing slopes are black walnut, white oak, black oak, northern red oak, yellow-poplar, white ash, eastern white pine, Virginia pine, and shortleaf pine. Those suitable for planting on south-facing slopes include the same oak species, yellow-poplar, eastern white pine, loblolly pine, and Virginia pine.

This soil is poorly suited to most urban uses. Steepness of slope, depth to bedrock, and low strength are the main limitations. Some of these limitations are difficult to overcome.

This Wellston soil is in capability subclass IVe and in woodland suitability groups 2r (north aspect) and 3r (south aspect).

WlC3—Wellston silty clay loam, 6 to 12 percent slopes, severely eroded. This soil is deep, well drained, and sloping. It is on narrow ridgetops and side slopes of uplands and is underlain by sandstone. Slopes are irregular and convex. They are dissected by intermittent drainageways. Most of the original topsoil, and in places part of the subsoil, has been removed by excessive erosion. Rills and small gullies are common. Areas of this map unit range from 4 to 200 acres.

Typically, the surface layer is strong brown silty clay loam about 8 inches thick. The subsoil extends to a depth of 40 inches. To a depth of 22 inches, it is strong brown silty clay loam. The lower part is yellowish brown silt loam that has brown mottles. The substratum is yellowish brown channery loam. Sandstone bedrock is at a depth of 47 inches.

This soil has low natural fertility and organic matter content. It is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. The available water capacity is high. Surface runoff is medium, and tilth is fair. Sandstone or shale bedrock is at a depth of 40 to 65 inches.

Included with this soil in mapping are a few areas of Zanesville, Frondorf, and Riney soils. Also included are a few areas of Wellston soils that are not eroded and areas of a soil that has a clayey subsoil below a depth of about 20 inches and that formed in material weathered from shale. The included soils make up less than 25 percent of the map unit. Individual areas are less than 3 acres.

This Wellston soil is used mainly for cultivated crops, woodland, and hay and pasture.

This soil is poorly suited to cultivated crops. The very severe erosion hazard and low organic matter content are the main limitations. If this soil is cultivated, it can be protected from further erosion by cultivating only occasionally and by conservation tillage, contour farming, stripcropping, cover crops, crop residue returned to the soil, and grasses and legumes in the cropping system.

This soil is suited to hay and pasture, but good management practices are needed. Most grasses and legumes grow well on this soil. Seeding or renovation late in summer or early in fall generally produces better stands, reduces competition from weeds, and improves erosion control. To prevent further erosion, renovation needs to be done without turning the soil. Lime and fertilizer, weed control, and controlled grazing also help to maintain good production.

This soil is well suited to use as woodland, and productivity is moderately high. Plant competition is moderate in establishing new stands. Trees suitable for planting include black oak, white oak, chestnut oak, eastern white pine, Virginia pine, and shortleaf pine.

This soil is suited to most urban uses. Slope is a moderate limitation for dwellings. Depth to bedrock is a severe limitation for septic tank absorption fields. Low strength of the soil material is a moderate limitation for local roads and streets. Some of these limitations can be overcome by good design and proper installation.

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

WlD3—Wellston silty clay loam, 12 to 20 percent slopes, severely eroded. This soil is deep, well drained, and moderately steep. It is on side slopes of uplands and is underlain by sandstone. Slopes are irregular and convex. They are dissected by intermittent drainageways. Most of the original topsoil, and in places part of the subsoil, have been removed by excessive erosion. Rills and small gullies 1 foot to 4 feet deep are common. Areas of this map unit range from 5 to 90 acres.

Typically, the present surface layer is strong brown silty clay loam about 8 inches thick. The subsoil extends to a depth of about 40 inches. To a depth of 22 inches, it is strong brown silty clay loam. The lower part is yellowish brown silt loam that has brown mottles. The substratum is yellowish brown channery loam. Sandstone bedrock is at a depth of 47 inches.

This soil has low natural fertility and organic matter content. It is medium acid to very strongly acid throughout except where lime has been added. The root zone is deep, and permeability is moderate. The available water capacity is high. Surface runoff is rapid, and tilth is fair. Sandstone or shale bedrock is at a depth of 40 to 65 inches.

Included with this soil in mapping are a few areas of severely eroded Frondorf and Riney soils. Also included are a few areas of Wellston soils that are not eroded and areas of a soil that has a clayey subsoil below a depth of about 20 inches and that formed in material weathered from shale. The included soils make up 15 to 25 percent of the map unit. Individual areas are less than 3 acres.

This Wellston soil is used mainly for hay and pasture or as woodland.

This soil is poorly suited to cultivated crops because of the very severe erosion hazard, moderately steep slopes, and low organic matter content. These limitations are difficult to overcome.

This soil is suited to hay and pasture. Most grasses and legumes commonly grown in the county are suitable. Seeding or renovation late in summer or early in fall generally produces better stands, reduces competition from weeds, and improves erosion control. In some areas, land leveling is needed before a seedbed can be prepared. To prevent further erosion, renovation needs to be done without turning the soil. Lime and fertilizer, weed control, and controlled grazing also help to maintain production.

This soil is suited to use as woodland, and productivity is moderately high on north aspects and moderate on south aspects. Plant competition is moderate in establishing new stands. The moderately steep slopes are a moderate limitation for equipment use and for controlling erosion on skid trails and logging roads. Trees suitable for planting include black oak, white oak, eastern white pine, chestnut oak, Virginia pine, and shortleaf pine.

This soil is poorly suited to most urban uses. The moderately steep slope and depth to bedrock are limitations. Low strength is a limitation for local roads and streets. These limitations are difficult to overcome.

This Wellston soil is in capability subclass VIe and in woodland suitability groups 3r (north aspect) and 4r (south aspect).

ZaB—Zanesville silt loam, 2 to 6 percent slopes. This soil is deep, well drained or moderately well drained, and gently sloping. It is on narrow to moderately wide ridgetops. Slopes are smooth and slightly convex. Areas of this map unit range from 4 to 380 acres.

Typically, the surface layer is dark grayish brown and dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches. To a depth of about 26 inches, it is strong brown silty clay loam. A fragipan is at a depth of 26 to 43 inches. It is firm, brittle and compact, strong brown silty clay loam that has gray mottles. Below that the subsoil is yellowish brown silt loam that has brown and gray mottles. Thin bedded sandstone bedrock is at a depth of 60 inches.

This soil has medium natural fertility. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. Organic matter content in the surface layer is moderate. The root zone is moderately deep to the fragipan. A seasonal high water table is above the fragipan in winter and early in spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium, and tilth is good.

Included with this soil in mapping are a few small areas of Sadler and Wellston soils. The included soils make up less than 20 percent of the map unit. Individual areas are less than 4 acres.

This Zanesville soil is used mainly for cultivated crops, small grains, and hay and pasture. In a few areas, it is used as woodland.

This soil is well suited to cultivated crops and small grains. Most crops do well on this soil. Tilth is good, and this soil can be worked throughout a wide range in moisture content without clodding or crusting. Erosion is a moderate hazard when this soil is cultivated by conventional tillage methods. Conservation tillage, contour farming, return of crop residue to the soil, and grasses and legumes in the cropping system slow runoff and help to control erosion. During extended dry periods, this soil is droughty because of the restricted root zone and moderate available water capacity.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well. Deep-rooted plants are limited by the dense fragipan. Lime and fertilizer help produce good yields of most crops. Weed control, controlled grazing, and erosion control during seeding or renovation are concerns in management.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include black oak, white oak, eastern white pine, Virginia pine, shortleaf pine, and loblolly pine. Plant competition is the main concern in management.

This soil is suited to most urban uses. Depth to bedrock is a moderate limitation for shallow excavations and dwellings with basements. Wetness, caused by the perched water table, is a moderate limitation for use as building sites. Slow permeability in the fragipan is a severe limitation for septic tank absorption fields. Low strength of the soil material is a moderate limitation for local roads and streets. Good design and proper installation can overcome some of these limitations.

This Zanesville soil is in capability subclass IIe and in woodland suitability group 3o.

ZaC2—Zanesville silt loam, 6 to 12 percent slopes, eroded. This soil is deep, well drained or moderately well drained, and sloping. It is on narrow ridges and side slopes. Most slopes are somewhat irregular and convex. Areas of this map unit range from 5 to 65 acres. Part of the original topsoil has been removed by erosion.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil extends to a depth of about 57 inches. To a depth of about 23 inches, it is strong brown silty clay loam. A fragipan is at a depth of 23 to 40 inches. It is strong brown silty clay loam that has gray mottles and is firm, brittle and compact. Below the fragipan, the subsoil is yellowish brown silt loam that has brown and gray mottles. Thin bedded sandstone bedrock is at a depth of 57 inches.

This soil has medium natural fertility. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The organic matter content in the surface layer is low. The root zone is moderately deep to the fragipan. A seasonal high water table is above the fragipan in winter and early in spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium, and tilth is good.

Included with this soil in mapping are a few small areas of Frondorf and Wellston soils. Also included is a soil that has more sand in the subsoil than this Zanesville soil. The included soils make up less than 20 percent of the map unit. Individual areas are less than 3 acres.

This Zanesville soil is used mainly for cultivated crops, small grains, and hay and pasture. In a few areas, it is used as woodland.

This soil is suited to cultivated crops and small grains. Most crops commonly grown in the area grow well. The severe hazard of erosion and low organic matter content are the main limitations. Conservation tillage, contour farming, crop residue returned to the soil, and grasses and legumes in the cropping system are needed to prevent further erosion. During extended dry periods, this soil is droughty because of the restricted root zone and moderate available water capacity.

This soil is well suited to hay and pasture. Most commonly grown grasses and legumes grow well. Deep-rooted plants are limited by the dense fragipan. Lime and fertilizer help to produce good yields. Weed control, controlled grazing, and erosion control during seeding or renovation are concerns in management.

This soil is suited to use as woodland, and productivity is moderately high. Trees suitable for planting include black oak, white oak, eastern white pine, Virginia pine, shortleaf pine, and loblolly pine. Plant competition is the main concern in management.

This soil is suited to most urban uses. Depth to bedrock is a moderate limitation for shallow excavations and dwellings with basements. Wetness, caused by the perched water table, is a moderate limitation for use as building sites. Slow permeability in the fragipan is a severe limitation for septic tank absorption fields. Low strength of the soil material is a moderate limitation for local roads and streets. Good design and proper installation can overcome some of these limitations.

This Zanesville soil is in capability subclass IIIe and in woodland suitability group 3o.

ZnC3—Zanesville silty clay loam, 6 to 12 percent slopes, severely eroded. This soil is deep, well drained or moderately well drained, and sloping. It is on narrow ridges and side slopes. Slopes are somewhat irregular and convex. Most of the original surface layer, and in places part of the subsoil, has been removed by excessive erosion. Areas of this map unit range from 4 to 80 acres.

Typically, the surface layer is strong brown silty clay loam about 6 inches thick. The subsoil extends to a depth of about 54 inches. To a depth of about 20 inches, it is strong brown silty clay loam. A fragipan is at a depth of 20 to 37 inches. It is strong brown silty clay loam that has gray mottles and is firm, brittle and compact. Below the fragipan, the subsoil is yellowish brown silt loam that has brown and gray mottles. Thin bedded sandstone is at a depth of 54 inches.

This soil has low natural fertility. The available water capacity is moderate. Reaction is strongly acid or very strongly acid throughout except where lime has been added. The organic matter content in the surface layer is low. The root zone is moderately deep to the fragipan. A seasonal high water table is above the fragipan in winter and early in spring. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium, and tilth is fair.

Included with this soil in mapping are a few small areas of Sadler and Wellston soils and areas of Zanesville soils that are not eroded and have a silt loam surface layer. The included soils make up 5 to 15 percent of the map unit. Individual areas are less than 3 acres.

This Zanesville soil is used mainly for cultivated crops, small grains, and hay and pasture.

This soil is poorly suited to cultivated crops. Erosion is a very severe hazard when this soil is cultivated by conventional tillage methods. Conservation tillage, contour farming, crop residue returned to the soil, and grasses and legumes in the cropping system are needed to prevent further erosion.

This soil is suited to hay and pasture. Most commonly grown grasses and legumes grow well. Deep-rooted plants are limited by the dense fragipan. Lime and fertilizer, weed control, controlled grazing, and erosion control during seeding or renovation are concerns in management.

This soil is suited to use as woodland, and productivity is moderate. Trees suitable for planting include black oak, white oak, Virginia pine, shortleaf pine, and loblolly pine. Seedling mortality is the main concern in management.

This soil is suited to most urban uses. Depth to bedrock is a moderate limitation for shallow excavations and dwellings with basements. Wetness, caused by the perched water table, is a moderate limitation for use as building sites. The slow permeability in the fragipan is a severe limitation for septic tank absorption fields. Low strength of the soil material is a moderate limitation for local roads and streets.

This Zanesville soil is in capability subclass IVe and in woodland suitability group 4d.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Todd 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 (fig. 20). 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

Figure 20.—Prime farmland soil of Nicholson silt loam, 2 to 6 percent slopes is used to produce wheat. This soil and other prime farmland soils are important in providing the nation's needs for food and fiber.

acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources. Farming these soils results in the least damage to the environment.

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

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. More detailed information about the criteria for prime farmland is available at local offices of the Soil Conservation Service.

About 129,000 acres, or about 53 percent of the total acreage, meets the requirements for prime farmland. Areas are scattered throughout the county, but most are in the central and southern parts, mainly in general soil map units 3, 4, 5, 6, and 7. The main crops grown on this prime farmland are corn, small grains, soybeans, tobacco, pasture, and hay.

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

The following map units, or soils, make up prime farmland in Todd County. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 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.

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

CaB	Caneyville silt loam, 2 to 6 percent slopes
CrA	Crider silt loam, 0 to 2 percent slopes
CrB	Crider silt loam, 2 to 6 percent slopes
Du	Dunning silt loam, occasionally flooded (where drained)
ElA	Elk silt loam, 0 to 2 percent slopes, rarely flooded
ElB	Elk silt loam, 2 to 6 percent slopes, rarely flooded
EpB	Epley silt loam, 2 to 6 percent slopes
HbB	Hammack-Baxter complex, 2 to 6 percent slopes
Jo	Johnsburg silt loam (where drained)
La	Lawrence silt loam, occasionally flooded (where drained)
Ln	Lindside silt loam, occasionally flooded
Me	Melvin silt loam, occasionally flooded (where drained)
Ne	Newark silt loam, occasionally flooded (where drained)
NhA	Nicholson silt loam, 0 to 2 percent slopes
NhB	Nicholson silt loam, 2 to 6 percent slopes
No	Nolin silt loam, occasionally flooded
PmA	Pembroke silt loam, 0 to 2 percent slopes
PmB	Pembroke silt loam, 2 to 6 percent slopes
SaA	Sadler silt loam, 0 to 2 percent slopes
SaB	Sadler silt loam, 2 to 6 percent slopes
WeB	Wellston silt loam, 2 to 6 percent slopes
ZaB	Zanesville silt loam, 2 to 6 percent slopes

Use and Management of the Soils

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

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

Information in this section can be used to plan the use and management of soils for crops and pasture; as 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 suitability and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

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

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

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

Crops and Pasture

Billy Harris, district conservationist, Soil Conservation Service, helped to 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.

In 1967, about 170,166 acres in Todd County was used as cropland, pasture, or hayland *(9)*. Since 1967, changes in economic conditions have led to changes in land use. At the present, about 129,000 acres, or 76 percent of the cropland, is being used for row or close-growing crops, mainly feed grains, soybeans, and tobacco. Pasture and hayland account for about 41,000 acres, or 22 percent of the cropland. The remaining 2 percent is mainly idle cropland.

Acreage in crops and pasture has been decreasing as more and more land is used for urban and built-up areas along roads where transportation and utilities are more readily available. In 1982, a National Resource Inventory Survey conducted by the Soil Conservation Service indicated there were about 2,444 acres of urban and built-up land and 3,486 acres of roads and railroads in the county.

Soil erosion is the major concern on about 72 percent of the crop and pastureland in Todd County. If a soil has slope of more than 2 percent, erosion is a hazard. Erosion is a hazard on Caneyville, Crider, Elk, Fredonia, Frondorf, Hammack, Baxter, Nicholson, Pembroke, Riney, Sadler, Wellston, and Zanesville soils.

Loss of the surface layer through erosion is damaging. Erosion reduces productivity by modifying soil properties. Some of the properties that are affected include fertility, organic matter content, rooting depth, soil tilth, and available water capacity. Research has shown that if other production factors remain constant, soil erosion reduces yields. As a result of erosion, more of the subsoil is incorporated with the remaining topsoil. Loss of the surface layer is especially damaging to soils that have a clayey subsoil, such as the Caneyville, Fredonia, and Vertrees soils, and to soils that have a layer in or below the subsoil that limits the depth of the root zone. Such layers include the fragipan in the Lawrence, Nicholson, Sadler, and Zanesville soils, or bedrock in the Caneyville, DeKalb, Fredonia, Frondorf, and Weikert soils. This loss of soil by erosion also decreases the volume of soil favorable for root growth and available water capacity. Soil tilth, organic matter content, and fertility are decreased. Soil erosion dislodges the lighter soil particles first. This, along with the other factors associated with erosion, increases the problems with tillage operations, tilth of the soil, and preparation of the seedbed.

Soil erosion also results in the sedimentation of streams and bodies of water. If erosion is controlled, less sediment and other constituents enter streams, lakes, and reservoirs. This improves the quality of water for municipal use, recreation, fish, and wildlife.

Erosion control practices provide protective surface cover, help to reduce runoff, and increase infiltration. A conservation tillage system that keeps vegetative cover or crop residue on the soil surface for extended periods generally reduces soil erosion losses to an acceptable level and does not reduce the productivity of the soil. Grass and legume forage crops in a cropping system reduce erosion on sloping pasture and hayland of livestock farms. They also provide nitrogen and improve tilth for the following crop.

Conservation tillage increases the rate of infiltration, reduces runoff, and helps control erosion. This practice can be adapted to most soils in Todd County. The no-till method of planting corn, soybeans, and small grains, for example, is effective in controlling erosion on sloping cropland. This practice, which is becoming more common, is adaptable to a majority of the soils in the county.

Terraces and diversions are conservation practices that reduce the length of slope and thereby reduce runoff and erosion. These practices are most practical on deep, well drained soils that have uniform slopes. Crider, Pembroke, and Elk soils are suitable for terraces. Other soils, such as Baxter, Vertrees, Sadler, or Fredonia, are less suitable for terraces and diversions because of irregular slopes, a clayey subsoil or fragipan that would be exposed in terrace channels, or bedrock at a depth of less than 40 inches.

Contouring and stripcropping are also suitable erosion control practices in the survey area. They are best adapted to soils that have smooth, uniform slopes. Most areas of the gently sloping and sloping Crider, Elk, Frondorf, Fredonia, Caneyville, Pembroke, Nicholson, Vertrees, Sadler, Wellston, and Zanesville soils are suitable for contouring and stripcropping.

Soil drainage is the main management practice needed on about 11 percent of the acreage used for crops and pasture in the county. Some soils are so wet that the production of crops common to the area is generally not possible unless drained. Examples are the very poorly drained to poorly drained Dunning soils and the poorly drained Melvin and Robertsville soils. On somewhat poorly drained soils, planting and harvesting operations are affected or the crops are damaged almost every year unless they are artificially drained. In this group are the Newark, Lawrence, and Johnsburg soils. These soils account for about 11,000 acres. The nearly level, moderately well drained Nicholson and Sadler soils have a perched water table and slow surface runoff. They also tend to dry out slowly in the early part of the growing season. Artificial drainage is needed in some of the wetter areas of these soils.

The design of both surface and subsurface (tile) drainage systems varies with the kind of soil. If used for intensive cultivation, a combination of surface and subsurface drainage is needed in most areas of the somewhat poorly drained Lawrence and Newark soils, the very poorly drained Dunning soils, and the poorly drained Melvin and Robertsville soils. Open drainage ditches are more effective than subsurface drains on soils that have a fragipan within 18 to 20 inches of the soil surface. Because the fragipan restricts water movement, the subsurface drains would have to be installed in the very slowly permeable fragipan to have adequate cover over them. This fragipan would lower the efficiency of the subsurface drainage system in removing excess water from the fields. The Robertsville soils have a fragipan within 20 inches of the soil surface. However, on soils that do not have a fragipan or that have a fragipan at a depth of more than 24 inches, subsurface drainage may be more effective than open ditches in lowering the water table. To be effective, subsurface drains would have to be spaced closer in slowly permeable soils than in more permeable soils. Both surface and subsurface drainage systems require a suitable outlet.

Natural soil fertility is high in the Crider, Elk, Hammack, and Pembroke soils on uplands. Other soils on uplands are medium or low in natural fertility. Some of the soils on flood plains are also high in natural fertility. Lindside, Newark, and Nolin soils are examples. The major factors affecting soil fertility are the organic matter content and reaction. Those soils that have high natural fertility generally have a higher organic matter content than those of medium or low natural fertility. The organic matter content affects tilth and the ability of the soil to hold water and nutrients.

Soil reaction affects the availability of nutrients to the plants. The Dunning, Melvin, Lindside, Newark, and Nolin soils on the flood plains range from medium acid to mildly alkaline. Many of the soils on uplands are very strongly acid to medium acid in their natural state. If a soil has never been limed, ground limestone may be needed to raise the pH level sufficiently for good growth of alfalfa and other crops that grow best on nearly neutral soils. Available phosphorus and potassium are naturally low in most of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crops, and on the expected levels of production. The Cooperative Extension Service can help to determine the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water. A soil that has good tilth is granular and porous. Some of the soils used for crops in the survey area have a surface layer of silt loam that is light in color and low in organic matter content. Generally the structure of such soils is weak, and intense rainfall causes the formation of a crust on the surface. The crust is hard when dry and nearly impervious to water. Once the crust forms, it reduces infiltration and increases runoff. A few soils used for crops in the survey area have a silty clay loam surface layer and a low content of organic matter because erosion has removed most of the original surface layer and exposed the more clayey subsoil. These soils tend to form clods unless they are worked within a fairly narrow range of soil moisture content. Crop residue, manure, and other organic material regularly added to the soil improve soil structure and reduce crusting and clod formation.

Because of the crust that forms during winter and spring, fall plowing or chiseling is generally not a good practice on the light color soils that have a surface layer of silt loam. After fall plowing, many soils are nearly as dense and hard at planting time as they were before plowing. Also, about 80 percent of the cropland is made up of sloping soils that are subject to damaging erosion if they are plowed in the fall.

Field crops suited to the soils and climate of the county include many that are not commonly grown. Corn, soybeans, and tobacco are predominant. Grain sorghum, sunflowers, navy beans, peanuts, potatoes, and similar crops can be grown if economic conditions are favorable. Wheat and barley are the most common close-growing small grain crops, but rye and oats could be grown. Grass seed can be produced from fescue, orchardgrass, timothy, and bluegrass. Specialty crops grown in the county are vegetables, small fruits, tree fruits, and nursery plants. A small acreage is used for melons, cucumbers, snapbeans, cabbage, tomatoes, peppers, strawberries, blackberries, and other vegetables and small fruits. In addition, large areas can be adapted to other specialty crops, such as blueberries, grapes, and many vegetables. Apples and peaches are the most common tree fruits.

Deep soils that have good natural drainage and warm up early in the spring are especially well suited to many vegetables and small fruits. In Todd County, these soils are the Crider, Pembroke, Elk, Hammack, Baxter, and Wellston soils that have slopes of less than 6 percent. These soils make up about 61,600 acres. The Elk soils are not as well suited to vegetable and fruit crops as the other soils because they are subject to rare flooding. Crops can generally be planted and harvested earlier on all these soils than on the other soils in the county. Most of the well drained soils in the county are suitable for orchards and nursery plants. Soils in low positions, where frost is frequent and air drainage is poor, are poorly suited to early vegetables, small fruits, and orchards. Latest information and suggestions for growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pasture and Hayland

Henry Amos, conservation agronomist, and Billy Harris, district conservationist, Soil Conservation Service, helped to prepare this section.

A successful forage program can furnish up to 78 percent of the feed for beef cattle and 66 percent for dairy cattle *(7)*.

In Todd County, about 41,000 acres is used for hay and pasture *(9)*. About 15 percent needs reestablishment; a sizable acreage needs improvement, brush control, and protection from overgrazing.

The soils in Todd County vary widely in their capabilities and properties because of differences in depth to rock or limiting layers, internal drainage, ability to supply moisture, and many other properties. Grasses and legumes and grass-legume combinations vary widely in the ability to persist and produce on different soils. The plant species or mixtures of species need to be matched to the soil for the highest yields and for maximum soil and water conservation.

The level to sloping, deep, well drained soils are best suited to the highest producing crops, such as corn silage, alfalfa, or a mixture of alfalfa and orchardgrass or alfalfa and timothy. The steeper soils should be maintained in sod-forming grasses, such as tall fescue or orchardgrass, to minimize soil erosion. Alfalfa should be used with a cool-season grass where the soils are at least 2 feet deep and well drained. On soils that are less than 2 feet deep to bedrock or are not well drained, a mixture of clover and grass or a pure stand of grass is more suitable than alfalfa. 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. Selected plants should provide maximum quality and versatility in the forage program. Legumes generally produce higher quality feed 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. Grasses, such as orchardgrass, timothy, and tall fescue, are better adapted for hay and silage (fig. 21).

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 fields and is reserved for deferred grazing late in fall and in winter. Nitrogen fertilizer is one of the important keys for maximum production during this

Figure 21.—This pasture of Kentucky 31 fescue and orchardgrass is on Crider silt loam, 2 to 6 percent slopes. This soil is well suited to pasture and hay.

period of growth, and applications should be based on the desired level of production.

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

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.

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

Class V soils are not likely to erode, but they have other limitations, impractical to remove, that limit their use. This survey area does not have any class V soils.

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*, or *s* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

There are no subclasses in class I because the soils of this class have few limitations.

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 to prepare this section.

Todd County is in the Western Mesophytic Forest region of Kentucky in which the white and red oaks and hickories are dominant. Commercial woodland covers about 74,500 acres, or 31 percent of the land area. The oak-hickory type makes up about 68 percent of the woodland; the elm-ash-red maple type, 21 percent; the oak-pine type, 4 percent; the maple-beech-birch type, 3 percent; the loblolly-shortleaf pine type, 2 percent; and the oak-gum type, 2 percent.

Woodland tracts in the soil survey area are small private holdings of about 24 acres and are essentially unmanaged. The average forest stand currently produces only 33 cubic feet per acre per year of wood. However, 75 percent of the forest land is capable of producing 50 cubic feet or more.

Tree growth, stocking, and tree quality can be improved by removal of low quality trees in fully stocked and understocked stands of all sizes as well as regeneration of sawtimber stands after harvest (fig. 22). Soil surveys are a useful management tool to identify Kentucky's most productive forest lands, soil limitations for management, and trees to favor or to plant, or both.

At present, six commercial sawmills in the county purchase logs or standing trees from local landowners. Products produced include rough lumber, dimension stock, crossties, wood chips, and pallet parts. Treated crossties and posts are produced by one local plant. 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 symbol (woodland suitability) for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

Figure 22.—Timber is harvested from an area of DeKalb-Frondorf-Rock outcrop complex, 20 to 45 percent slopes. The loading area is on Lindside silt loam, occasionally flooded.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *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, d, c, 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 a well-managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

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

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

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

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands *(3, 4, 5, 17, 18)*. 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

Many recreational activities, most of which are outdoor activities, are in Todd County. Hunting and fishing are very popular in the county. The abundance of crop fields and wooded areas create the habitat necessary for a large variety of game. The hilly, wooded areas in the northern part of the county provide food, water, and cover for squirrel, rabbit, quail, and deer. The large grain fields in the southern part of the county provide good habitat for quail, mourning dove, and rabbit.

The abundance of farm ponds, floodwater retarding structures, and streams provide adequate areas for fishing (fig. 23). Lake Malone, in the southern edge of Muhlenberg County, extends into Todd County and provides public facilities for fishing, boating, water skiing, camping, and swimming.

Other outdoor activities include hiking, golfing, and picnicking. Pilot Rock and the Cliffs provide scenic overlooks in the northern part of the county. The City-County Park in Elkton provides ball diamonds, tennis courts, and a basketball court. The Jefferson Davis Monument State Park in Fairview provides picnic facilities in addition to an elevator ride to the top of the 351 foot monument.

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

In table 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 gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

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

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

Figure 23.—The floodwater retarding structure that created this lake provides a good area for fishing and protects fertile bottom lands from flooding.

not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

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

Wildlife Habitat

William H. Casey, biologist, Soil Conservation Service, helped to prepare this section.

The wildlife population of Todd 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. More than 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 wildlife in the county are those that furnish recreation in the form of sport hunting, economic gain in the form of commercial trapping, and aesthetic enjoyment in the form of observation and photography. The cottontail rabbit, gray squirrel, fox squirrel, white-tailed deer, raccoon, red fox, skunk, opossum, mourning dove, and bobwhite quail are hunted. Trapping effort is concentrated on the raccoon, red fox, gray fox, mink, and muskrat. Birdwatchers and photographers are especially interested in rare or unusual species that are either seldom seen or difficult to approach.

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 *(24)*. 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, soybeans, 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, 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, beggarweed, wild carrot, and frost-weed aster.

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 silky dogwood, 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, hemlock, and cedar.

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

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

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

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

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include 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

Billy H. Vivrette, area engineer, Soil Conservation Service, helped to prepare this section.

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, and because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

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

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

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

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

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

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

Building Site Development

Table 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, or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

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

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

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

Sanitary Facilities

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

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 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 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. When two or more lagoons are designed in conjunction with each other, the second lagoon is generally anaerobic. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Holding ponds used as sewage lagoons may vary in depth without having level floors. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Anaerobic lagoons, however, generally range in depth from 8 to 14 feet in order to initiate anaerobic digestion. 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 and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, and soil reaction 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

Figure 24.—Grassed waterway and cornfield are on Nicholson silt loam, 2 to 6 percent slopes. Woodland in the background is on Caneyville-Rock outcrop complex, 6 to 30 percent slopes.

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 releases a variety of plant-available nutrients as it decomposes.

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 for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, terraces and diversions, and grassed waterways (fig. 24).

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

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

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

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. 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 affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of 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 erosion, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

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. 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.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 17.

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

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They influence the soil's adsorption of cations, moisture retention, shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and 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 in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

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

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. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

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

In table 15, the estimated content of organic matter of the surface layer 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 are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

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

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams or by runoff from adjacent slopes. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

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

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none, rare, occasional,* or *frequent. None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), and *long* (7 days to 1 month). The time of year that floods are most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding 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, which are characteristic of soils that are not subject to flooding.

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

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

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

The two numbers in the "High water table-Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

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

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

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

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

Engineering Index Test Data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." The soil samples were tested by the Soil Conservation Service, Soil Mechanics Laboratory, Fort Worth, Texas.

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

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM); Specific gravity (particle index)—T100 (AASHTO), D653 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(21)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 18 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 Entisol.

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 Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of 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 Fluvaquents (*Fluv*, meaning flood plain plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

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

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-silty, mixed, nonacid, mesic Typic Fluvaquents.

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

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (20)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (21)*. 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 ridgetops and side slopes of the karst Mississippian plateau area. These soils formed in residuum from cherty limestone. Slopes range from 2 to 20 percent.

Baxter soils are associated with Hammack, Crider, Pembroke, and Nicholson soils. Hammack soils have 20 to 40 inches of loess over a cherty layer and are fine-silty. Crider, Pembroke, and Nicholson soils have a fine-silty control section. These soils have less than 15 percent chert fragments in the control section. Nicholson soils also have a fragipan. In addition, Nolin soils are nearby. These soils formed in silty alluvium and do not have an argillic horizon.

Typical pedon of Baxter cherty silt loam, 12 to 20 percent slopes; 50 feet south of Kentucky Highway 848, 300 feet east of Elk Fork, about 5 miles east of Guthrie.

Ap—0 to 9 inches; brown (10YR 4/3) cherty silt loam; weak fine granular structure; very friable; many fine roots; 15 percent chert fragments; neutral; clear smooth boundary.

B1—9 to 16 inches; strong brown (7.5YR 5/6) cherty silty clay loam; moderate fine subangular blocky structure; friable; many fine roots; common clay films; 30 percent chert fragments; slightly acid; clear smooth boundary.

B21t—16 to 32 inches; yellowish red (5YR 4/6) cherty silty clay; moderate medium angular and subangular blocky structure; firm; common medium roots; many clay films; 30 percent chert fragments; strongly acid; gradual smooth boundary.

B22t—32 to 47 inches; dark red (2.5YR 3/6) cherty silty clay; moderate medium angular blocky structure; firm; many clay films; 15 percent chert fragments; very strongly acid; gradual smooth boundary.

B23t—47 to 65 inches; dark red (10R 3/6) cherty clay; moderate medium angular blocky structure; very firm; many clay films; 30 percent chert fragments; very strongly acid.

The solum is 60 to more than 120 inches thick. Depth to limestone bedrock is more than 60 inches. Reaction is strongly acid or very strongly acid except where lime has been added. Chert content ranges from 15 to 35 percent.

The Ap horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. In severely eroded pedons, the chroma ranges to 6. The texture is cherty silt loam or cherty silty clay loam.

The B1 horizon has hue of 10YR to 2.5YR and value and chroma of 4 to 6. Texture is cherty silt loam or cherty silty clay loam. Some pedons do not have a B1 horizon.

The B2t horizon has hue of 5YR, 2.5YR, or 10R, value of 3 to 5, and chroma of 4 to 6. In some pedons it has chroma of 3 below a depth of 60 inches. The texture is cherty silty clay or cherty clay. In some pedons, the upper few inches of the B2t horizon ranges from cherty clay to cherty silty clay loam.

Some pedons have a B3 horizon. It is red, brown, and gray or is mottled in shades of red, brown, and gray. The texture is silty clay or clay and their cherty or very cherty analogs.

Baxter soils in Todd County are taxadjuncts to the Baxter series because they have a color value in the lower part of the subsoil that is one unit lower than is permitted for the range of the series. This difference, however, does not alter the use or behavior of these soils.

Caneyville Series

The Caneyville series consists of moderately deep, well drained, moderately slowly permeable soils on narrow ridgetops and dissected side slopes. These soils formed in residuum weathered from limestone. Some areas are karst. Slopes range from 2 to 30 percent.

Caneyville soils are associated with Frondorf, Weikert, and DeKalb soils. These associated soils are less clayey than Caneyville soils. Frondorf, Weikert, and DeKalb soils formed in residuum or loess and residuum from sandstone, siltstone, or shale. These associated soils commonly are in higher positions on the landscape than Caneyville soils.

Typical pedon of Caneyville silt loam, 6 to 12 percent slopes; 525 feet north of Squire Groves Road, 0.6 mile northeast of Kentucky Highway 107, about 1 mile east of Kirkmansville.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine granular and subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21t—6 to 18 inches; yellowish red (5YR 4/6) silty clay; moderate fine and medium subangular blocky structure; firm; common fine roots; many clay films; strongly acid; gradual smooth boundary.

B22t—18 to 30 inches; yellowish red (5YR 4/6) silty clay; moderate medium subangular and angular blocky structure; firm; common fine roots; many clay films; common black oxide coatings, few black concretions; medium acid; clear wavy boundary.

B3—30 to 33 inches; dark yellowish brown (10YR 4/4) clay; strong medium angular blocky structure; very firm; many clay films; neutral; abrupt, smooth boundary.

R—33 inches; limestone bedrock.

The thickness of the solum and depth to bedrock range from 20 to 40 inches. Reaction ranges from very strongly acid to neutral in the upper part of the solum and medium acid to mildly alkaline in the lower part. Limestone or sandstone fragments range from 0 to 10 percent throughout.

The Ap horizon has hue of 10YR to 7.5YR, value of 4 or 5, and chroma of 2 to 4. Some pedons have an A1 horizon that has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4, and an A2 horizon that has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. In severely eroded areas, the A horizon has hue ranging to 5YR, value of 4 or 5, and chroma of 3 to 6. Texture is silt loam in uneroded areas and silty clay in severely eroded areas.

Some pedons have a B1 horizon that has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. Texture is predominantly silt loam or silty clay loam.

The B2t horizon has hue of 2.5YR, 5YR, 7.5YR, or 10YR, value of 4 or 5, and chroma of 4 to 8. In some pedons, the lower part of this horizon has mottles in shades of red, brown, olive, and gray. Texture is silty clay or clay.

The B3 horizon has matrix and mottles in shades of red, brown, olive, and gray. Some pedons do not have a B3 horizon.

Some pedons have a C horizon that has matrix and mottle colors similar to those in the B3 horizon.

Crider Series

The Crider series consists of deep, well drained, moderately permeable soils on broad upland ridges and side slopes. These soils formed in loess and the underlying residuum from limestone or old alluvium. Slopes are mostly less than 6 percent, but can range from 0 to 12 percent.

Crider soils are associated with Pembroke, Nicholson, Hammack, Baxter, and Fredonia soils. Pembroke soils are redder in the upper part of the B horizon than Crider soils and have a darker color A horizon. Nicholson soils have a fragipan and are moderately well drained. Hammack and Baxter soils are in karst areas and contain more chert fragments. Fredonia soils are 20 to 40 inches to bedrock. In addition, Nolin soils are nearby. These soils formed in alluvial depressions and do not have an argillic horizon.

Typical pedon of Crider silt loam, 0 to 2 percent slopes; 10 feet south of private road, on a curve, about 100 yards west of Kentucky Highway 181, and 0.25 mile south of the Elkton city limits.

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

B1—9 to 13 inches; brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; few clay films; neutral; gradual smooth boundary.

B21t—13 to 26 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; common clay films, few medium black coatings, and few small black concretions; medium acid; gradual smooth boundary.

B22t—26 to 36 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common clay films; pale brown silt coatings on some peds; strongly acid; clear smooth boundary.

IIB23t—36 to 70 inches; dark red (2.5YR 3/6) silty clay loam; moderate medium subangular and angular blocky structure; firm; common clay films; few black concretions; 3 percent chert fragments; strongly acid; clear smooth boundary.

IIB24t—70 to 80 inches; dark red (2.5YR 3/6) silty clay; moderate medium blocky structure; firm; common clay films; common black concretions; 5 percent chert fragments; strongly acid.

The solum is 60 to 100 inches thick. Depth to limestone bedrock is 60 to more than 100 inches. Reaction ranges from neutral to strongly acid in the A horizon and the upper part of the B horizon. Reaction is medium acid to very strongly acid in the lower part of the B horizon. The upper part of the solum does not have chert fragments, but the lower part has 0 to 15 percent, by volume.

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

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam. Some pedons do not have a B1 horizon.

The B2t horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam or silty clay loam.

The IIB2t horizon has hue of 5YR, 2.5YR, or 10R, value of 3 to 5, and chroma of 4 or 6. The texture is silty clay loam, silty clay, or clay.

Some pedons have a IIC horizon that has colors and texture similar to the IIB2t horizon.

DeKalb Series

The DeKalb series consists of moderately deep, well drained, steep and very steep soils on side slopes. These soils formed in residuum weathered from acid sandstone. Permeability is moderately rapid. Slopes range from 20 to 45 percent.

DeKalb soils are associated with Frondorf, Wellston, Zanesville, Weikert, and Riney soils. Frondorf soils have a fine-loamy control section and an argillic horizon. Wellston, Zanesville, and Riney soils have a thicker solum than DeKalb soils and have an argillic horizon, and depth to bedrock is more than 40 inches. Zanesville soils also have a fragipan. Weikert soils have bedrock at a depth of less than 20 inches.

Typical pedon of DeKalb channery sandy loam from an area of DeKalb-Frondorf-Rock outcrop complex, 20 to 45 percent slopes; 200 feet north of Wolf Lick Creek, about 1.3 miles south of Sharon Grove.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) channery sandy loam; weak fine granular structure; very friable; many fine and medium roots; 15 percent coarse fragments; strongly acid; abrupt smooth boundary.

A2—2 to 8 inches; brown (10YR 4/3) channery sandy loam; weak fine granular structure; very friable; 15

percent coarse fragments; very strongly acid; clear smooth boundary.
B1—8 to 12 inches; dark yellowish brown (10YR 4/4) channery sandy loam; weak medium subangular blocky structure; friable; 20 percent coarse fragments; very strongly acid; gradual wavy boundary.
B2—12 to 20 inches; yellowish brown (10YR 4/4) channery sandy loam; weak fine subangular blocky structure; friable; few coarse roots and common medium roots; common medium pores; 25 percent coarse fragments; very strongly acid; gradual wavy boundary.
B3—20 to 29 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak medium subangular blocky structure; friable; common medium and large roots; 60 percent coarse fragments; very strongly acid; gradual wavy boundary.
C—29 to 33 inches; brown (7.5YR 4/4) extremely channery sandy loam; single grain; loose; few coarse roots; 85 percent coarse fragments; very strongly acid.
R—33 inches; sandstone bedrock.

Thickness of the solum and depth to bedrock range from 20 to 40 inches. Content of coarse fragments ranges from 10 to 60 percent in individual horizons of the control section with a weighted average of 35 percent or more. The C horizon ranges from 50 to 90 percent coarse fragments. Reaction is strongly acid or very strongly acid throughout except where lime has been added.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. Texture of the A horizon is dominantly channery sandy loam but includes gravelly and channery loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. Texture is sandy loam or loam and their gravelly, channery, very gravelly, or very channery analogs.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 or 6. The texture is extremely channery or very channery sandy loam or loamy sand.

Dunning Series

The Dunning series consists of deep, nearly level, very poorly drained to poorly drained soils on flood plains and stream heads, and in ponded areas. These soils formed in slack-water alluvium derived from limestone residuum. Permeability is slow. Slopes are mostly less than 1 percent, but can range to 3 percent.

Dunning soils are associated with Melvin, Newark, Lindside, Nolin, Robertsville, and Lawrence soils. Melvin, Newark, Lindside, and Nolin soils have less than 35 percent clay in the control section and do not have a mollic epipedon. Robertsville and Lawrence soils are on stream terraces and have a fragipan.

Typical pedon of Dunning silt loam, occasionally flooded; about 4.5 miles southwest of Elkton on Bells Chapel Road, 300 feet south of a bend in the road.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam; few fine distinct light olive brown (2.5Y 5/4) mottles; weak fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.
A1g—7 to 14 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; few patchy clay films on ped faces; common fine brown and black concretions; neutral; abrupt wavy boundary.
B1g—14 to 29 inches; dark gray (5Y 4/1) silty clay; many fine distinct light olive brown (2.5Y 5/4, 5/6) mottles; moderate fine and medium angular blocky structure; firm, sticky and plastic; common fine and medium roots; neutral; gradual wavy boundary.
B2g—29 to 41 inches; gray (10YR 5/1) silty clay; common fine distinct brownish yellow (10YR 6/6) mottles and common medium distinct light olive brown (2.5Y 5/6) mottles; moderate fine and medium angular blocky structure; firm, sticky and plastic; few fine roots; common fine concretions; mildly alkaline; gradual wavy boundary.
Cg—41 to 65 inches; gray (N 5/0) clay; common medium distinct yellowish brown (10YR 5/6) mottles and light olive brown (2.5Y 5/6) mottles; massive; firm, sticky and plastic; few gray (10YR 5/1) silty clay loam pockets; common dark brown and black concretions and stains; mildly alkaline.

The solum is 30 to 50 inches thick. Depth to limestone bedrock is 60 to more than 100 inches. The mollic epipedon ranges from 12 to 24 inches thick. Reaction ranges from medium acid to mildly alkaline throughout.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3; or it is neutral and has value of 2 or 3. It is silt loam. In most pedons, this horizon is mottled in shades of brown.

The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. The texture is silty clay loam, silty clay, or clay. Mottles are in shades of brown.

The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2; or it is neutral and has value of 4 to 6. The texture is silty clay loam, silty clay, or clay. In some pedons, the Cg horizon has pockets or stratified layers of silty clay loam, silt loam, loam, sandy loam, or gravel below a depth of 40 inches.

Elk Series

The Elk series consists of deep, well drained, nearly level to sloping soils on stream terraces. These soils formed in alluvium washed from soils derived from limestone, sandstone, siltstone, shale, and loess. Permeability is moderate. Slopes are mostly less than 4 percent, but can range from 0 to 12 percent.

Elk soils are associated with Nolin, Lindside, Lawrence, Nicholson, and Crider soils. Nolin and Lindside soils are on flood plains and do not have an argillic horizon. Lindside soils are moderately well drained. Lawrence and Nicholson soils are on stream terraces and adjacent uplands and have a fragipan. Crider soils are on adjacent uplands and have a solum more than 60 inches thick.

Typical pedon of Elk silt loam, 2 to 6 percent slopes, rarely flooded; 200 feet north of a farm road, 300 feet east of the West Fork of Red River, 0.6 mile west of Kentucky Highway 475, about 4.5 miles north of Trenton.

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

B1—9 to 15 inches; brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; medium acid; gradual smooth boundary.

B21t—15 to 29 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; common roots; common thin clay films; few black concretions in lower part; medium acid; gradual smooth boundary.

B22t—29 to 43 inches; strong brown (7.5YR 5/6) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; thin patchy clay films; few small black concretions; strongly acid; clear smooth boundary.

C—43 to 60 inches; strong brown (7.5YR 5/6) silty clay loam; common medium faint yellowish brown (10YR 5/6) mottles; massive; firm; few small black concretions; strongly acid.

The solum is 36 to 54 inches thick. Depth to bedrock is 60 to 80 inches or more. Reaction ranges from medium acid to strongly acid throughout except where lime has been added.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. The texture is silt loam or silty clay loam. In some pedons, below a depth of 24 inches, the B horizon has few to common mottles that have chroma of 2 or higher.

The C horizon has the same colors as those in the B horizon. The texture is predominantly silt loam or silty clay loam, but in some pedons the C horizon has strata of fine sandy loam, loam, clay loam, or silty clay and as much as 35 percent gravel.

Epley Series

The Epley series consists of deep, moderately well drained, slowly permeable soils on broad ridgetops and benches. These soils formed in silty material and the underlying clayey residuum from limestone, shale, or old alluvium. Slopes range from 2 to 6 percent.

Epley soils are associated with Sadler, Zanesville, Johnsburg, Lawrence, and Nicholson soils. Johnsburg and Lawrence soils have more gray mottles in the upper part of the argillic horizon than the Epley soils, and all of the associated soils have a fragipan.

Typical pedon of Epley silt loam, 2 to 6 percent slopes; 300 feet east of Shemwell Road, 0.2 miles north of Kentucky Highway 178, about 1.6 miles west of Claymour.

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

B21t—6 to 18 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct pale brown (10YR 6/3) mottles and common fine faint yellowish brown mottles; weak fine and medium subangular blocky structure; friable; common fine roots; common dark brown and black concretions; few patchy clay films on ped faces and root holes; strongly acid; clear smooth boundary.

B&A'2—18 to 22 inches; yellowish brown (10YR 5/6) silty clay loam (B); moderate fine and medium subangular blocky structure; firm; about 50 percent, by volume, light brownish gray (10YR 6/2) silt loam (A'2), white (10YR 8/1) dry; skeletans 1 to 5 mm thick on most peds (B); few thin patchy clay films (some B peds); few fine roots (A'2); strongly acid; clear wavy boundary.

IIB22t—22 to 43 inches; yellowish brown (10YR 5/6) silty clay; many medium distinct gray (10YR 5/1) mottles; moderate fine angular blocky structure; very firm; few brown and black concretions; many clay films; few small sandstone fragments and crinoid stems in lower 6 inches; strongly acid; gradual wavy boundary.

IIC1—43 to 51 inches; mottled yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) clay; massive; very firm, sticky and plastic; neutral; gradual wavy boundary.

IIC2—51 to 60 inches; mottled yellowish brown (10YR 5/6), brownish yellow (10YR 6/6), and light brownish gray (2.5Y 6/2) clay; massive; very firm, sticky and plastic; neutral.

The solum is 30 to 50 inches thick. Depth to limestone or shale bedrock is 48 to 100 inches. Reaction ranges from very strongly acid to medium acid through the IIB2t horizon except where lime has been added. It ranges from medium acid to neutral in the IIC horizon.

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

The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. In some pedons, the lower part of the B2t horizon has few to common mottles in shades of brown and gray. The texture is silt loam, or silty clay loam.

The A'2 part of the B&A'2 horizon has hue of 10YR, value of 6 or 7, and chroma of 1 to 3. Coatings of A'2 material are silt loam. They are 1 to 5 millimeters thick and make up 10 to 50 percent of the horizon. The B part of the B&A'2 has matrix and mottles similar to the B2t horizon. The texture is silty clay loam.

The IIB horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It has common or many mottles in shades of brown or gray. In some pedons, the lower part of the IIB horizon is equally mottled in shades of brown and gray or is dominantly gray. The texture is mostly silty clay but ranges to clay.

The IIC horizon has the same colors, mottles, and textures as the IIB horizon. Coarse fragments of shale or limestone in the lower part of the profile range from 0 to 50 percent.

Fredonia Series

The Fredonia series consists of moderately deep, well drained, gently sloping and sloping soils on uplands. These soils formed in red and reddish brown clayey limestone residuum. They contain rock outcrops. Fredonia soils are mainly on karst topography of the Mississippian Plateau. Permeability is moderately slow to slow. Slopes are mostly 4 or 5 percent, but can range from 2 to 12 percent.

Fredonia soils are associated with Pembroke, Vertrees, and Baxter soils. All the associated soils have a solum more than 60 inches thick. Pembroke soils have less than 35 percent clay in the control section. Baxter soils have 15 percent or more chert fragments in the control section.

Typical pedon of Fredonia silt loam, very rocky, 2 to 12 percent slopes; 200 feet west of Kentucky Highway 475, 0.9 mile south of U.S. Highway 68, about 3.4 miles west of Elkton.

Ap—0 to 6 inches; dark brown (7.5YR 3/2) silt loam; weak fine granular structure; very friable; many very fine and fine roots; neutral; abrupt smooth boundary.

B21t—6 to 19 inches; red (2.5YR 4/6) silty clay; moderate fine subangular blocky structure; firm; common fine roots; many thin clay films; strongly acid; gradual smooth boundary.

B22t—19 to 31 inches; dark red (2.5YR 3/6) clay; moderate medium angular blocky structure; very firm; few fine roots; many clay films; few fine black concretions; strongly acid; abrupt smooth boundary.

C—31 to 33 inches; mottled reddish brown (2.5YR 4/4) and yellowish brown (10YR 5/4) clay; massive; very firm; neutral.

R—33 inches; gray limestone.

Thickness of the solum and depth to limestone bedrock are 20 to 40 inches. Reaction ranges from strongly acid to slightly acid in the A horizon and the upper part of the B horizon except where lime has been added. Reaction is strongly acid to neutral in the lower part of the B horizon and in the C horizon.

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

The B2t horizon has hue of 2.5YR or 10R, value of 3 or 4, and chroma of 4 or 6. It is silty clay or clay. In some pedons, the upper part of the B2t horizon is silty clay loam.

Some pedons have a B3 horizon that has colors and textures similar to those of the B2t horizon, or the B3 horizon is mottled in shades of brown, yellow, olive, or gray. This horizon is 2 to 6 inches thick.

The C horizon has colors and textures similar to those of the B2t horizon. Some pedons do not have the C horizon.

Frondorf Series

The Frondorf series consists of moderately deep, sloping to very steep, well drained soils on side slopes and narrow ridgetops. These soils formed in a thin loess cap and the underlying residuum from sandstone and shale. Permeability is moderate. Slopes range from 6 to 45 percent.

Frondorf soils are associated with Weikert, Zanesville, Sadler, Wellston, and Caneyville soils. Weikert soils are mapped in a complex with the Frondorf soils on moderately steep to very steep side slopes. They are less than 20 inches to bedrock. Zanesville and Sadler soils are on adjacent ridgetops and have a fragipan. Wellston soils are more than 40 inches to bedrock. Caneyville soils commonly are below Frondorf soils on side slopes. They formed in clayey residuum weathered from limestone.

Typical pedon of Frondorf silt loam, from an area of Frondorf-Weikert complex, 20 to 45 percent slopes; 300 feet west of Flat Rock Road, 0.7 mile south of Kentucky Highway 507, about 1.5 miles west of Allegre.

A1—0 to 1 inch; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; many very fine and fine roots; strongly acid; abrupt smooth boundary.

A2—1 to 4 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; very friable; many fine and coarse roots; 14 percent sandstone fragments; strongly acid; clear smooth boundary.

B21t—4 to 16 inches; yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable; common fine and medium roots; common thin clay films; 14 percent sandstone fragments; strongly acid; clear smooth boundary.

IIB22t—16 to 26 inches; strong brown (7.5YR 5/6) very channery silty clay loam; weak medium subangular blocky structure; firm; common medium roots; common thin clay films; 40 percent sandstone fragments 0.5 inch to 10 inches across; strongly acid; gradual smooth boundary.

IIB3—26 to 33 inches; strong brown (7.5YR 5/6) very channery silty clay loam; weak fine and medium subangular blocky structure; firm; common medium roots; 45 percent sandstone fragments 0.5 inch to 10 inches across; strongly acid; clear smooth boundary.

IIR—33 inches; thin bedded rippable sandstone.

Thickness of the solum and depth to sandstone, siltstone, or shale bedrock range from 20 to 40 inches. Reaction is strongly acid to very strongly acid throughout except where lime has been added. Content of coarse sandstone, siltstone, or shale fragments ranges from 0 to 14 percent in the upper part of the solum and from 20 to 60 percent in the lower part.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The texture is silt loam.

The B21t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. In some pedons, the lower part of this horizon has a few mottles in shades of brown. The texture is silt loam or silty clay loam.

The IIB22t horizon has the same colors as those of the B21t horizon. The IIB22t horizon is gravelly, shaly, or channery silt loam or silty clay loam.

The IIB3 or IIC horizon has the same colors as those of the B21t horizon. Texture is silt loam, loam, silty clay loam, or silty clay and their gravelly, shaly, or channery or very channery analogs.

Frondorf soils in Todd County are taxadjuncts to the Frondorf series because they have lower base saturation and more coarse fragments in the upper part of the solum than is permitted for the range of the series. These differences, however, do not alter the use or behavior of these soils.

Hammack Series

The Hammack series consists of deep, well drained, moderately permeable soils on ridgetops and side slopes in the karst Mississippian Plateau area. These soils formed in a thin loess mantle and the underlying residuum from cherty limestone. Slopes are dominantly about 8 percent but range from 2 to 12 percent.

Hammack soils are associated with Baxter, Crider, Pembroke, and Nicholson soils. Baxter soils are mapped in complex with Hammack soils. They have a clayey control section and 15 to 35 percent chert fragments in the upper part of the argillic horizon. Crider and Pembroke soils have less than 15 percent chert in the B or IIB horizon. Pembroke soils have value and chroma of 2 or 3 in the Ap horizon. Nicholson soils have a fragipan. In addition, Nolin soils are near the Hammack soils in depressions in karst areas. They formed in silty alluvium.

Typical pedon of Hammack silt loam, from an area of Hammack-Baxter complex, 2 to 6 percent slopes; 300 feet north of a farm road and 300 feet west of a large pond, 1 mile west of Kentucky Highway 104, 4.5 miles south of Trenton.

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

B21t—8 to 28 inches; brown (7.5YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; few fine roots; few fine pores; few clay films; medium acid; abrupt smooth boundary.

IIB&A2—28 to 42 inches; (B) brown (7.5YR 4/4) extremely cherty silty clay loam; few fine distinct yellowish red (5YR 5/6) mottles; weak fine subangular blocky structure; firm; few clay films; 70 percent chert fragments, half smaller than 3 inches; (A2) about 10 percent of horizon; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) silt coatings around chert fragments and some peds; few fine black concretions; strongly acid; clear smooth boundary.

IIB22t—42 to 55 inches; red (2.5YR 4/6) very cherty silty clay; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and very fine angular blocky structure; firm; few fine pores; many clay films; 40 percent chert fragments, half smaller than 3 inches; few fine black concretions; very strongly acid; clear smooth boundary.

IIB23t—55 to 84 inches; red (2.5YR 4/6) cherty clay; common medium prominent very pale brown (10YR 7/4), pinkish gray (7.5YR 7/2), and reddish yellow (7.5YR 6/6) mottles and few medium faint reddish brown (5YR 4/3) mottles; moderate medium angular blocky structure parting to fine and very fine angular blocky; very firm; few fine pores; many clay films; 15 percent chert fragments, half smaller than 3 inches; few fine black concretions; very strongly acid.

Thickness of the solum and depth to limestone bedrock are 60 inches or more. Reaction is medium acid to very strongly acid throughout except where lime has been added. The upper part of the B horizon can range to neutral. The upper part of the solum formed in loess and is 20 to 40 inches thick. Chert fragments range from 0 to 5 percent in the Ap and B2t horizons, from 35 to 80 percent in the IIB&A2 horizon, and from 0 to 80 percent in individual IIB2t horizons. The weighted average of chert fragments ranges from 15 to 50 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam.

Some pedons have a B1 horizon, 3 to 8 inches thick, that has colors and textures similar to those of the Ap horizon.

The B2t horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 or 6. In some pedons, this horizon is mottled in shades of brown, and in shades of gray in the lower few inches. It is silt loam or silty clay loam.

The B part of the IIB&A2 horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 or 6. In some pedons it is mottled in shades of brown and gray. The texture is extremely cherty silt loam, very cherty silt loam, extremely cherty silty clay loam, or very cherty silty clay loam. The A2 part of the IIB&A2 horizon has hue of 10YR or 7.5YR, value of 6 or 7, and chroma of 1 to 4. It consists of silt coatings that make up 5 to 15 percent of the horizon. The A2 coatings range from 1 to 2 millimeters thick and are discontinuous.

The IIB2t horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 4 or 6. Mottles are in shades of yellow, brown, red, and gray. The texture is mostly silty clay and clay and their cherty or very cherty analogs. In some pedons, it is cherty clay loam.

Johnsburg Series

The Johnsburg series consists of deep, somewhat poorly drained, very slowly permeable soils on stream terraces and in broad concave upland areas. These soils formed in loess and the underlying residuum weathered from sandstone, siltstone, or shale. Slopes range from 0 to 3 percent.

Johnsburg soils are associated with Zanesville, Sadler, and Nicholson soils. The associated soils are better drained than Johnsburg and do not have gray mottles in the upper 10 inches of the argillic horizon. Nicholson soils formed in loess and the underlying limestone residuum.

Typical pedon of Johnsburg silt loam; 50 feet west of Flat Rock Road, 0.4 mile north of Kentucky Highway 508, about 6 miles north of Fairview.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B1—8 to 18 inches; light yellowish brown (10YR 6/4) silt loam; common fine faint light brownish gray mottles and few medium faint strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable; common fine black concretions; very strongly acid; clear smooth boundary.

B2t—18 to 22 inches; light olive brown (2.5Y 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles and common medium faint light yellowish brown (10YR 6/4) mottles; moderate fine and medium subangular blocky structure; friable; common patchy clay films; few small black concretions; very strongly acid; clear smooth boundary.

Bx—22 to 46 inches; light brownish gray (10YR 6/2) silty clay loam; common fine and medium faint light yellowish brown (2.5Y 6/4) mottles and common medium distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to fine and medium subangular blocky; very firm, compact and brittle; thin coatings of light gray (10YR 7/1) silt on faces of peds; many clay films; very strongly acid; clear smooth boundary.

IIC—46 to 60 inches; brownish yellow (10YR 6/6) loam; common medium distinct strong brown (7.5YR 5/6) mottles and few medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; 5 percent sandstone fragments; strongly acid.

The solum is 40 to 60 inches thick. Depth to bedrock is 50 to 80 inches. Reaction is strongly acid or very strongly acid throughout except where lime has been added.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Undisturbed areas have a thin A1 horizon, 1 to 4 inches thick, that has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Some pedons have an A2 horizon that has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. In some pedons, it is mottled. Texture is silt loam.

The B1 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. It has few or common mottles in shades of brown and gray. The texture is silt loam.

The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. It has few to many mottles in shades of brown and gray. The texture is silt loam or silty clay loam.

The Bx horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 2 to 8. Mottles are in shades of brown and gray. The texture is silt loam or silty clay loam.

The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6. It has few to many mottles in shades of brown and gray. The texture is loam, sandy loam, silt loam, or silty clay loam. Coarse fragments range from 2 to 10 percent.

Lawrence Series

The Lawrence series consists of deep, nearly level, somewhat poorly drained soils on stream terraces and in concave upland areas. Lawrence soils have a slowly permeable fragipan. These soils formed in old mixed alluvium or colluvium derived from limestone, shale, siltstone, sandstone, and loess. Slopes are dominantly less than 2 percent.

Lawrence soils are associated with Robertsville, Nicholson, Sadler, and Crider soils. Robertsville soils are on adjacent terraces or in upland depressions and are dominantly gray above the fragipan. Nicholson and Sadler soils are moderately well drained and do not have mottles that have chroma of 2 or less in the upper part of the argillic horizon. Crider soils are on adjacent uplands, are well drained, and do not have a fragipan.

Typical pedon of Lawrence silt loam, occasionally flooded; 800 feet north of the junction of a private road and Kentucky Highway 104, 1.4 miles west of Kentucky Highway 181, about 0.5 mile south of Elkton.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21t—8 to 20 inches; brownish yellow (10YR 6/6) silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular blocky structure; friable; common fine roots; common clay films; very strongly acid; clear smooth boundary.

B22t—20 to 25 inches; light yellowish brown (2.5Y 6/4) silt loam; many fine distinct light gray (2.5Y 7/2) mottles and few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; common clay films; very strongly acid; clear smooth boundary.

Bx1—25 to 36 inches; mottled light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) silty clay loam; moderate very coarse prismatic structure parting to moderate medium subangular and angular blocky; very firm, brittle and compact; few fine roots between prisms; few gray (10YR 5/1) silt coatings on prisms; continuous clay films on peds; few small black concretions; very strongly acid; gradual wavy boundary.

Bx2—36 to 52 inches; gray (10YR 5/1) silty clay loam; common fine faint light brownish gray mottles and many coarse distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium angular blocky; very firm, brittle and compact; few small black concretions; very strongly acid; gradual wavy boundary.

B3—52 to 60 inches; mottled strong brown (7.5YR 5/6), gray (10YR 5/1), and light brownish gray (10YR 6/2) silty clay loam; moderate medium angular blocky structure; firm; few small black concretions; strongly acid.

The solum is 40 to 80 inches thick. Depth to bedrock is 50 to 200 inches. Reaction ranges from slightly acid to very strongly acid through the fragipan except where lime has been added. It ranges from very strongly acid to neutral below the fragipan.

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

The B2t horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 to 6. It contains few to many mottles that have chroma of 2 or less, and some pedons have mottles in shades of brown. The texture is silt loam or silty clay loam. Some pedons have a B1 horizon 2 to 6 inches thick that does not have gray mottles.

The Bx horizon has matrix and mottle colors that have hue of 7.5YR, 10YR, or 2.5Y, value of 5 to 7, and chroma of 1 to 8; or it is neutral and has value of 5 to 7. Most pedons are equally mottled and do not contain a dominant matrix color. The texture is silt loam or silty clay loam.

The B3 horizon has matrix and mottles that have hue of 5YR, 7.5YR, 10YR, or 2.5Y, value of 5 to 7, and chroma of 1 to 8; or it is neutral and has value of 5 to 7. The texture ranges from silt loam to silty clay. Some pedons do not have a B3 horizon.

Some pedons have a C horizon that has matrix, mottles, and texture similar to those of the B3 horizon. The C horizon is residuum from limestone, or it is stratified layers of sand, silt, or clay below a depth of 40 inches.

Lindside Series

The Lindside series consists of deep, nearly level, moderately well drained soils on flood plains and in upland depressions. These soils formed in silty alluvium that washed from soils derived from limestone, sandstone, siltstone, shale, and loess. Permeability is moderate. Slopes are mostly less than 2 percent.

Lindside soils are associated with Nolin, Newark, Melvin, and Dunning soils on flood plains; with Elk and Lawrence soils on stream terraces; and with Nicholson soils on upland ridges and side slopes. In upland depressions, Crider, Pembroke, and Baxter soils are on adjacent slopes. Nolin soils are better drained than Lindside soils. They do not have gray mottles in the upper part of the subsoil. Newark, Melvin, and Dunning soils are more poorly drained and have more gray mottles in the upper part of the subsoil. Dunning soils also have a mollic epipedon and more than 35 percent clay in the control section. Elk, Nicholson, Lawrence, Crider, Pembroke, and Baxter soils have an argillic horizon. Nicholson and Lawrence soils have a fragipan.

Typical pedon of Lindside silt loam, occasionally flooded; 150 feet southwest of a bend in East Fork of Pond River, 2,000 feet northeast of Kentucky Highway 107, 2.3 miles west of Clifty, in a soybean field.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; common fine roots; few wormholes and casts; few pieces of partly decomposed organic matter; neutral; abrupt smooth boundary.

B1—8 to 18 inches; dark yellowish brown (10YR 4/4) silt loam; common fine faint yellowish brown mottles; weak fine granular structure; very friable; common fine roots; many fine root channels; slightly acid; clear smooth boundary.

B2—18 to 29 inches; dark yellowish brown (10YR 4/4) silt loam; common fine faint yellowish brown mottles and few fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few fine roots; slightly acid; gradual wavy boundary.

B3—29 to 39 inches; dark yellowish brown (10YR 4/4) silt loam; common medium faint yellowish brown (10YR 5/4) mottles and common medium distinct grayish brown (10YR 5/2) mottles; weak medium and coarse subangular blocky structure; friable; few fine roots; few black coatings on peds; few fine sandy loam pockets in lower 3 inches; slightly acid; gradual wavy boundary.

C—39 to 60 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; few black coatings on peds; stratified layers of fine sandy loam 0.25 inch to 2.0 inches thick; slightly acid.

The solum is 25 to 50 inches thick. Depth to bedrock is 60 to more than 80 inches in some places. Reaction ranges from medium acid to neutral throughout.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The texture is silt loam.

The B horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Mottles are in shades of brown and gray. Depth to mottles that have chroma of 2 or less ranges from 14 to 20 inches. The texture is silt loam or silty clay loam. Thin strata of fine sandy loam or loam are in some pedons.

The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is mottled in shades of brown and gray. The texture is weakly stratified silt loam, silty clay loam, loam, or fine sandy loam.

Melvin Series

The Melvin series consists of deep, nearly level, poorly drained soils on flood plains and in upland depressions. These soils formed in silty alluvium that washed from soils derived from limestone, sandstone, siltstone, shale, and loess. Permeability is moderate. Slopes are mostly less than 1 percent.

Melvin soils are associated with Newark, Lindside, Nolin, and Dunning soils on flood plains; Nicholson, Lawrence, and Robertsville soils are nearby on terraces. In upland depressions, Crider, Pembroke, and Baxter soils are on adjacent slopes. Newark, Lindside, and Nolin soils are better drained than Melvin soil and have fewer gray mottles in the upper part of the subsoil. Dunning soils have a mollic epipedon, and have more than 35 percent clay in the control section. Nicholson, Lawrence, and Robertsville soils have an argillic horizon and a fragipan. Crider, Pembroke, and Baxter soils have an argillic horizon.

Typical pedon of Melvin silt loam, occasionally flooded; 150 yards north of Kentucky Highway 848, 300 feet west of Spring Creek, about 0.5 mile west of Pinchem.

Ap—0 to 8 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine faint light brownish gray mottles and few fine distinct brown (10YR 5/3) mottles; weak fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

B2g—8 to 22 inches; gray (10YR 5/1) silt loam; common fine distinct light brownish gray (2.5YR 6/2) mottles and few medium distinct brown (7.5YR 5/4) mottles; weak fine granular and subangular blocky structure; friable; few fine roots; common brown and black concretions; neutral; gradual smooth boundary.

C1g—22 to 34 inches; dark gray (5Y 4/1) silty clay loam; common fine and medium distinct pale olive (5Y 6/4) mottles; structureless; friable; few brown (7.5YR 5/4) coatings on peds; neutral; gradual smooth boundary.

C2g—34 to 60 inches; mottled dark gray (N 4/0), light brownish gray (2.5Y 6/2), and olive yellow (2.5Y 6/6) silty clay loam; massive; friable; few brown coatings on peds; neutral.

The solum is 18 to 40 inches thick. Depth to bedrock is 60 inches or more. Reaction ranges from medium acid to mildly alkaline throughout.

The Ap horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1 to 3. It is silt loam.

The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1; or it is neutral and has value of 4 to 7. It has mottles in shades of brown, gray, and red. The texture is silt loam or silty clay loam.

The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1 or 2; or it is neutral and has value of 4 to 7. It is mottled in shades of olive, yellow, brown, and red. The Cg horizon is silt loam or silty clay loam to a depth of about 40 inches. In some pedons, it is stratified loam, clay loam, silty clay, or fine sandy loam below a depth of about 40 inches.

Newark Series

The Newark series consists of deep, nearly level, somewhat poorly drained soils on flood plains and in upland depressions. These soils formed in silty alluvium that washed from soils derived from limestone, sandstone, siltstone, shale, and loess. Permeability is moderate. Slopes are dominantly less than 1 percent.

Newark soils are associated with Melvin, Lindside, Nolin, and Dunning soils on flood plains; Elk and Lawrence soils on stream terraces; and Nicholson soils on upland ridges and side slopes. In upland depressions, Crider, Pembroke, and Baxter soils are on adjacent slopes. Melvin and Dunning soils are more poorly drained and have more gray mottles in the upper part of the subsoil than Newark soils. Dunning soils also have a mollic epipedon and more than 35 percent clay in the control section. Lindside and Nolin soils are better drained and have fewer gray mottles in the upper part of the subsoil than Newark soils. Nicholson and Lawrence soils have an argillic horizon and a fragipan. Elk, Crider, Pembroke, and Baxter soils have an argillic horizon.

Typical pedon of Newark silt loam, occasionally flooded; in a soybean field 600 feet north of Buck Fork of Pond River, 1 mile north of Kentucky Highway 107, about 2 miles north of Kirkmansville.

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

B21—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; common fine roots; slightly acid; gradual smooth boundary.

B22g—14 to 36 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/4) and light gray (2.5Y 7/2) mottles; weak medium subangular blocky structure; friable; few roots; slightly acid; gradual smooth boundary.

Cg—36 to 60 inches; mottled light brownish gray (10YR 6/2), light gray (2.5Y 7/2), and yellowish brown (10YR 5/6) silt loam; massive; friable; few roots; few dark brown concretions; medium acid.

The solum is 22 to 44 inches thick. Depth to bedrock is 60 inches or more. Reaction ranges from medium acid to mildly alkaline throughout.

The Ap horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 2 to 4. The texture is silt loam.

The B21 horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 2 to 4. Mottles are in shades of brown and gray. The B22g horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 7, and chroma of 1 or 2. Mottles are in shades of brown or gray. The texture of the B horizon is silt loam or silty clay loam.

The Cg horizon has colors and mottles similar to those of the B22g horizon. The texture is silt loam or silty clay loam. In some pedons, it has thin layers of loam or fine sandy loam.

Nicholson Series

The Nicholson series consists of deep, nearly level to sloping, moderately well drained soils on broad upland ridges and side slopes. These soils have a slowly permeable fragipan. They formed in loess or silty material and the underlying residuum from limestone. Slopes are mostly less than 6 percent but can range from 0 to 12 percent.

Nicholson soils are associated with Crider, Pembroke, and Lawrence soils. Crider and Pembroke soils are well drained and do not have a fragipan. Lawrence soils are on nearly level stream terraces or in concave upland areas and are somewhat poorly drained.

Typical pedon of Nicholson silt loam, 2 to 6 percent slopes; in a soybean field 100 feet south of Davis Mill Road, 2 miles south of U.S. Highway 68, 2 miles west of Elkton.

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

B21t—8 to 18 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; strongly acid; clear smooth boundary.

B22t—18 to 24 inches; brown (7.5YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common fine and medium roots; patchy clay films on ped faces; firm; light gray (N 7/0) silt coatings; strongly acid; clear wavy boundary.

Bx—24 to 42 inches; brown (7.5YR 4/4) silt loam; common medium distinct strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2) mottles; very coarse prismatic structure parting to moderate medium subangular blocky; firm, brittle and compact; few black concretions; strongly acid; gradual wavy boundary.

IIB3—42 to 60 inches; yellowish brown (10YR 5/4) silty clay; few medium distinct strong brown (7.5YR 5/6) mottles and common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; medium acid.

The solum is 40 to 80 inches. Depth to bedrock is 60 to 100 inches. Depth to the fragipan is 20 to 30 inches. Reaction ranges from slightly acid to very strongly acid through the fragipan except where lime has been added. It ranges from strongly acid to slightly acid below the fragipan.

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

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. A few pale brown or light gray mottles are in the lower part of some pedons. The texture is silt loam or silty clay loam. Some pedons have a B1 horizon that has texture and colors similar to the B2t horizon.

The Bx horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 3 to 5, and chroma of 4 to 8. It has few to many mottles that have chroma of 2 or less. The texture is silt loam or silty clay loam.

The IIB3 horizon has hue of 2.5YR to 2.5Y, value of 4 or 5, and chroma of 4 or 6. It has few to common mottles that have chroma of 2 or less. The texture is silty clay loam, silty clay, or clay.

Some pedons have a IIC horizon that has hue of 2.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 6. It has mottles that have chroma of 2 or less. The texture is silty clay loam, silty clay, or clay. Coarse fragments range from 0 to 35 percent.

Nolin Series

The Nolin series consists of deep, nearly level, well drained soils on flood plains and in upland depressions. These soils formed in silty alluvium that washed from soils derived from limestone, sandstone, siltstone, shale, and loess. Permeability is moderate. Slopes are mostly about 1 percent but can range from 0 to 3 percent.

Nolin soils are associated with Lindside, Newark, and Melvin soils on flood plains; Elk and Lawrence soils on stream terraces; and Nicholson soils on upland ridges and side slopes. In upland depressions, Crider, Pembroke, and Baxter soils are on adjacent slopes. Lindside, Newark, and Melvin soils are not as well drained as Nolin soils and have more gray mottles in the upper part of the subsoil. Lawrence and Nicholson soils have an argillic horizon and a fragipan. Elk, Crider, Pembroke, and Baxter soils have an argillic horizon.

Typical pedon of Nolin silt loam, occasionally flooded; 300 feet north of East Fork of Pond River and 300 feet east of a county road, about 1.2 miles north of Kentucky Highway 171, about 2.3 miles north of Kirkmansville, in a soybean field.

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

B21—8 to 20 inches; brown (10YR 4/3) silt loam; few medium faint yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; common fine roots; medium acid; gradual smooth boundary.

B22—20 to 60 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; common fine and medium roots in upper part; slightly acid.

The solum is 40 to 60 inches thick. Depth to bedrock is 60 inches to more than 80 inches in some places. In most pedons, reaction ranges from medium acid to mildly alkaline throughout, but in some pedons, it ranges from strongly acid to mildly alkaline. Content of pebbles and cobbles range from 0 to 5 percent.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. The texture is silt loam.

Some pedons have a B1 horizon that has colors and textures 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, the B horizon has mottles that have chroma of 2 or less below a depth of 24 inches. The texture is silt loam or silty clay loam.

Some pedons have a C horizon that has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silt loam, silty clay loam, loam, fine sandy loam, or sandy loam.

Pembroke Series

The Pembroke series consists of deep, well drained, moderately permeable soils on slightly karst broad upland ridges and side slopes of the Mississippian Plateau. These soils formed in loess and the underlying residuum from limestone or old alluvium. Slopes range from 0 to 12 percent.

Pembroke soils are associated with Crider, Nicholson, Baxter, Fredonia, Vertrees, and Nolin soils. Crider soils have yellower hue than 5YR in the upper part of the B horizon. Nicholson soils have a fragipan. Baxter soils have an argillic horizon that has more than 15 percent chert fragments. Baxter, Fredonia, and Vertrees soils have more than 35 percent clay in the control section. Fredonia soils also are moderately deep to bedrock. Nolin soils formed in alluvium and do not have an argillic horizon.

Typical pedon of Pembroke silt loam, 2 to 6 percent slopes; 300 feet east of Daysville-Allensville Road, about 2.2 miles north of U.S. Highway 79, about 3.4 miles north of Allensville.

Ap—0 to 9 inches; dark brown (7.5YR 3/2) silt loam; weak fine granular structure; very friable; common fine roots; neutral; abrupt smooth boundary.

B1—9 to 16 inches; reddish brown (5YR 4/4) silty clay loam; weak fine subangular blocky structure; friable; common fine roots; few clay films; common dark brown coatings on peds; slightly acid; gradual smooth boundary.

B21t—16 to 33 inches; yellowish red (5YR 4/6) silty clay loam; moderate medium subangular blocky structure; friable; common roots; common clay films; common dark brown coatings on peds; medium acid; gradual smooth boundary.

B22t—33 to 53 inches; dark red (2.5YR 3/6) silty clay loam; moderate medium subangular blocky structure; friable; common clay films; common black concretions and coatings on peds; common small and medium pores; strongly acid; gradual wavy boundary.

B23t—53 to 63 inches; dark red (10YR 3/6) silty clay; moderate medium angular blocky structure; firm; many clay films; common black coatings on peds; strongly acid.

Thickness of the solum and depth to bedrock are more than 60 inches. Reaction ranges from very strongly acid to medium acid throughout except where lime has been added; then, it ranges from very strongly acid to neutral. Content of chert fragments ranges from 0 to 5 percent, by volume, in the upper part of the solum; and from 0 to 15 percent, by volume, in the lower part.

The Ap horizon has hue of 10YR, 7.5YR, or 5YR, value of 3, and chroma of 2 or 3. The texture is silt loam.

The B1 horizon has hue of 5YR, value of 4, and chroma of 4 or 6. It is silty loam or silty clay loam. The B21t horizon has hue of 5YR or 2.5YR, value of 3 or 4, and chroma of 4 or 6. The B22t and B23t horizons have hue of 5YR, 2.5YR, or 10R, value of 3 or 4, and chroma of 6. The texture of the B2t horizons is silty clay loam or silty clay.

Riney Series

The Riney series consists of deep, well drained, sloping to steep soils on ridges and side slopes. These soils formed in residuum of weakly consolidated sandstone and shale. Permeability is moderately rapid. Slopes range from 6 to 30 percent.

Riney soils are associated with Frondorf, DeKalb, Weikert, Caneyville, and Zanesville soils. Frondorf soils are less than 40 inches to bedrock and have a thin loess mantle. DeKalb soils are skeletal and moderately deep to bedrock. Weikert soils are shallow to bedrock. Caneyville soils have more than 35 percent clay in the control section and are moderately deep to bedrock. Zanesville soils are on adjacent ridges and have a thin loess mantle and a fragipan.

Typical pedon of Riney loam, 12 to 20 percent slopes, eroded; 50 feet south of Kentucky Highway 507, 0.25 mile east of Pilot Rock, 4.2 miles west of Allegre.

Ap—0 to 7 inches; yellowish brown (10YR 5/4) loam; weak fine granular structure; friable; many fine roots; 5 percent quartzite pebbles 0.25 to 1 inch in diameter; strongly acid; abrupt smooth boundary.

B1—7 to 12 inches; yellowish brown (10YR 5/4) loam; weak fine granular and subangular blocky structure; friable; many fine to coarse roots; 10 percent quartzite pebbles and sandstone fragments 0.25 inch to 3 inches in diameter; very strongly acid; abrupt wavy boundary.

B21t—12 to 18 inches; yellowish red (5YR 4/6) clay loam; moderate fine angular blocky structure; firm; common medium and coarse roots; 5 percent quartzite pebbles and sandstone fragments 0.25 inch to 3 inches in diameter; strongly acid; gradual smooth boundary.

B22t—18 to 36 inches; red (2.5YR 4/6) clay loam; moderate fine angular blocky structure; firm; common coarse roots; thin continuous dark red (2.5YR 3/6) clay films; strongly acid; gradual smooth boundary.

B23t—36 to 60 inches; red (2.5YR 4/6) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate fine angular blocky structure; firm; thin continuous yellowish red (5YR 4/6) clay films; 14 percent sandstone fragments 0.25 inch to 3 inches; strongly acid.

The solum is 40 to 80 inches thick. Depth to sandstone bedrock ranges from 48 to 80 inches or more. Reaction is strongly acid or very strongly acid throughout except where lime has been added.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Undisturbed pedons have an A1 horizon, 1 inch to 4 inches thick, that has value of 3 and an A2 horizon, 4 to 6 inches thick, that has similar colors to those of the Ap horizon. The texture is loam. Coarse fragments of quartzitic pebbles range from 0 to 10 percent.

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. The texture is loam or sandy clay loam.

The B2t horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 or 5, and chroma of 6 or 8. In most pedons, it is mottled in shades of brown or red in the lower part. The texture is clay loam or sandy clay loam. Coarse fragments of soft sandstone or quartzitic pebbles range from 0 to 20 percent.

Some pedons have a C horizon that has colors similar to those of the B2t horizon. The texture is sandy clay loam, fine sandy loam, sandy loam, or loamy sand. Coarse fragments of soft sandstone range from 0 to 20 percent.

The Riney soil in the Riney gravelly loam, 12 to 30 percent slopes, severely eroded, map unit in Todd County, is a taxadjunct to the Riney series. The Riney soil in this map unit has more gravel in the upper part of the solum and is less red in the subsoil and substratum than is permitted for the range of the series. This difference, however, does not alter the use or behavior of this soil.

Robertsville Series

The Robertsville series consists of deep, nearly level, poorly drained soils on stream terraces and in concave upland depressions. These soils have a slowly permeable fragipan. They formed in old mixed alluvium or colluvium. Robertsville soils are saturated in winter and spring in most years. Slopes range from 0 to 2 percent.

Robertsville soils are associated with Lawrence, Nicholson, Melvin, Newark, and Pembroke soils. Lawrence and Nicholson soils are better drained than Robertsville soils and have fewer gray mottles in the upper part of the subsoil. Melvin and Newark soils are on adjacent flood plains and do not have an argillic horizon or a fragipan. Pembroke soils are on adjacent uplands, are better drained than Robertsville soils, and do not have a fragipan.

Typical pedon of Robertsville silt loam, occasionally flooded; 100 feet north of Fairgrounds Road, 0.25 mile east of Guthrie, in a pasture.

A1—0 to 2 inches; very dark gray (10YR 3/1) silt loam; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A2g—2 to 8 inches; light gray (10YR 6/1) silt loam; common fine faint light brownish gray mottles and common medium distinct dark brown (7.5YR 4/4) mottles; weak fine granular structure; friable; common fine roots; few brown coatings; slightly acid; clear smooth boundary.

B2g—8 to 20 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; weak fine and medium subangular blocky structure; friable; common fine roots; very strongly acid; clear smooth boundary.

Bx—20 to 43 inches; gray (10YR 6/1) silty clay loam; many fine and medium distinct brown (7.5YR 4/4) mottles; moderate very coarse prismatic structure parting to weak fine and medium subangular blocky; very firm, brittle and compact; few fine roots between prisms; discontinuous clay films; very strongly acid; gradual wavy boundary.

B3g—43 to 53 inches; mottled gray (10YR 6/1) and brown (7.5YR 4/4) silty clay; moderate fine and medium angular blocky structure; very firm; very strongly acid; clear smooth boundary.

Cg—53 to 70 inches; mottled gray (10YR 6/1), brown (7.5YR 4/4), and light olive brown (2.5Y 5/4) silty clay; massive; firm; very strongly acid.

The solum is 40 to 60 inches thick. Depth to bedrock is 60 to 100 inches or more. Reaction is strongly acid or very strongly acid through the fragipan except where lime has been added. It ranges from very strongly acid to neutral below the fragipan.

The A1 horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 1 or 2. The A2g horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 or 2. Some pedons have an Ap horizon that has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Mottles are in shades of brown and gray. The texture is silt loam.

The B2g horizon has hue of 10YR, 2.5Y, or 5Y, value of 6 or 7, and chroma of 1 or 2. Mottles are in shades of brown, yellow, and gray. The texture is silt loam or silty clay loam.

The Bx horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2; or it is neutral and has value of 5 to 7. Mottles are in shades of brown, yellow, and gray. The texture is silt loam or silty clay loam.

The B3g and Cg horizons have matrix and mottles in shades of brown and gray, or they are equally mottled. The texture is silt loam, silty clay loam, or silty clay. In some pedons, the Cg horizon has stratified layers of loam, clay loam, or clay.

Sadler Series

The Sadler series consists of deep, nearly level to gently sloping, moderately well drained soils on broad ridgetops. These soils formed in a thin loess mantle and the underlying residuum from sandstone, siltstone, or shale. They have a slowly permeable fragipan. Slopes range from 0 to 6 percent.

Sadler soils are associated with Zanesville, Johnsburg, Epley, and Wellston soils. Zanesville soils are on adjacent ridges and do not have an A'2 horizon above the fragipan. Johnsburg soils are not as well drained as Sadler soils. They have gray mottles in the upper 10 inches of the argillic horizon. Epley and Wellston soils do not have a fragipan.

Typical pedon of Sadler silt loam, 2 to 6 percent slopes; 200 feet east of Flat Rock Road, 0.3 mile north of Kentucky Highway 508, about 6 miles north of Fairview, in a fescue field.

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

B2t—8 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; weak fine and medium subangular blocky structure; friable; common fine and medium roots; common thin clay films; very strongly acid; clear smooth boundary.

A'2&B—22 to 26 inches; light brownish gray (10YR 6/2) silt loam (A'2) coatings 2 to 12 mm thick on yellowish brown (10YR 5/6) silt loam peds (B); about 35 percent, by volume, B material; weak fine and medium subangular blocky structure; friable; common fine and medium roots; very strongly acid; clear wavy boundary.

IIBx—26 to 44 inches; mottled yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and light brownish gray (10YR 6/2) silt loam; moderate very coarse prismatic structure parting to weak fine and medium subangular blocky; very firm, brittle and compact; common thin clay films; noticeably more sand than layers above; few small black concretions; very strongly acid; gradual smooth boundary.

IIB3—44 to 60 inches; mottled light olive brown (2.5Y 5/6) and light brownish gray (2.5Y 6/2) silty clay loam; moderate medium angular blocky structure; firm; many clay films; 3 percent sandstone fragments; few small concretions; very strongly acid.

The solum is 40 to 60 inches thick. Depth to bedrock is 50 to 80 inches. The loess mantle is 20 to 43 inches thick. Depth to the fragipan ranges from 18 to 32 inches. Reaction is strongly acid or very strongly acid throughout except where lime has been added.

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

The B2t horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 4 or 6. If this horizon has hue of 7.5YR, that hue is only in the upper part of the horizon. The texture is silt loam or silty clay loam.

The A'2 part of the A'2&B horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. The B part has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 4 to 8. It comprises 30 to 45 percent of the horizon.

The IIBx horizon has matrix and mottle colors in hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 1 to 6. The texture is silt loam, silty clay loam, or loam.

The IIB3 horizon has matrix and mottle colors in hue of 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. Texture is silt loam, silty clay loam, or clay loam. Content of coarse fragments ranges from 1 to 50 percent.

Some pedons have a IIC horizon that has colors similar to those of the IIB3 horizon. The texture ranges from silt loam to silty clay. Content of coarse fragments ranges from 1 to 50 percent.

Skidmore Series

The Skidmore series consists of deep, nearly level, well drained soils on narrow flood plains. These soils formed in gravelly alluvium. Permeability is moderately rapid. Very brief flooding is common in winter and spring. Slopes range from 0 to 2 percent.

Skidmore soils are associated with Nolin and Lindside soils. The associated soils have less than 15 percent coarse fragments in the upper part of the subsoil.

Typical pedon of Skidmore gravelly loam, occasionally flooded; in a soybean field, 1,100 feet northwest of Jones Road, 1,200 feet east of the Christian County line, 1 mile south of Kentucky Highway 507, about 4 miles west of Allegre.

Ap—0 to 8 inches; brown (10YR 4/3) gravelly loam; weak fine granular structure; very friable; common fine roots; 15 percent gravel; slightly acid; abrupt smooth boundary.

B2—8 to 16 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; friable; common fine roots; 30 percent gravel; medium acid; gradual wavy boundary.

B3—16 to 30 inches; yellowish brown (10YR 5/4) very gravelly sandy loam; few fine distinct pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; common black coatings on peds; few fine roots; 60 percent gravel; medium acid; gradual smooth boundary.

IIC—30 to 47 inches; mottled yellowish brown (10YR 5/6, 5/4) and grayish brown (10YR 5/2) gravelly clay loam; massive; firm, slightly plastic; 35 percent gravel; common black stains; mildly alkaline.

R—47 inches; limestone bedrock.

The solum is 20 to 40 inches thick. Depth to bedrock is 40 to 100 inches. Reaction ranges from medium acid to mildly alkaline throughout. Content of coarse fragments ranges from 10 to 40 percent in the Ap horizon and the upper part of the B horizon and from 35 to 85 percent in the lower part of the B horizon and in the IIC horizon.

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

The B and IIC horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. In some pedons, they have mottles that have chroma of 1 or 2 below a depth of 25 inches. Texture of the fine earth is loam, fine sandy loam, sandy clay loam, clay loam, or sandy loam.

Vertrees Series

The Vertrees series consists of deep, well drained, moderately slowly permeable soils on side slopes of uplands underlain by limestone. These soils formed in clayey residuum from limestone. Most areas are karst. Slopes range from 6 to 12 percent.

Vertrees soils are associated with Crider, Pembroke, Baxter, and Nicholson soils. Crider, Pembroke, and Nicholson soils are on adjacent ridges and have less than 35 percent clay in the control section. Nicholson soils also have a fragipan. Baxter soils have a weighted average of 15 to 35 percent chert fragments in the Bt horizon.

Typical pedon of Vertrees silty clay loam, 6 to 12 percent slopes, eroded; in a soybean field 150 feet south of Kentucky Highway 1802, 1 mile east of Hammacksville.

Ap—0 to 5 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21t—5 to 20 inches; red (2.5YR 4/6) silty clay; moderate fine and medium angular blocky structure; firm, plastic; few fine roots; neutral; gradual smooth boundary.

B22t—20 to 46 inches; red (2.5YR 4/6) clay; strong fine and medium angular blocky structure; very firm, plastic; 1 percent chert fragments; thick continuous dark red (2.5YR 3/6) clay films; few black concretions; medium acid; gradual smooth boundary.

B23t—46 to 66 inches; red (2.5YR 4/6) clay; common medium distinct strong brown (7.5YR 5/8) mottles; strong fine and medium angular blocky structure; very firm, plastic; thick continuous dark red (2.5YR 3/6) clay films; 2 percent chert fragments; medium acid; gradual smooth boundary.

B24t—66 to 75 inches; dark red (2.5YR 3/6) clay; common medium distinct strong brown (7.5YR 5/8) mottles; strong fine angular blocky structure; firm, plastic; continuous dark reddish brown (2.5YR 3/4) clay films; medium acid.

Thickness of the solum and depth to bedrock are more than 60 inches. Reaction ranges from medium acid to very strongly acid except where lime has been added. Content of chert fragments ranges from 0 to 35 percent in the A and B1 horizons and from 0 to 20 percent in the B2t horizon.

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

Some pedons have a B1 horizon that has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 or 6. The texture is silty clay loam.

The B2t horizon has hue of 5YR or 2.5YR, value of 3 to 5, and chroma of 6 or 8. This horizon is mottled in shades of brown, red, or yellow in some pedons. The texture is silty clay or clay.

Weikert Series

The Weikert series consists of shallow, moderately steep to very steep, well drained soils on side slopes. These soils formed in residuum from sandstone, siltstone, or shale. Permeability is moderately rapid. Slopes are dominantly about 25 percent but range from 12 to 45 percent.

Weikert soils are associated with Frondorf, Wellston, Caneyville, and DeKalb soils. Frondorf soils are mapped in complex with Weikert soils on moderately steep and very steep side slopes and are 20 to 40 inches to bedrock. Wellston soils are more than 40 inches to bedrock and contain fewer coarse fragments than Weikert soils. Caneyville soils are 20 to 40 inches to bedrock and formed in clayey residuum from limestone. DeKalb soils are 20 to 40 inches to bedrock.

Typical pedon of Weikert channery silt loam from an area of Frondorf-Weikert complex, 20 to 45 percent slopes; in woodlands, 300 feet east of Blue Hole Road, 0.9 mile north of Claymour-Russellville Road, 1.6 miles east of Allegre.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) channery silt loam; weak fine granular structure; very friable; many fine roots; 20 percent sandstone fragments 0.25 inch to 2.0 inches across; medium acid; abrupt smooth boundary.

A2—2 to 5 inches; light yellowish brown (10YR 6/4) channery silt loam; weak fine granular structure; very friable; many fine and medium roots; 25 percent sandstone fragments 0.25 inch to 2.0 inches across; very strongly acid; clear smooth boundary.

B2—5 to 14 inches; brownish yellow (10YR 6/6) very channery silt loam; weak medium subangular blocky structure; friable; many medium and coarse roots; 50 percent sandstone fragments 0.25 inch to 3.0 inches across; very strongly acid; gradual wavy boundary.

C—14 to 19 inches; brownish yellow (10YR 6/6) very channery loam; massive; friable; few coarse roots; 60 percent sandstone fragments 0.25 inch to 4.0 inches across; very strongly acid; clear wavy boundary.

R—19 inches; fractured sandstone bedrock.

The solum is 8 to 20 inches thick. Depth to bedrock is 10 to 20 inches. Reaction is strongly acid or very strongly acid throughout except where lime has been added. Content of coarse fragments ranges from 20 to 60 percent in the solum and from 60 to 85 percent in the C horizon with a weighted average in the control section of 50 percent or more, by volume.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The texture is channery silt loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is channery or very channery silt loam or loam.

The C horizon has colors similar to those of the B horizon. The texture is very channery silt loam or loam. Some pedons do not have the C horizon.

Wellston Series

The Wellston series consists of deep, well drained, moderately permeable soils on ridgetops and side slopes. These soils formed in a thin loess mantle and the underlying residuum from sandstone, siltstone, and shale. Slopes range from 2 to 20 percent.

Wellston soils are associated with Zanesville, Sadler, Frondorf, Weikert, and Caneyville soils. Zanesville and Sadler soils are on ridges adjacent to the Wellston soils, and they have a fragipan. Caneyville and Frondorf soils have bedrock at a depth of 20 to 40 inches, and the Caneyville soils formed in clayey residuum from limestone. Weikert soils are shallow.

Typical pedon of Wellston silt loam, 12 to 20 percent slopes; in woodland, 1,100 feet north of a county road, about 0.5 mile west of Mt. Tabor Church, about 2 miles north of Allegre.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; many fine roots and pores; medium acid; abrupt smooth boundary.

A2—2 to 7 inches; brown (10YR 5/3) silt loam; moderate fine granular structure; very friable; many fine and medium roots and pores; strongly acid; clear smooth boundary.

B1—7 to 11 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; thin patchy brown (7.5YR 4/4) clay films on peds; strongly acid; clear smooth boundary.

B21t—11 to 30 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine to coarse roots; thin continuous brown (7.5YR 4/4) clay films; very strongly acid; clear smooth boundary.

IIB22t—30 to 42 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common medium and coarse roots; common thin brown (7.5YR 4/4) clay films, 3 percent sandstone fragments; very strongly acid; clear wavy boundary.

IIB3—42 to 48 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct brown (10YR 5/3) mottles; moderate medium and coarse subangular blocky structure; firm; few coarse roots; 5 percent sandstone fragments; very strongly acid; abrupt wavy boundary.

IIC—48 to 55 inches; yellowish brown (10YR 5/6) channery loam; massive; firm; 15 percent sandstone fragments; very strongly acid; abrupt smooth boundary.

R—55 inches; sandstone bedrock.

The solum is 33 to 50 inches thick. Depth to bedrock is 40 to 65 inches. Reaction ranges from medium acid to very strongly acid throughout except where lime has been added. The weighted average content of coarse fragments in the B and IIC horizons is less than 10 percent.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. In severely eroded pedons, it has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 or 6. The texture is silt loam or silty clay loam.

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

The IIB horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. Content of coarse fragments ranges from 0 to 50 percent. The texture of the fine earth fraction is loam, silt loam, clay loam, or silty clay loam.

The IIC horizon has colors and texture similar to those of the IIB horizon. Content of coarse fragments ranges from 5 to 50 percent or more.

Zanesville Series

The Zanesville series consists of deep, well drained to moderately well drained, gently sloping to sloping soils on ridgetops and side slopes. They formed in a thin loess mantle and the underlying residuum from sandstone, siltstone, or shale. These soils have a slowly permeable fragipan. Slopes range from 2 to 12 percent.

Zanesville soils are associated with Sadler, Johnsburg, Wellston, Frondorf, and Weikert soils. Sadler soils are on adjacent ridgetops and have an A'2 horizon above the fragipan. Johnsburg soils are somewhat poorly drained and have gray mottles in the upper 10 inches of the argillic horizon. Wellston, Frondorf, and Weikert soils are on adjacent side slopes and do not have a fragipan. Frondorf soils are moderately deep to bedrock, and Weikert soils are shallow to bedrock.

Typical pedon of Zanesville silt loam, 2 to 6 percent slopes; 50 feet north of a stock barn, 666 feet north of Kentucky Highway 508, about 2.5 miles east of the Christian County line, about 5.6 miles southwest of Allegre, in a fescue field.

A1—0 to 1 inch; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

A2—1 to 6 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

B2t—6 to 26 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; common clay films; very strongly acid; gradual smooth boundary.

Bx—26 to 43 inches; strong brown (7.5YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and light gray (N 7/0) mottles; moderate very coarse prismatic structure parting to weak fine and medium subangular blocky; very firm, compact and brittle; common fine roots between prisms; light gray (10YR 7/1) silt coatings; common clay films; very strongly acid; gradual wavy boundary.

IIB3—43 to 60 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct light brownish gray (10YR 6/2) mottles and few fine faint dark yellowish brown mottles; coarse columnar structure breaking to medium and coarse angular blocky; firm; 5 percent weathered brown sandstone fragments; common clay films on ped surfaces; very strongly acid; abrupt wavy boundary.

R—60 inches; rippable thin bedded brown sandstone.

The solum is 35 to 60 inches thick. Depth to bedrock is 45 to 80 inches. Reaction is strongly acid or very strongly acid throughout except where lime has been added. Depth to the fragipan ranges from 20 to 32 inches.

Some pedons have an Ap horizon that has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Severely eroded pedons have chroma of 4 or 6. Pedons that are not cultivated have an A1 horizon that is 1 inch to 3 inches thick. It has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has the same colors as those of the Ap horizon. The texture is silt loam or silty clay loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. The texture is silt loam or silty clay loam.

The Bx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It has few to many mottles in shades of brown and gray. The texture is silty clay loam or silt loam.

The IIB3 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Mottles are in shades of brown and gray. The texture is silt loam, loam, clay loam, or sandy clay loam. Content of coarse fragments ranges from 5 to 50 percent.

Some pedons have a IIC horizon that has colors, mottles, texture, and content of coarse fragments similar to those of the IIB3 horizon.

Formation of the Soils

In this section, the factors of soil formation are discussed and related to the soils in Todd County.

Factors of Soil Formation

Soils are individual natural bodies formed through the interaction of five major factors of formation. These factors of formation are climate, parent material, plant and animal life, relief, and time *(6)*. Parent material is acted upon by climate and plant and animal life, and their effect is controlled by relief and the amount of time they have had to act.

The relative influence that each of these factors has over the others varies from place to place. These differences account for the variety of characteristics of the soils.

Climate

Climate is generally the most important factor in soil formation, but because the climate is uniform throughout Todd County, the differences in soils in the county are caused by factors other than the climate. Climate influences soil development principally through the affects of temperature and precipitation *(6)*. It affects the weathering of rocks and minerals, the susceptibility of the soil to erosion, and the kind and number of plants and animals. As water percolates through the soil, it assists in physical and chemical reactions, leaches soluble bases from the soil, and translocates clay minerals to lower layers within the soil profile.

The climate in Todd County is humid and temperate. The average annual precipitation is about 49 inches, and the average temperature is about 57 degrees Farenheit. Because the soils are not dry or frozen for long periods, the processes of soil formation have continued almost uninterrupted. This almost continual process has leached many of the soluble bases and clay minerals to lower horizons within the soil, and in some instances completely from the soil. As a result, many of the soils in the county are acid, have a loamy surface layer, and have a subsoil that has accumulated clay from the surface layer. Examples are the Wellston, Sadler, and Pembroke soils.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It is derived from the weathering of bedrock in place. Wind, ice, water, and gravity can transport and redeposit the parent material to form new soils.

The soils in Todd County formed in parent material of loess, residuum, and alluvium. Loess is wind-deposited material comprised mostly of silt-sized particles. Loess is on most of the uplands and is thickest on the gentle slopes and thinnest on the steepest slopes. The thickest loess deposits in Todd County are less than 4 feet thick. Residuum weathered from bedrock is under the loess cap. Sadler, Wellston, and Frondorf soils developed partly in loess and partly in residuum derived from sandstone and siltstone. These soils have a loamy subsoil. Crider, Nicholson, and Pembroke soils formed in loess and residuum weathered from limestone. These soils have a clayey subsoil.

Some soils in Todd County formed entirely in residuum. These soils are mostly on steeper slopes where loess was not deposited or in areas where erosion removed the loess cap before the present soils developed. DeKalb soils formed in residuum from sandstone and are loamy. Caneyville and Fredonia soils formed in residuum from limestone and are clayey.

Alluvium is parent material transported by water from uplands and deposited in the valleys. Nolin, Lindside, Newark, and Melvin soils formed in alluvium on the flood plains or in small depressions on uplands. Elk, Robertsville, and Lawrence soils formed on alluvial terraces. The alluvium that these soils developed in came from a variety of parent material so the soils have a high content of silt and a moderate content of clay. Dunning soils, however, formed in alluvium deposited in slack water and have a high content of clay.

Plant and Animal Life

Plants and animals greatly influence the formation of soils. Plants add organic matter to the surface layer, and their roots bring nutrients up from the subsoil.

The native vegetation in the northern part of Todd County was hardwood forests. Soils that formed under this type of vegetation typically are acid and have a thin dark surface layer, a leached subsurface layer, and a subsoil that has a higher clay content than the layers above or below it. Sadler and Wellston soils formed under a forest vegetation and have these characteristics.

In the southern part of the county the native vegetation was probably a mixture of hardwood forests, brushy vegetation, and grassland. Some of the soils in this part of the county exhibit the characteristics of soils formed under native hardwoods and some exhibit characteristics common to those formed under grasslands. The Pembroke and Dunning soils formed under grass vegetation. The surface layer is thick and dark resulting from the accumulation of organic matter.

Animals influence soil formation to a lesser extent than plants. Worms, crayfish, moles, and groundhogs mix the soil and add organic matter. Bacteria and fungi decompose the organic matter and release nutrients to the soil.

Man has also influenced soil formation by clearing trees, draining swamps, cultivating the land, and by excavating. These activities influence the physical and chemical properties in the soil. Except for alterations predominantly of the surface layer, man's influence on the formation of soils has been minor in most places.

Relief

Relief influences soil formation through its affects on drainage, erosion, soil temperature, and plant cover. Soils that formed on nearly level topography and have poor internal drainage generally are not well developed and have gray colors in the subsoil. Other soils that have good internal drainage are more fully developed and have little or no gray colors in the subsoil. Soils that have nearly level or gentle relief are not likely to erode. Newark and Melvin soils on nearly level flood plains have poor internal drainage. Crider and Pembroke soils on nearly level uplands have good internal drainage and are well developed.

As relief increases, poor drainage becomes less of a factor, and the effects of erosion are increased. Soils in steep areas are not as deep and are less developed than soils in gently sloping areas because of increased water runoff; thus erosion removes material from the surface as fast as the residuum is formed. The Frondorf, DeKalb, and Caneyville soils are not as deep to bedrock as soils on the gently sloping topography.

The influences of soil temperature and plant cover on soil development are more pronounced on the steeper slopes. These differences are most readily observed when comparing north-facing and south-facing slopes. South-facing slopes are slightly warmer than north-facing slopes, and they erode and weather at a faster rate. Plant cover is also different on north- and south-facing slopes. These differences in soil temperature and plant cover, however, have not affected soil formation in Todd County to any great extent.

Time

The length of time required for a soil to form depends on the other soil-forming factors. Generally, soils require less time to develop in a warm, moist climate than in a cool, dry climate. The resistance of the parent material to weathering also influences the amount of time needed for soil formation. Ultimately the amount of profile development determines the maturity of a soil rather than the number of years that a soil has been in the process of developing.

Immature soils have little profile development and have retained many of the characteristics of the original parent material. In Todd County, immature soils are on flood plains where high water tables and deposition of fresh material prevents horizon development. Melvin and Newark soils are examples. Immature soils also occur on steep side slopes where runoff and geologic erosion prevent profile development. Weikert soils are an example.

Mature soils have well developed profiles. The Crider, Pembroke, and Wellston soils are examples. These soils generally are on relatively stable surfaces and are deep to bedrock. Weathering has translocated minerals and finer material into the subsoil and has developed well defined horizons.

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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.

Aspect (forestry). The direction toward which a slope faces.

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	ess than 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels, i.e., clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

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 tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

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.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

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.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting. The term is more often applied to cliffs produced by differential erosion and is synonymous with "scarp."

Excess fines (in tables). Excess silt and clay are in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

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.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

A2 horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O or A horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

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.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Landscape (General). All the natural features, such as fields, hills, forests, and water, that distinguish one part of the earth's surface from another part; generally that part of land that the eye can comprehend in a single view.

Landscape (Geology) including all of its natural characteristics. The distinct association of landforms, especially as modified by geologic forces, that can be seen in a single view.

Large stones (in tables). Rock fragments that are 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Limestone. A sedimentary rock consisting chiefly (more than 50 percent) of calcium carbonate, primarily in the form of calcite. Limestone is generally formed by a combination of organic and inorganic processes and includes chemical and clastic (soluble and insoluble) constituents; many are fossiliferous.

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.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

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.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Reaction, soil. A measure of the acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). There is a shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole (sink). 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.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

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.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1951-80 at Hopkinsville, Kentucky]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	43.2	23.1	33.2	72	-4	19	4.41	2.13	6.38	8	4.5
February---	47.8	25.6	36.7	76	1	24	3.96	2.11	5.58	7	3.3
March------	57.3	34.4	45.9	83	13	99	5.62	3.24	7.73	9	2.6
April------	69.8	45.6	57.7	88	28	243	4.49	2.76	6.04	8	.0
May--------	78.5	54.3	66.4	93	35	508	4.48	2.25	6.41	8	.0
June-------	86.5	62.6	74.6	99	48	738	3.72	1.85	5.33	6	.0
July-------	90.0	66.1	78.1	100	53	871	4.22	2.37	5.84	7	.0
August-----	89.5	64.6	77.1	101	53	840	3.38	1.84	4.74	5	.0
September--	83.6	57.8	70.7	98	40	621	3.28	.94	5.16	5	.0
October----	72.6	44.6	58.6	90	27	292	2.64	1.22	3.86	5	.0
November---	58.4	34.8	46.6	82	15	49	4.37	2.15	6.29	7	.6
December---	47.5	27.5	37.5	72	4	15	4.59	2.13	6.69	7	1.2
Yearly:											
Average--	68.7	45.1	56.9	---	---	---	---	---	---	---	---
Extreme--	---	---	---	102	-7	---	---	---	---	---	---
Total----	---	---	---	---	---	4,319	49.16	41.09	56.87	82	12.2

* 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

[Data recorded in the period 1951-80 at Hopkinsville, 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 1	April 14	April 24
2 years in 10 later than--	March 27	April 9	April 20
5 years in 10 later than--	March 17	March 31	April 12
First freezing temperature in fall:			
1 year in 10 earlier than--	October 28	October 24	October 13
2 years in 10 earlier than--	November 2	October 28	October 17
5 years in 10 earlier than--	November 10	November 4	October 26

TABLE 3.--GROWING SEASON

[Data recorded in the period 1951-80 at Hopkinsville, 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	199	180
8 years in 10	224	206	186
5 years in 10	237	217	197
2 years in 10	250	229	207
1 year in 10	256	235	213

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
BaD	Baxter cherty silt loam, 12 to 20 percent slopes	650	0.3
CaB	Caneyville silt loam, 2 to 6 percent slopes	630	0.3
CaC	Caneyville silt loam, 6 to 12 percent slopes	4,220	1.7
CnD3	Caneyville sillty clay, 6 to 20 percent slopes, severely eroded	4,410	1.8
CoD	Caneyville-Rock outcrop complex, 6 to 30 percent slopes	18,220	7.5
CrA	Crider silt loam, 0 to 2 percent slopes	2,570	1.1
CrB	Crider silt loam, 2 to 6 percent slopes	12,390	5.1
CrC2	Crider silt loam, 6 to 12 percent slopes, eroded	970	0.4
DkF	DeKalb-Frondorf-Rock outcrop complex, 20 to 45 percent slopes	4,950	2.1
Du	Dunning silt loam, occasionally flooded	930	0.4
ElA	Elk silt loam, 0 to 2 percent slopes, rarely flooded	330	0.1
ElB	Elk silt loam, 2 to 6 percent slopes, rarely flooded	800	0.3
ElC	Elk silt loam, 6 to 12 percent slopes, rarely flooded	130	0.1
EpB	Epley silt loam, 2 to 6 percent slopes	300	0.1
FdC	Fredonia silt loam, very rocky, 2 to 12 percent slopes	4,580	1.9
FnC2	Frondorf silt loam, 6 to 12 percent slopes, eroded	5,210	2.2
FnC3	Frondorf silt loam, 6 to 12 percent slopes, severely eroded	1,590	0.7
FwD	Frondorf-Weikert complex, 12 to 20 percent slopes	8,320	3.4
FwF	Frondorf-Weikert complex, 20 to 45 percent slopes	16,020	6.6
HbB	Hammack-Baxter complex, 2 to 6 percent slopes	1,290	0.5
HbC2	Hammack-Baxter complex, 6 to 12 percent slopes, eroded	4,830	2.0
HbC3	Hammack-Baxter complex, 6 to 12 percent slopes, severely eroded	450	0.2
Jo	Johnsburg silt loam	2,050	0.9
La	Lawrence silt loam, occasionally flooded	3,800	1.6
Ln	Lindside silt loam, occasionally flooded	4,730	2.0
Me	Melvin silt loam, occasionally flooded	810	0.3
Ne	Newark silt loam, occasionally flooded	5,280	2.2
NhA	Nicholson silt loam, 0 to 2 percent slopes	1,510	0.6
NhB	Nicholson silt loam, 2 to 6 percent slopes	11,950	5.0
NhC2	Nicholson silt loam, 6 to 12 percent slopes, eroded	1,060	0.4
No	Nolin silt loam, occasionally flooded	9,530	3.9
PmA	Pembroke silt loam, 0 to 2 percent slopes	1,100	0.5
PmB	Pembroke silt loam, 2 to 6 percent slopes	42,640	17.7
PmC2	Pembroke silt loam, 6 to 12 percent slopes, eroded	6,240	2.6
ReC2	Riney loam, 6 to 12 percent slopes, eroded	590	0.2
ReD2	Riney loam, 12 to 20 percent slopes, eroded	140	0.1
RmE3	Riney gravelly loam, 12 to 30 percent slopes, severely eroded	290	0.1
Ro	Robertsville silt loam, occasionally flooded	3,940	1.6
SaA	Sadler silt loam, 0 to 2 percent slopes	1,050	0.4
SaB	Sadler silt loam, 2 to 6 percent slopes	20,220	8.4
Sk	Skidmore gravelly loam, occasionally flooded	490	0.2
VeC2	Vertrees silty clay loam, 6 to 12 percent slopes, eroded	7,100	2.9
WeB	Wellston silt loam, 2 to 6 percent slopes	500	0.2
WeC2	Wellston silt loam, 6 to 12 percent slopes, eroded	4,610	1.9
WeD	Wellston silt loam, 12 to 20 percent slopes	710	0.3
WlC3	Wellston silty clay loam, 6 to 12 percent slopes, severely eroded	3,260	1.4
WlD3	Wellston silty clay loam, 12 to 20 percent slopes, severely eroded	1,090	0.5
ZaB	Zanesville silt loam, 2 to 6 percent slopes	8,060	3.3
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded	3,380	1.4
ZnC3	Zanesville silty clay loam, 6 to 12 percent slopes, severely eroded	1,360	0.6
	Water	96	*
	Total	241,376	100.0

* Less than 0.1 percent.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Land capability	Corn	Soybeans	Wheat	Tobacco	Grass-legume hay	Pasture
		Bu	Bu	Bu	Lbs	Ton	AUM*
BaD------------- Baxter	IVe	70	25	30	1,600	3.5	7.0
CaB------------- Caneyville	IIe	90	30	---	2,500	4.5	8.5
CaC------------- Caneyville	IIIe	75	25	---	2,200	4.0	7.5
CnD3------------ Caneyville	VIIe	---	---	---	---	---	5.5
CoD*:							
Caneyville-----	VIe	---	---	---	---	---	---
Rock outcrop---	VIIIs	---	---	---	---	---	---
CrA------------- Crider	I	135	50	50	3,500	5.5	11.0
CrB------------- Crider	IIe	135	50	50	3,500	5.5	11.0
CrC2------------ Crider	IIIe	105	35	40	2,900	5.0	10.0
DkF*:							
DeKalb- Frondorf------	VIIe	---	---	---	---	---	---
Rock outcrop---	VIIIs	---	---	---	---	---	---
Du-------------- Dunning	IIIw	130	45	---	---	4.0	8.0
ElA------------- Elk	I	130	50	50	3,200	4.5	9.0
ElB------------- Elk	IIe	125	50	50	3,200	4.5	9.0
ElC------------- Elk	IIIe	110	40	45	2,900	4.0	8.0
EpB------------- Epley	IIe	110	35	40	2,400	4.0	7.5
FdC------------- Fredonia	VIs	80	30	35	2,300	3.5	6.5
FnC2------------ Frondorf	IIIe	80	25	30	---	3.0	6.0
FnC3------------ Frondorf	IVe	75	20	25	---	2.5	5.0
FwD------------- Frondorf- Weikert	VIe	---	---	---	---	2.5	5.0

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Wheat	Tobacco	Grass-legume hay	Pasture
		Bu	Bu	Bu	Lbs	Ton	AUM*
FwF----------- Frondorf-Weikert	VIIe	---	---	---	---	---	---
HbB----------- Hammack-Baxter	IIe	110	40	45	2,800	4.5	9.0
HbC2---------- Hammack-Baxter	IIIe	85	30	40	2,200	4.0	8.5
HbC3---------- Hammack-Baxter	IVe	80	25	35	1,900	3.5	7.5
Jo------------ Johnsburg	IIIw	80	35	---	1,700	3.0	5.5
La------------ Lawrence	IIIw	80	35	---	1,700	3.0	5.5
Ln------------ Lindside	IIw	130	45	40	2,800	4.5	8.5
Me------------ Melvin	IIIw	80	35	---	---	3.5	7.0
Ne------------ Newark	IIw	120	45	---	2,500	4.5	8.5
NhA----------- Nicholson	IIw	125	40	45	2,500	3.5	6.5
NhB----------- Nicholson	IIe	130	40	45	3,000	3.5	6.5
NhC2---------- Nicholson	IIIe	100	30	35	2,500	3.5	6.0
No------------ Nolin	IIw	135	50	50	3,300	4.5	9.0
PmA----------- Pembroke	I	140	50	50	3,200	5.0	10.0
PmB----------- Pembroke	IIe	140	50	50	3,200	5.0	10.0
PmC2---------- Pembroke	IIIe	110	40	40	2,700	4.5	8.5
ReC2---------- Riney	IIIe	80	30	35	2,250	3.0	6.0
ReD2---------- Riney	IVe	75	25	35	---	2.5	5.0
RmE3---------- Riney	VIe	---	---	---	---	---	3.5
Ro------------ Robertsville	IVw	70	30	---	---	3.0	5.5

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Soybeans	Wheat	Tobacco	Grass-legume hay	Pasture
		Bu	Bu	Bu	Lbs	Ton	AUM*
SaA------------- Sadler	IIw	100	35	40	2,350	3.5	7.0
SaB------------- Sadler	IIe	105	35	40	2,550	3.5	7.0
Sk-------------- Skidmore	IIs	70	30	30	---	3.0	5.5
VeC2------------ Vertrees	IIIe	80	30	35	2,200	3.0	6.0
WeB------------- Wellston	IIe	115	40	40	3,000	4.0	7.5
WeC2------------ Wellston	IIIe	90	30	30	2,250	3.5	7.5
WeD------------- Wellston	IVe	95	---	---	---	3.5	7.0
WlC3------------ Wellston	IVe	80	---	---	---	3.5	7.0
WlD3------------ Wellston	VIe	---	---	---	---	3.0	6.0
ZaB------------- Zanesville	IIe	115	40	40	2,700	3.5	7.0
ZaC2------------ Zanesville	IIIe	75	30	30	2,300	3.5	6.5
ZnC3------------ Zanesville	IVe	60	---	25	2,000	3.0	5.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[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	4,000	---	---	---
II	121,370	98,780	22,100	490
III	45,930	38,340	7,590	---
IV	12,100	8,160	3,940	---
V	---	---	---	---
VI	27,030	22,450	---	4,580
VII	24,070	24,070	---	---
VIII	6,780	---	---	6,780

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
BaD----------------- Baxter	2c	Moderate	Moderate	Slight	Moderate	Black oak----------- White oak----------- Southern red oak---- Yellow-poplar-------	82 74 67 89	Yellow-poplar, eastern white pine, shortleaf pine, white oak, black oak, loblolly pine, chestnut oak, Virginia pine.
CaB, CaC----------- Caneyville	3c	Slight	Moderate	Slight	Moderate	Black oak----------- White oak----------- Scarlet oak--------- Sugar maple--------- Shagbark hickory---- Eastern redcedar----	69 62 59 --- --- 45	Virginia pine, black oak, white oak, eastern white pine, white ash, loblolly pine.
CnD3--------------- Caneyville	4c	Moderate	Moderate	Moderate	Slight	White oak----------- Eastern redcedar---- White ash----------- Sugar maple--------- Chinkapin oak------- Scarlet oak---------	53 34 --- --- --- ---	Black oak, Virginia pine, white oak, loblolly pine.
CoD*:								
Caneyville-------- (north aspect)	3c	Moderate	Severe	Slight	Moderate	Black oak----------- Scarlet oak--------- Sugar maple--------- White ash----------- Yellow-poplar------- Black walnut--------	69 59 --- --- 90 ---	White oak, black oak, yellow-poplar, white ash, eastern white pine, loblolly pine, Virginia pine.
Caneyville-------- (south aspect)	4c	Moderate	Severe	Moderate	Slight	Scarlet oak--------- White oak----------- Sugar maple--------- Eastern redcedar---- Black walnut-------- White ash-----------	--- 53 --- 34 --- ---	Black oak, white oak, Virginia pine, loblolly pine.
Rock outcrop.								
CrA, CrB, CrC2----- Crider	1o	Slight	Slight	Slight	Severe	Black oak----------- Northern red oak---- Yellow-poplar------- Virginia pine------- Black walnut--------	87 88 97 74 ---	Black oak, northern red oak, eastern white pine, yellow-poplar, black walnut, loblolly pine, white ash, Virginia pine, white oak.
DkF*:								
DeKalb------------ (north aspect)	2f	Severe	Severe	Slight	Slight	White oak----------- Scarlet oak--------- Black oak----------- Chestnut oak-------- Yellow-poplar-------	76 --- 76 82 93	Eastern white pine, Virginia pine, white oak, shortleaf pine, loblolly pine, black oak, yellow-poplar, chestnut oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
DkF*:								
Frondorf (north aspect)	2r	Moderate	Moderate	Slight	Moderate	Black oak Virginia pine Yellow-poplar White oak American elm	78 70 --- 74 ---	Black oak, white oak, shortleaf pine, eastern white pine, loblolly pine, Virginia pine, northern red oak.
DeKalb (south aspect)	3f	Severe	Severe	Moderate	Moderate	White oak Scarlet oak Black oak Chestnut oak	55 --- 62 55	Eastern white pine, Virginia pine, chestnut oak, shortleaf pine, loblolly pine, white oak, black oak.
Frondorf (south aspect)	3r	Moderate	Moderate	Moderate	Moderate	Black oak White oak	70 68	Shortleaf pine, black oak, loblolly pine, white oak, Virginia pine.
Rock outcrop.								
Du Dunning	1w	Slight	Severe	Severe	Severe	Pin oak Sweetgum Eastern cottonwood American sycamore Swamp white oak	95 95 100 --- ---	Pin oak, American sycamore, baldcypress, swamp white oak, loblolly pine.
ElA, ElB, ElC Elk	2o	Slight	Slight	Slight	Moderate	Yellow-poplar Northern red oak Pin oak Red maple American sycamore Black walnut	90 80 --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, loblolly pine, white oak, black oak, white ash, shortleaf pine, Virginia pine.
EpB Epley	3o	Slight	Slight	Slight	Moderate	White oak Sweetgum Scarlet oak Black oak	--- 80 70 ---	Loblolly pine, Virginia pine, sweetgum, white ash, eastern white pine, American sycamore, white oak, black oak.
FdC Fredonia	3x	Slight	Moderate	Slight	Moderate	Northern red oak Eastern redcedar	70 50	Virginia pine, black oak, white oak.
FnC2, FnC3 Frondorf	2o	Slight	Slight	Slight	Moderate	Black oak White oak Virginia pine Yellow-poplar American elm	78 74 70 --- ---	Black oak, shortleaf pine, eastern white pine, loblolly pine, white oak, northern red oak, Virginia pine.
FwD*:								
Frondorf (north aspect)	2r	Moderate	Moderate	Slight	Moderate	Black oak White oak Virginia pine Yellow-poplar American elm	78 74 70 --- ---	Black oak, shortleaf pine, eastern white pine, loblolly pine, Virginia pine, northern red oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Trees to plant
FwD*:								
Weikert----------- (north aspect)	4d	Moderate	Moderate	Moderate	Slight	White oak-----------	73	Eastern white pine, black oak, shortleaf pine, chestnut oak, Virginia pine, white oak.
						Virginia pine-------	56	
						Scarlet oak---------	73	
						Chestnut oak--------	73	
						Black oak-----------	75	
Frondorf---------- (south aspect)	3r	Moderate	Moderate	Moderate	Moderate	Black oak-----------	70	Shortleaf pine, black oak, loblolly pine, white oak, Virginia pine.
						White oak-----------	68	
Weikert----------- (south aspect)	5d	Moderate	Moderate	Moderate	Slight	White oak-----------	59	Virginia pine, black oak, shortleaf pine, white oak, chestnut oak.
						Virginia pine-------	52	
						Scarlet oak---------	64	
						Chestnut oak--------	63	
						Black oak-----------	60	
FwF*:								
Frondorf---------- (north aspect)	2r	Severe	Severe	Slight	Moderate	Black oak-----------	78	Black oak, shortleaf pine, eastern white pine, loblolly pine, Virginia pine, white oak.
						White oak-----------	74	
						Virginia pine-------	70	
						Yellow-poplar-------	---	
						American elm--------	---	
Weikert----------- (north aspect)	4d	Severe	Severe	Moderate	Slight	White oak-----------	72	Eastern white pine, shortleaf pine, black oak, Virginia pine, chestnut oak, white oak.
						Virginia pine-------	56	
						Scarlet oak---------	73	
						Chestnut oak--------	73	
						Black oak-----------	75	
Frondorf---------- (south aspect)	3r	Severe	Severe	Moderate	Moderate	Black oak-----------	70	Shortleaf pine, black oak, loblolly pine, white oak, Virginia pine.
						White oak-----------	68	
Weikert----------- (south aspect)	5d	Severe	Severe	Moderate	Slight	White oak-----------	59	Virginia pine, black oak, shortleaf pine, white oak, chestnut oak.
						Virginia pine-------	52	
						Scarlet oak---------	64	
						Chestnut oak--------	63	
						Black oak-----------	60	
HbB*, HbC2*:								
Hammack-----------	2o	Slight	Slight	Slight	Moderate	Southern red oak----	82	Yellow-poplar, black oak, shortleaf pine, Virginia pine, white oak, eastern white pine.
						Black oak-----------	82	
						Yellow-poplar-------	88	
						Sugar maple---------	---	
						Post oak------------	---	
						Hickory-------------	---	
Baxter------------	2o	Slight	Slight	Slight	Moderate	Black oak-----------	82	Yellow-poplar, eastern white pine, shortleaf pine, black oak, white oak, chestnut oak, loblolly pine, Virginia pine.
						White oak-----------	74	
						Southern red oak----	67	
						Yellow-poplar-------	89	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
HbC3*:								
Hammack	3o	Slight	Slight	Slight	Moderate	Southern red oak Black oak Yellow-poplar Sugar maple Hickory	80 80 88 --- ---	Yellow-poplar, black oak, shortleaf pine, Virginia pine, eastern white pine.
Baxter	3c	Slight	Slight	Slight	Moderate	Black oak White oak Southern red oak Yellow-poplar	70 65 --- ---	Eastern white pine, loblolly pine, white oak, shortleaf pine, black oak, chestnut oak.
Jo Johnsburg	2w	Slight	Moderate	Moderate	Moderate	Black oak Southern red oak Pin oak Red maple Sweetgum White oak Shagbark hickory	77 85 85 --- --- --- ---	Eastern white pine, black oak, baldcypress, white ash, red maple, pin oak, American sycamore.
La Lawrence	2w	Slight	Moderate	Slight	Moderate	Yellow-poplar Sweetgum White oak	86 87 74	Yellow-poplar, white ash, loblolly pine, American sycamore, black oak, white oak, sweetgum.
Ln Lindside	1o	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Black walnut White ash White oak Red maple	86 95 --- 85 85 ---	Eastern white pine, yellow-poplar, black walnut, black oak, shortleaf pine, white ash, white oak, Virginia pine.
Me Melvin	1w	Slight	Severe	Moderate	Severe	Pin oak Cottonwood Sweetgum Cherrybark oak	101 100 --- ---	Pin oak, American sycamore, sweetgum, loblolly pine, baldcypress, willow oak.
Ne Newark	1w	Slight	Moderate	Slight	Severe	Pin oak Eastern cottonwood Sweetgum Cherrybark oak	99 94 88 ---	Eastern cottonwood, pin oak, sweetgum, loblolly pine, American sycamore, eastern white pine, cherrybark oak.
NhA, NhB, NhC2 Nicholson	2o	Slight	Slight	Slight	Moderate	Southern red oak Black oak White oak Yellow-poplar	73 76 72 100	Black oak, yellow-poplar, white oak, northern red oak, white ash, eastern white pine, shortleaf pine.
No Nolin	1o	Slight	Slight	Slight	Severe	Sweetgum Yellow-poplar Cherrybark oak American sycamore Red maple	92 107 --- --- ---	Sweetgum, yellow-poplar, eastern white pine, eastern cottonwood, white ash, cherrybark oak, black walnut.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Potential productivity: Common trees	Site index	Trees to plant
PmA, PmB, PmC2----- Pembroke	1o	Slight	Slight	Slight	Severe	Northern red oak---- Yellow-poplar------- Sugar maple--------- Black walnut-------- White ash-----------	95 89 --- --- ---	Yellow-poplar, black walnut, white ash, eastern white pine, shortleaf pine, black oak, loblolly pine, white oak, northern red oak.
ReC2, ReD2--------- Riney	2o	Slight	Slight	Slight	Moderate	White oak----------- Yellow-poplar------- Black oak----------- Scarlet oak--------- Chestnut oak--------	80 90 80 --- ---	Yellow-poplar, black oak, shortleaf pine, chestnut oak, loblolly pine, eastern white pine, northern red oak, white ash, Virginia pine, white oak.
RmE3--------------- Riney	3r	Slight	Moderate	Moderate	Moderate	White oak----------- Virginia pine------- Black oak----------- Scarlet oak--------- Chestnut oak--------	70 70 70 --- ---	Shortleaf pine, black oak, loblolly pine, white oak, Virginia pine, chestnut oak, eastern white pine.
Ro----------------- Robertsville	1w	Slight	Moderate	Moderate	Severe	Pin oak------------- Yellow-poplar------- Sweetgum------------ Black oak----------- Red maple-----------	89 100 95 86 ---	Sweetgum, loblolly pine, American sycamore, baldcypress, pin oak, willow oak.
SaA, SaB----------- Sadler	3o	Slight	Slight	Slight	Moderate	Black oak----------- Yellow-poplar------- Virginia pine-------	70 --- 70	Eastern white pine, shortleaf pine, black oak, white oak, Virginia pine, loblolly pine.
Sk----------------- Skidmore	1f	Slight	Slight	Slight	Severe	Northern red oak---- Yellow-poplar-------	85 108	Yellow-poplar, white ash, black oak, eastern white pine, white oak, American sycamore, loblolly pine, Virginia pine.
VeC2--------------- 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.
WeB, WeC2---------- Wellston	2o	Slight	Slight	Slight	Moderate	Black oak----------- Yellow-poplar------- Virginia pine------- White oak----------- Sugar maple--------- Scarlet oak--------- Chestnut oak-------- American beech------	81 90 67 75 --- 80 --- ---	Eastern white pine, black walnut, yellow-poplar, white oak, black oak, northern red oak, chestnut oak, shortleaf pine, loblolly pine, white ash, Virginia pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Plant competi-tion	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
WeD:								
Wellston (north aspect)	2r	Moderate	Moderate	Slight	Moderate	Black oak	81	Eastern white pine, black walnut, yellow-poplar, white oak, black oak, northern red oak, chestnut oak, white ash, shortleaf pine, loblolly pine, Virginia pine.
						Yellow-poplar	90	
						Virginia pine	67	
						White oak	75	
						Sugar maple	---	
						Scarlet oak	80	
						Chestnut oak	78	
						American beech	---	
Wellston (south aspect)	3r	Moderate	Moderate	Moderate	Moderate	Black oak	70	Eastern white pine, white oak, black oak, chestnut oak, loblolly pine, Virginia pine, shortleaf pine.
						Virginia pine	60	
						White oak	70	
						Scarlet oak	---	
						Hickory	---	
WlC3 Wellston	3o	Slight	Slight	Slight	Moderate	Black oak	73	Eastern white pine, black oak, white oak, chestnut oak, loblolly pine, Virginia pine, shortleaf pine, white ash.
						Virginia pine	60	
						White oak	70	
						Scarlet oak	---	
WlD3:								
Wellston (north aspect)	3r	Moderate	Moderate	Slight	Moderate	Black oak	71	Eastern white pine, black oak, white oak, chestnut oak, loblolly pine, Virginia pine, shortleaf pine.
						Virginia pine	60	
						White oak	70	
						Scarlet oak	---	
						Hickory	---	
Wellston (south aspect)	4r	Moderate	Moderate	Moderate	Slight	Black oak	60	White oak, black oak, chestnut oak, loblolly pine, Virginia pine, shortleaf pine.
						Virginia pine	60	
						White oak	55	
						Scarlet oak	60	
ZaB, ZaC2 Zanesville	3o	Slight	Slight	Slight	Moderate	White oak	62	Virginia pine, eastern white pine, shortleaf pine, black oak, white oak, loblolly pine.
						Virginia pine	66	
						Black oak	72	
						Black locust	---	
						Black cherry	---	
ZnC3 Zanesville	4d	Slight	Slight	Moderate	Slight	Black oak	60	Virginia pine, loblolly pine, shortleaf pine, white oak, black oak.
						Virginia pine	60	
						White oak	60	

* 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
BaD: Baxter	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
CaB: Caneyville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight	Moderate: depth to rock.
CaC: Caneyville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
CnD3: Caneyville	Severe: too clayey, slope.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.	Severe: too clayey.
CoD*:					
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Rock outcrop.					
CrA: Crider	Slight	Slight	Slight	Slight	Slight.
CrB: Crider	Slight	Slight	Moderate: slope.	Slight	Slight.
CrC2: Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
DkF*:					
DeKalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope, small stones.
Frondorf	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
Du: Dunning	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
ElA: Elk	Severe: flooding.	Slight	Slight	Slight	Slight.
ElB: Elk	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
ElC: Elk	Severe: flooding.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
EpB-------------------- Epley	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
FdC-------------------- Fredonia	Moderate: percs slowly.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: depth to rock.
FnC2, FnC3------------ Frondorf	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
FwD*:					
Frondorf-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Weikert--------------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Moderate: slope.	Severe: slope, depth to rock, small stones.
FwF*:					
Frondorf-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Weikert--------------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, depth to rock, small stones.
HbB*:					
Hammack--------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Baxter---------------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Moderate: small stones.
HbC2*, HbC3*:					
Hammack--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Baxter---------------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight----------	Moderate: small stones, slope.
Jo-------------------- Johnsburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
La-------------------- Lawrence	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Ln-------------------- Lindside	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.	Moderate: flooding.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Me-------------------- Melvin	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Ne-------------------- Newark	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
NhA------------------- Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
NhB------------------- Nicholson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
NhC2------------------ Nicholson	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
No-------------------- Nolin	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
PmA------------------- Pembroke	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
PmB------------------- Pembroke	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
PmC2------------------ Pembroke	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
ReC2------------------ Riney	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
ReD2, RmE3------------ Riney	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ro-------------------- Robertsville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SaA------------------- Sadler	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
SaB------------------- Sadler	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Sk-------------------- Skidmore	Severe: flooding.	Severe: small stones.	Severe: small stones.	Slight----------	Severe: small stones.
VeC2------------------ Vertrees	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

See footnote at end of table.

TABLE 8--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WeB----------------- Wellston	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
WeC2---------------- Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
WeD----------------- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
WlC3---------------- Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
WlD3---------------- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
ZaB----------------- Zanesville	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
ZaC2, ZnC3---------- Zanesville	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	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
BaD----------------- Baxter	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CaB----------------- Caneyville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CaC, CnD3---------- Caneyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CoD*:										
Caneyville---------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Rock outcrop.										
CrA----------------- Crider	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrB----------------- Crider	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrC2---------------- Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
DkF*:										
DeKalb-------------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Frondorf----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
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.
ElC----------------- Elk	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
EpB----------------- Epley	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
FdC----------------- Fredonia	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FnC2, FnC3--------- Frondorf	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FwD*:										
Frondorf----------	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
FwD*:										
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
FwF*:										
Frondorf	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
HbB*:										
Hammack	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Baxter	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HbC2*, HbC3*:										
Hammack	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Baxter	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Jo Johnsburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
La Lawrence	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ln Lindside	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Me Melvin	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ne Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
NhA Nicholson	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
NhB Nicholson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
NhC2 Nicholson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
No Nolin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PmA Pembroke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PmB Pembroke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PmC2 Pembroke	Fair	Good	Good	Good	Good	Very 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
ReC2-----------------Riney	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ReD2, RmE3----------Riney	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ro------------------Robertsville	Poor	Fair	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
SaA-----------------Sadler	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
SaB-----------------Sadler	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sk------------------Skidmore	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
VeC2----------------Vertrees	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WeB-----------------Wellston	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WeC2----------------Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WeD-----------------Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WlC3----------------Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WlD3----------------Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ZaB-----------------Zanesville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ZaC2, ZnC3----------Zanesville	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 but does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BaD: Baxter	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CaB: Caneyville	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: depth to rock.
CaC: Caneyville	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, depth to rock.
CnD3: Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: too clayey.
CoD*:						
Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Rock outcrop.						
CrA: Crider	Moderate: too clayey.	Slight	Slight	Slight	Severe: low strength.	Slight.
CrB: Crider	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
CrC2: Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
DkF*:						
DeKalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Frondorf	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
Du: Dunning	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
ElA, ElB: Elk	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.

See footnote at end of table.

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
ElC-------------- Elk	Moderate: slope.	Severe: flooding.	Severe: flooding.	Severe: flooding, slope.	Severe: low strength.	Moderate: slope.
EpB-------------- Epley	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.
FdC-------------- Fredonia	Severe: depth to rock.	Moderate: shrink-swell, depth to rock, slope.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: depth to rock.
FnC2, FnC3------- Frondorf	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope, depth to rock.
FwD*, FwF*:						
Frondorf--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert---------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones, depth to rock.
HbB*:						
Hammack---------	Moderate: too clayey.	Slight---------	Slight---------	Moderate: slope.	Severe: low strength.	Slight.
Baxter----------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: small stones.
HbC2*, HbC3*:						
Hammack---------	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Baxter----------	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: small stones, slope.
Jo--------------- Johnsburg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
La--------------- Lawrence	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding.	Moderate: wetness, flooding.
Ln--------------- Lindside	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Me--------------- Melvin	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.

See footnote at end of table.

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
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.
NhB--------------- Nicholson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Moderate: wetness.
NhC2-------------- Nicholson	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: wetness, slope.
No----------------- Nolin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
PmA--------------- Pembroke	Moderate: too clayey.	Slight---------	Moderate: shrink-swell.	Slight---------	Severe: low strength.	Slight.
PmB--------------- Pembroke	Moderate: too clayey.	Slight---------	Moderate: shrink-swell.	Moderate: slope.	Severe: low strength.	Slight.
PmC2-------------- Pembroke	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
ReC2-------------- Riney	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
ReD2, RmE3-------- Riney	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ro----------------- Robertsville	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness.
SaA--------------- Sadler	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
SaB--------------- Sadler	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Moderate: wetness.
Sk----------------- Skidmore	Moderate: depth to rock, wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: small stones.
VeC2-------------- Vertrees	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
WeB--------------- Wellston	Moderate: depth to rock.	Slight---------	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.	Slight.

See footnote at end of table.

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
WeC2------------- Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: low strength.	Moderate: slope.
WeD-------------- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WlC3------------- Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: low strength.	Moderate: slope.
WlD3------------- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
ZaB-------------- Zanesville	Moderate: depth to rock, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
ZaC2, ZnC3------- Zanesville	Moderate: slope, wetness, depth to rock.	Moderate: slope, wetness.	Severe: wetness.	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," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BaD: Baxter	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, slope, hard to pack.
CaB: Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: too clayey, hard to pack, thin layer.
CaC, CnD3: Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: too clayey, hard to pack, thin layer.
CoD*:					
Caneyville	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: too clayey, hard to pack, thin layer.
Rock outcrop.					
CrA: Crider	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
CrB: Crider	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
CrC2: Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
DkF*:					
DeKalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, thin layer.
Frondorf	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: small stones, slope, thin layer.
Rock outcrop.					
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.

See footnote at end of table.

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
ElA, ElB------------ Elk	Moderate: flooding.	Moderate: seepage.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
ElC---------------- Elk	Moderate: slope, flooding.	Severe: slope.	Moderate: slope, flooding, too clayey.	Moderate: slope, flooding.	Fair: slope, too clayey.
EpB---------------- Epley	Severe: wetness, percs slowly.	Slight-----------	Severe: depth to rock, wetness, too clayey.	Moderate: depth to rock, wetness.	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: too clayey, hard to pack, thin layer.
FnC2, FnC3---------- Frondorf	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: small stones, thin layer.
FwD*, FwF*:					
Frondorf-----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: small stones, slope, thin layer.
Weikert------------	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, seepage, thin layer.
HbB*:					
Hammack------------	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Baxter-------------	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
HbC2*, HbC3*:					
Hammack------------	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Baxter-------------	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Jo----------------- Johnsburg	Severe: wetness, percs slowly.	Slight-----------	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness.
La----------------- Lawrence	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

See footnote at end of table.

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
Ln----------------- Lindside	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness, too clayey.
Me----------------- Melvin	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ne----------------- Newark	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
NhA, NhB----------- Nicholson	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
NhC2--------------- Nicholson	Severe: wetness percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
No----------------- Nolin	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Good.
PmA---------------- Pembroke	Slight-----------	Moderate: seepage.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
PmB---------------- Pembroke	Slight-----------	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
PmC2--------------- Pembroke	Moderate: slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
ReC2--------------- Riney	Moderate: depth to rock, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Fair: too clayey, slope, depth to rock.
ReD2, RmE3--------- Riney	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
Ro----------------- Robertsville	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
SaA, SaB----------- Sadler	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness.	Moderate: depth to rock, wetness.	Fair: too clayey, depth to rock.
Sk----------------- Skidmore	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, depth to rock, seepage.	Severe: flooding, seepage, wetness.	Poor: seepage small stones.
VeC2--------------- Vertrees	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.

See footnote at end of table.

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
WeB: Wellston	Moderate: depth to rock.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: depth to rock.
WeC2: Wellston	Moderate: depth to rock, slope.	Severe: slope.	Severe: depth to rock.	Moderate: slope, depth to rock.	Fair: slope, depth to rock.
WeD: Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
WlC3: Wellston	Moderate: depth to rock, slope.	Severe: slope.	Severe: depth to rock.	Moderate: slope, depth to rock.	Fair: depth to rock, too clayey, slope.
WlD3: Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
ZaB: Zanesville	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: depth to rock.
ZaC2, ZnC3: Zanesville	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: depth to rock, slope, wetness.	Fair: slope, depth to rock.

* 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," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
BaD------------------ Baxter	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
CaB, CaC, CnD3-------- Caneyville	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CoD*:				
Caneyville-----------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Rock outcrop.				
CrA, CrB-------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
CrC2------------------ Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
DkF*:				
DeKalb---------------	Poor: slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Frondorf-------------	Poor: slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
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.
ElC------------------- Elk	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
EpB------------------- Epley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FdC------------------- Fredonia	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FnC2, FnC3------------ Frondorf	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
FwD*:				
Frondorf	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Weikert	Poor: thin layer.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, depth to rock.
FwF*:				
Frondorf	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Weikert	Poor: slope, thin layer.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, depth to rock.
HbB* HbC2*, HbC3*:				
Hammack	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Baxter	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Jo Johnsburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
La Lawrence	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ln Lindside	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Me Melvin	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
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.
NhC2 Nicholson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
No Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
PmA, PmB: Pembroke	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PmC2: Pembroke	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
ReC2: Riney	Fair: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
ReD2, RmE3: Riney	Fair: slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ro: Robertsville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
SaA, SaB: Sadler	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Sk: Skidmore	Fair: depth to rock.	Improbable: small stones.	Probable	Poor: small stones, area reclaim.
VeC2: Vertrees	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
WeB: Wellston	Fair: depth to rock, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
WeC2: Wellston	Fair: depth to rock, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WeD: Wellston	Fair: thin layer, slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
WlC3: Wellston	Fair: depth to rock, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WlD3: Wellston	Fair: low strength, thin layer, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
ZaB, ZaC2, ZnC3: Zanesville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

* 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 but does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
BaD: Baxter	Moderate: seepage.	Slight	Deep to water	Slope	Slope.
CaB: Caneyville	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Depth to rock	Depth to rock.
CaC: Caneyville	Moderate: depth to rock.	Severe: hard to pack.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
CnD3: Caneyville	Moderate: depth to rock.	Severe: hard to pack, thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
CoD*:					
Caneyville	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.					
CrA, CrB: Crider	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
CrC2: Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Slope.
DkF*:					
DeKalb	Severe: seepage, large stones, slope.	Severe: piping, large stones.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, droughty.
Frondorf	Severe: slope.	Severe: piping.	Deep to water	Slope, large stones, depth to rock, slope.	Large stones, slope, depth to rock.
Rock outcrop.					
Du: Dunning	Slight	Severe: wetness.	Percs slowly, flooding.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
ElA, ElB: Elk	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Favorable.
ElC: Elk	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Slope.
EpB: Epley	Moderate: seepage, depth to rock, slope.	Moderate: hard to pack.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.

See footnote at end of table.

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
FdC----------------- Fredonia	Moderate: depth to rock, slope.	Severe: hard to pack.	Deep to water----	Depth to rock, erodes easily.	Erodes easily, depth to rock.
FnC2, FnC3-------- Frondorf	Moderate: depth to rock, seepage.	Severe: piping.	Deep to water----	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
FwD*, FwF*:					
Frondorf---------	Severe: slope.	Severe: piping.	Deep to water----	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Weikert----------	Severe: depth to rock, slope, seepage.	Severe: seepage, thin layer.	Deep to water----	Slope, depth to rock.	Slope, depth to rock.
HbB*:					
Hammack----------	Moderate: seepage.	Slight------------	Deep to water----	Favorable--------	Favorable.
Baxter-----------	Moderate: seepage.	Slight------------	Deep to water----	Favorable--------	Favorable.
HbC2*, HbC3*:					
Hammack----------	Moderate: slope, seepage.	Severe: piping.	Deep to water----	Slope------------	Slope.
Baxter-----------	Moderate: seepage.	Slight------------	Deep to water----	Slope------------	Slope.
Jo----------------- Johnsburg	Moderate: seepage.	Severe: piping.	Percs slowly-----	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
La----------------- Lawrence	Slight------------	Severe: piping.	Percs slowly, flooding.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Ln----------------- Lindside	Moderate: seepage.	Severe: piping.	Flooding---------	Wetness, erodes easily.	Erodes easily.
Me----------------- Melvin	Moderate: seepage.	Severe: piping, wetness.	Flooding---------	Erodes easily, wetness.	Wetness, 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, rooting depth.	Erodes easily, rooting depth, percs slowly.
NhB---------------- Nicholson	Slight------------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
NhC2-------------- Nicholson	Slight-----------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Slope, erodes easily, wetness, rooting depth.	Slope, erodes easily, rooting depth.
No---------------- Nolin	Severe: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
PmA--------------- Pembroke	Moderate: seepage.	Moderate: hard to pack.	Deep to water----	Favorable--------	Favorable.
PmB--------------- Pembroke	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water----	Favorable--------	Favorable.
PmC2-------------- Pembroke	Moderate: slope, seepage.	Moderate: hard to pack.	Deep to water----	Slope------------	Slope.
ReC2, ReD2-------- Riney	Severe: seepage.	Severe: piping.	Deep to water----	Slope------------	Slope.
RmE3-------------- Riney	Severe: seepage, slope.	Severe: piping.	Deep to water----	Slope------------	Slope.
Ro---------------- Robertsville	Slight-----------	Severe: piping, wetness.	Percs slowly, flooding.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
SaA--------------- Sadler	Moderate: seepage, depth to rock.	Severe: piping.	Percs slowly-----	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
SaB--------------- Sadler	Moderate: seepage, depth to rock, slope.	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
Sk---------------- Skidmore	Severe: seepage.	Severe: seepage.	Deep to water----	Large stones-----	Large stones, droughty.
VeC2-------------- Vertrees	Slight-----------	Severe: hard to pack.	Deep to water----	Slope------------	Slope.
WeB, WeC2--------- Wellston	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
WeD--------------- Wellston	Severe: slope.	Severe: piping.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
WlC3-------------- Wellston	Moderate: seepage, depth to rock.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
WlD3-------------- Wellston	Severe: slope.	Severe: piping.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
ZaB--------------- Zanesville	Moderate: depth to rock, seepage.	Severe: piping.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
ZaC2, ZnC3-------- Zanesville	Moderate: depth to rock, seepage.	Severe: piping.	Percs slowly, slope.	Slope, erodes easily, wetness, rooting depth.	Slope, erodes easily, rooting depth.

* 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 may have Unified classifications and USDA textures in addition to these 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	
BaD-------------- Baxter	0-9	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
	9-16	Cherty silty clay loam, cherty silt loam.	CL, SM-SC, GC, CL-ML	A-4, A-6	0-10	60-90	55-80	55-80	45-80	25-40	5-20
	16-47	Cherty silty clay, cherty clay.	CH, CL, GC, SC	A-7	0-10	55-90	45-85	45-85	45-80	40-60	20-35
	47-65	Cherty clay, cherty silty clay.	GC, CH, SC, CL	A-7	0-20	50-90	40-75	35-70	35-70	45-70	20-40
CaB, CaC--------- Caneyville	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	6-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	30-33	Clay, silty clay	CH	A-7	0-15	90-100	85-100	75-100	65-100	50-75	30-45
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CnD3------------- Caneyville	0-5	Silty clay-------	CH, CL	A-7	0-3	90-100	85-100	80-100	75-100	45-65	25-45
	5-28	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CoD*:											
Caneyville------	0-6	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	6-30	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	30-33	Clay, silty clay	CH	A-7	0-15	90-100	85-100	75-100	65-100	50-75	30-45
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
CrA, CrB--------- Crider	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	9-36	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	36-80	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
CrC2------------- Crider	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	5-32	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	32-76	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DkF*:											
DeKalb----------	0-8	Channery sandy loam.	SM, GM, ML, CL-ML	A-2, A-4, A-1	0-30	50-90	45-80	40-75	20-55	<32	NP-10
	8-29	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-80	40-75	20-55	<32	NP-9
	29-33	Channery sandy loam, flaggy sandy loam.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	<32	NP-9
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Frondorf--------	0-16	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	70-100	70-100	60-100	<35	NP-10
	16-33	Channery silty clay loam, channery silt loam, channery loam.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	10-40	45-90	40-85	40-80	30-75	<45	NP-25
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Du--------------- Dunning	0-14	Silt loam--------	ML, CL, CL-ML	A-6, A-4	0	100	95-100	90-100	85-100	25-35	3-11
	14-65	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-5	95-100	95-100	90-100	85-100	45-70	20-40
ElA, ElB, ElC---- Elk	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	70-95	25-35	3-10
	9-43	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
	43-60	Silty clay loam, silt loam, silty clay.	ML, CL, CL-ML, SM-SC	A-4, A-6	0	75-100	50-100	45-100	40-95	25-40	5-15
EpB-------------- Epley	0-6	Silt loam--------	ML	A-4	0	95-100	95-100	90-100	80-100	25-35	3-10
	6-22	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	22-43	Silty clay, clay	CH, CL	A-7, A-6	0	95-100	95-100	90-100	85-100	35-65	20-35
	43-60	Clay, silty clay, channery clay.	CH, CL, GC, SC	A-7	0-20	60-100	40-100	40-100	40-95	40-70	20-40
FdC-------------- Fredonia	0-6	Silt loam--------	CL	A-6, A-4	0-5	95-100	90-100	85-100	75-100	25-40	8-20
	6-33	Silty clay, clay	CH, MH, CL	A-7	0-5	95-100	90-100	85-100	80-100	45-75	20-45
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FnC2------------- Frondorf	0-12	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	70-100	70-100	60-100	<35	NP-10
	12-30	Channery silty clay loam, channery silt loam, channery loam.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	10-40	45-90	40-85	40-80	30-75	<45	NP-25
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
FnC3------------- Frondorf	0-10	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	70-100	70-100	60-100	<35	NP-10
	10-25	Channery silty clay loam, channery silt loam, channery loam.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	10-40	45-90	40-85	40-80	30-75	<45	NP-25
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
FwD*, FwF*: Frondorf--------	0-16	Silt loam--------	ML, CL, CL-ML	A-4	0-5	90-100	70-100	70-100	60-100	<35	NP-10
	16-33	Channery silty clay loam, channery silt loam, channery loam.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	10-40	45-90	40-85	40-80	30-75	<45	NP-25
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert---------	0-5	Channery silt loam.	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	5-19	Channery loam, very channery silt loam.	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HbB*: Hammack---------	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	70-100	60-100	25-35	4-10
	8-28	Silt loam, silty clay loam.	ML, CL	A-6, A-7, A-4	0	100	95-100	90-100	85-95	30-45	6-20
	28-42	Very cherty silt loam, very cherty silty clay loam.	GM, GC, ML, CL	A-6, A-7, A-4, A-2	15-35	25-80	22-75	22-75	18-70	30-45	6-20
	42-84	Very cherty silty clay, very cherty clay, cherty clay.	GC, CL, CH, ML	A-7, A-2	10-40	40-75	30-75	30-70	25-70	42-70	14-40
Baxter----------	0-9	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
	9-16	Cherty silty clay loam, cherty silt loam.	CL, SM-SC, GC, CL-ML	A-4, A-6	0-10	60-90	55-80	55-80	45-80	25-40	5-20
	16-47	Cherty silty clay, cherty clay.	CH, CL, GC, SC	A-7	0-10	55-90	45-85	45-85	45-80	40-60	20-35
	47-65	Cherty clay, cherty silty clay.	GC, CH, SC, CL	A-7	0-20	50-90	40-75	35-70	35-70	45-70	20-40

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HbC2*:											
Hammack----------	0-5	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	70-100	60-100	25-35	4-10
	5-25	Silt loam, silty clay loam.	ML, CL	A-6, A-7, A-4	0	100	95-100	90-100	85-95	30-45	6-20
	25-39	Very cherty silt loam, very cherty silty clay loam.	GM, GC, ML, CL	A-6, A-7, A-4, A-2	15-35	25-80	22-75	22-75	18-70	30-45	6-20
	39-81	Very cherty silty clay, very cherty clay, cherty clay.	GC, CL, CH, ML	A-7, A-2	10-40	40-75	30-75	30-70	25-70	42-70	14-40
Baxter-----------	0-5	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
	5-12	Cherty silty clay loam, cherty silt loam.	CL, SM-SC, GC, CL-ML	A-4, A-6	0-10	60-90	55-80	55-80	45-80	25-40	5-20
	12-43	Cherty silty clay, cherty clay.	CH, CL, GC, SC	A-7	0-10	55-90	45-85	45-85	45-80	40-60	20-35
	43-64	Cherty clay, cherty silty clay.	GC, CH, SC, CL	A-7	0-20	50-90	40-75	35-70	35-70	45-70	20-40
HbC3*:											
Hammack----------	0-7	Silty clay loam	CL	A-6, A-7	0	100	95-100	70-100	60-100	34-45	15-20
	7-22	Silt loam, silty clay loam.	ML, CL	A-6, A-7, A-4	0	100	95-100	90-100	85-95	30-45	6-20
	22-36	Very cherty silt loam, very cherty silty clay loam.	GM, GC, ML, CL	A-6, A-7, A-4, A-2	15-35	25-80	22-75	22-75	18-70	30-45	6-20
	36-80	Very cherty silty clay, very cherty clay, cherty clay.	GC, CL, CH, ML	A-7, A-2	10-40	40-75	30-75	30-70	25-70	42-70	14-40
Baxter-----------	0-7	Cherty silty clay loam.	CL	A-6	0-10	60-85	55-75	55-75	55-75	30-40	15-22
	7-38	Cherty silty clay, cherty clay.	CH, CL, GC, SC	A-7	0-10	55-90	45-85	45-85	45-80	40-60	20-35
	38-64	Cherty clay, cherty silty clay.	GC, CH, SC, CL	A-7	0-20	50-90	40-75	35-70	35-70	45-70	20-40
Jo--------------- Johnsburg	0-8	Silt loam--------	CL, ML	A-4, A-6	0	100	100	90-100	70-95	30-40	5-15
	8-22	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	22-46	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-95	85-95	60-85	20-35	5-15
	46-60	Loam, sandy loam, silt loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	5-10	90-95	85-90	60-90	35-70	20-30	5-15

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
La---------------- Lawrence	0-8	Silt loam--------	ML	A-4	0	100	95-100	90-100	80-100	25-35	2-10
	8-25	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	25-52	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	90-100	80-100	25-42	5-20
	52-60	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
Ln---------------- Lindside	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-90	20-35	2-15
	8-60	Silty clay loam, silt loam, very fine sandy loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	70-95	25-40	4-18
Me---------------- Melvin	0-8	Silt loam--------	CL, CL-ML, ML	A-4	0	95-100	90-100	80-100	80-95	25-35	4-10
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	80-100	80-95	25-40	5-20
Ne---------------- Newark	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
	8-36	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-100	<42	NP-20
	36-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	22-42	3-20
NhA, NhB---------- Nicholson	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	8-24	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
	24-42	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	42-60	Silty clay, clay, channery clay.	CH, CL	A-6, A-7	0-10	80-100	70-100	60-100	55-95	34-70	16-40
NhC2-------------- Nicholson	0-6	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	85-100	80-95	25-35	5-10
	6-20	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
	20-38	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-4, A-7	0	95-100	90-100	80-100	75-95	25-45	5-20
	38-60	Silty clay, clay, channery clay.	CH, CL	A-6, A-7	0-10	80-100	70-100	60-100	55-95	34-70	16-40
No---------------- Nolin	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	8-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
PmA PmB----------- Pembroke	0-9	Silt loam--------	ML, CL	A-4, A-6	0	95-100	90-100	80-100	70-100	25-40	3-16
	9-33	Silty clay loam	CL	A-6, A-7	0	95-100	90-100	85-100	75-100	30-45	11-25
	33-63	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	90-100	75-100	75-100	65-100	35-65	18-45

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PmC2------------- Pembroke	0-6	Silt loam--------	ML, CL	A-4, A-6	0	95-100	90-100	80-100	70-100	25-40	3-16
	6-30	Silty clay loam	CL	A-6, A-7	0	95-100	90-100	85-100	75-100	30-45	11-25
	30-63	Silty clay loam, silty clay.	CH, CL	A-7, A-6	0	90-100	75-100	75-100	65-100	35-65	18-45
ReC2, ReD2------- Riney	0-7	Loam-------------	CL, ML, SM, SC	A-4	0	90-100	85-100	65-80	35-75	<30	NP-10
	7-60	Clay loam, sandy clay loam.	ML, CL, SC, SM-SC	A-6, A-2, A-4	0	80-100	70-100	70-85	25-75	20-35	2-15
RmE3------------- Riney	0-2	Gravelly loam----	GM, GM-GC, ML, SC	A-4	0	90-100	60-100	40-80	35-75	<30	NP-10
	2-48	Gravelly sandy loam, clay loam, sandy clay loam.	ML, GM, SC, GM-GC	A-6, A-2, A-4	0	80-100	70-100	40-80	15-55	<35	NP-15
	48-52	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ro--------------- Robertsville	0-8	Silt loam--------	ML	A-4	0	95-100	95-100	85-100	75-100	25-35	2-10
	8-20	Silt loam, silty clay loam.	ML, CL	A-4, A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	3-20
	20-43	Silty clay loam, silt loam.	ML, CL	A-4, A-6, A-7	0	95-100	95-100	90-100	80-100	25-45	3-20
	43-70	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
SaA, SaB--------- Sadler	0-8	Silt loam--------	ML, CL-ML	A-4	0	95-100	95-100	85-100	80-100	25-35	4-10
	8-26	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-20
	26-44	Silt loam, silty clay loam, loam.	ML, CL, CL-ML	A-4, A-6	0-10	85-100	80-100	70-100	55-95	20-40	2-20
	44-60	Loam, silty clay loam, gravelly loam.	ML, CL, SM, GM	A-4, A-6, A-7	0-20	65-100	60-95	50-95	35-90	20-50	2-30
Sk--------------- Skidmore	0-8	Gravelly loam----	GM, SM, ML	A-4, A-2	0-10	60-90	40-85	40-75	25-60	<30	NP-7
	8-47	Gravelly fine sandy loam, gravelly clay loam, very channery sandy loam, very gravelly loam.	GM, GP-GM	A-2, A-1	5-30	35-60	20-50	15-40	10-35	<30	NP-5
	47	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
VeC2------------- Vertrees	0-5	Silty clay loam	CL	A-6	0	85-100	80-100	70-95	65-95	30-40	12-20
	5-75	Clay, silty clay	CH, CL	A-7	0	85-100	75-100	70-95	65-95	41-70	25-45
WeB-------------- Wellston	0-7	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	7-48	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	75-100	60-95	60-90	25-40	5-20
	48-55	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WeC2------------- Wellston	0-4	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	4-44	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	44-51	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	51	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WeD-------------- Wellston	0-7	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	7-48	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	75-100	60-95	60-90	25-40	5-20
	48-55	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WlC3, WlD3------- Wellston	0-8	Silty clay loam	CL	A-6	0-5	95-100	90-100	85-100	75-95	30-40	10-20
	8-22	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	22-47	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	47	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ZaB-------------- Zanesville	0-6	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	6-26	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	26-43	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	43-60	Sandy clay loam, clay loam, silt loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-B	0-10	65-100	50-100	40-100	20-85	20-40	2-20
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ZaC2------------- Zanesville	0-6	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	6-23	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	23-40	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	40-57	Sandy clay loam, clay loam, silt loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-B	0-10	65-100	50-100	40-100	20-85	20-40	2-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ZnC3------------- Zanesville	0-6	Silty clay loam	CL	A-6	0	95-100	95-100	90-100	80-100	30-40	10-20
	6-20	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	20-37	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	37-54	Sandy clay loam, clay loam, silt loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-B	0-10	65-100	50-100	40-100	20-85	20-40	2-20
	54	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

* 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 K	Erosion factors T	Organic matter
	In	Pct	G/cc	In/hr	In/in	pH				Pct
BaD----------------	0-9	12-27	1.20-1.40	0.6-2.0	0.14-0.18	4.5-7.3	Low-----------	0.28	5	2-4
Baxter	9-16	18-40	1.30-1.55	0.6-2.0	0.14-0.18	4.5-6.5	Moderate-----	0.24		
	16-47	40-60	1.30-1.55	0.6-2.0	0.10-0.14	4.5-5.5	Moderate-----	0.24		
	47-65	40-60	1.35-1.65	0.6-2.0	0.08-0.13	4.5-5.5	Moderate-----	0.24		
CaB, CaC----------	0-6	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low-----------	0.43	3	2-4
Caneyville	6-30	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate-----	0.28		
	30-33	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate-----	0.28		
	33	---	---	---	---	---	-------------	----		
CnD3--------------	0-5	40-60	1.30-1.55	0.2-0.6	0.13-0.18	4.5-7.3	Moderate-----	0.32	2	<2
Caneyville	5-28	36-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate-----	0.28		
	28	---	---	---	---	---	-------------	----		
CoD*:										
Caneyville-------	0-6	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low-----------	0.43	3	2-4
	6-30	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate-----	0.28		
	30-33	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate-----	0.28		
	33	---	---	---	---	---	-------------	----		
Rock outcrop.										
CrA, CrB----------	0-9	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low-----------	0.32	5	2-4
Crider	9-36	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low-----------	0.28		
	36-80	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.28		
CrC2--------------	0-5	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low-----------	0.32	5	2-4
Crider	5-32	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low-----------	0.28		
	32-76	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.28		
DkF*:										
DeKalb-----------	0-8	10-20	1.20-1.50	6.0-20	0.08-0.12	4.5-5.5	Low-----------	0.17	3	2-4
	8-29	7-18	1.20-1.50	6.0-20	0.06-0.12	4.5-5.5	Low-----------	0.17		
	29-33	5-15	1.20-1.50	>6.0	0.05-0.10	4.5-5.5	Low-----------	0.17		
	33	---	---	---	---	---	-------------	----		
Frondorf---------	0-16	18-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-6.5	Low-----------	0.37	3	1-3
	16-33	18-35	1.20-1.45	0.6-2.0	0.08-0.16	4.5-5.5	Low-----------	0.17		
	33	---	---	---	---	---	-------------	----		
Rock outcrop.										
Du----------------	0-14	12-27	1.20-1.40	0.6-2.0	0.19-0.23	5.6-7.8	Low-----------	0.37	5	2-10
Dunning	14-65	35-60	1.40-1.65	0.06-0.2	0.14-0.18	5.6-7.8	Moderate-----	0.28		
ElA, ElB, ElC-----	0-9	10-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low-----------	0.37	5	.5-3
Elk	9-43	18-34	1.20-1.50	0.6-2.0	0.18-0.22	5.1-6.0	Low-----------	0.28		
	43-60	15-40	1.20-1.50	0.6-2.0	0.14-0.20	5.1-6.0	Low-----------	0.28		
EpB---------------	0-6	12-27	1.20-1.40	0.6-2.0	0.19-0.23	4.5-7.3	Low-----------	0.43	3	.5-4
Epley	6-22	18-35	1.20-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.37		
	22-43	40-60	1.30-1.55	0.06-0.2	0.13-0.18	4.5-6.0	Moderate-----	0.28		
	43-60	40-60	1.35-1.60	0.06-0.2	0.08-0.18	5.6-7.3	Moderate-----	0.28		

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/cc	In/hr	In/in	pH				Pct
FdC-------------- Fredonia	0-6	18-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	3	3-5
	6-33	40-60	1.30-1.60	0.06-0.6	0.13-0.18	5.1-7.3	Moderate-----	0.28		
	33	---	---	---	---	---	-------------	----		
FnC2------------- Frondorf	0-12	18-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.37	3	1-3
	12-30	18-35	1.20-1.45	0.6-2.0	0.08-0.16	4.5-5.5	Low----------	0.17		
	30	---	---	---	---	---	-------------	----		
FnC3------------- Frondorf	0-10	18-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.37	3	1-3
	10-25	18-35	1.20-1.45	0.6-2.0	0.08-0.16	4.5-5.5	Low----------	0.17		
	25	---	---	---	---	---	-------------	----		
FwD*, FwF*:										
Frondorf--------	0-16	18-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.37	3	1-3
	16-33	18-35	1.20-1.45	0.6-2.0	0.08-0.16	4.5-5.5	Low----------	0.17		
	33	---	---	---	---	---	-------------	----		
Weikert---------	0-5	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-5.5	Low----------	0.28	2	1-3
	5-19	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-5.5	Low----------	0.28		
	19	---	---	---	---	---	-------------	----		
HbB*:										
Hammack---------	0-8	12-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low----------	0.37	4	2-4
	8-28	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-6.0	Low----------	0.32		
	28-42	18-35	1.20-1.45	0.6-2.0	0.05-0.10	4.5-6.0	Low----------	0.24		
	42-84	40-60	1.35-1.65	0.6-2.0	0.08-0.12	4.5-6.0	Moderate-----	0.24		
Baxter----------	0-9	12-27	1.20-1.40	0.6-2.0	0.14-0.18	4.5-7.3	Low----------	0.28	5	2-4
	9-16	18-40	1.30-1.55	0.6-2.0	0.14-0.18	4.5-6.5	Moderate-----	0.24		
	16-47	40-60	1.30-1.55	0.6-2.0	0.10-0.14	4.5-5.5	Moderate-----	0.24		
	47-65	40-60	1.35-1.65	0.6-2.0	0.08-0.13	4.5-5.5	Moderate-----	0.24		
HbC2*:										
Hammack---------	0-5	12-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low----------	0.37	4	2-4
	5-25	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-6.0	Low----------	0.32		
	25-39	18-35	1.20-1.45	0.6-2.0	0.05-0.10	4.5-6.0	Low----------	0.24		
	39-81	40-60	1.35-1.65	0.6-2.0	0.08-0.12	4.5-6.0	Moderate-----	0.24		
Baxter----------	0-5	12-27	1.20-1.40	0.6-2.0	0.14-0.18	4.5-6.5	Low----------	0.28	5	2-4
	5-12	18-40	1.30-1.55	0.6-2.0	0.14-0.18	4.5-6.5	Moderate-----	0.24		
	12-43	40-60	1.30-1.55	0.6-2.0	0.10-0.14	4.5-5.5	Moderate-----	0.24		
	43-64	40-60	1.35-1.65	0.6-2.0	0.08-0.13	4.5-5.5	Moderate-----	0.24		
HbC3*:										
Hammack---------	0-7	27-35	1.20-1.40	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.32	4	.5-2
	7-22	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-6.0	Low----------	0.32		
	22-36	18-35	1.20-1.45	0.6-2.0	0.05-0.10	4.5-6.0	Low----------	0.24		
	36-80	40-60	1.35-1.65	0.6-2.0	0.08-0.12	4.5-6.0	Moderate-----	0.24		
Baxter----------	0-7	27-35	1.20-1.45	0.6-2.0	0.12-0.18	4.5-7.3	Low----------	0.24	5	.5-3
	7-38	40-60	1.30-1.55	0.6-2.0	0.10-0.14	4.5-5.5	Moderate-----	0.24		
	38-64	40-60	1.35-1.65	0.6-2.0	0.08-0.13	4.5-5.5	Moderate-----	0.24		
Jo--------------- Johnsburg	0-8	12-20	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.43	3	1-2
	8-22	24-32	1.40-1.55	0.6-2.0	0.18-0.22	4.5-5.5	Moderate-----	0.43		
	22-46	22-30	1.60-1.80	0.06-0.6	0.06-0.08	4.5-5.5	Low----------	0.43		
	46-60	14-20	1.40-1.55	0.6-2.0	0.12-0.14	4.5-5.0	Low----------	0.43		

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/cc	In/hr	In/in	pH				Pct
La---------------- Lawrence	0-8	12-27	1.20-1.40	0.6-2.0	0.19-0.23	4.5-7.3	Low-----------	0.43	3	1-4
	8-25	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Low-----------	0.37		
	25-52	18-35	1.50-1.70	0.06-0.2	0.08-0.12	4.5-5.5	Low-----------	0.43		
	52-60	18-60	1.50-1.70	0.06-0.6	0.08-0.12	4.5-7.3	Low-----------	0.37		
Ln---------------- Lindside	0-8	15-27	1.20-1.40	0.6-2.0	0.20-0.26	5.6-7.3	Low-----------	0.32	5	2-4
	8-60	18-35	1.20-1.40	0.2-2.0	0.17-0.22	5.6-7.3	Low-----------	0.37		
Me---------------- Melvin	0-8	12-17	1.20-1.60	0.6-2.0	0.18-0.23	5.6-7.8	Low-----------	0.43	5	.5-3
	8-60	12-35	1.30-1.60	0.6-2.0	0.18-0.23	5.6-7.8	Low-----------	0.43		
Ne---------------- Newark	0-8	7-27	1.20-1.40	0.6-2.0	0.15-0.23	5.6-7.8	Low-----------	0.43	5	1-4
	8-36	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.6-7.8	Low-----------	0.43		
	36-60	12-40	1.30-1.50	0.6-2.0	0.15-0.22	5.6-7.8	Low-----------	0.43		
NhA, NhB---------- Nicholson	0-8	12-30	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low-----------	0.43	3	2-4
	8-24	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Low-----------	0.43		
	24-42	18-35	1.50-1.70	0.06-0.2	0.07-0.12	4.5-6.5	Low-----------	0.43		
	42-60	35-60	1.40-1.60	0.06-0.6	0.07-0.12	5.1-6.5	Moderate-----	0.37		
NhC2-------------- Nicholson	0-6	12-27	1.20-1.40	0.6-2.0	0.19-0.23	4.5-6.5	Low-----------	0.43	3	2-4
	6-20	18-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Low-----------	0.43		
	20-38	18-35	1.50-1.70	0.06-0.2	0.07-0.12	4.5-6.5	Low-----------	0.43		
	38-60	35-60	1.40-1.60	0.06-0.6	0.07-0.12	5.1-6.5	Moderate-----	0.37		
No---------------- Nolin	0-8	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43	5	2-4
	8-60	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43		
PmA, PmB---------- Pembroke	0-9	15-27	1.30-1.50	0.6-2.0	0.18-0.23	4.5-7.3	Low-----------	0.32	5	2-4
	9-33	27-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.28		
	33-63	36-60	1.35-1.65	0.6-2.0	0.13-0.19	4.5-6.0	Moderate-----	0.28		
PmC2-------------- Pembroke	0-6	15-27	1.30-1.50	0.6-2.0	0.18-0.23	4.5-7.3	Low-----------	0.32	5	2-4
	6-30	27-35	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.28		
	30-63	36-60	1.35-1.65	0.6-2.0	0.13-0.19	4.5-6.0	Moderate-----	0.28		
ReC2, ReD2-------- Riney	0-7	10-25	1.20-1.40	2.0-6.0	0.12-0.18	4.5-6.5	Low-----------	0.28	4	.5-3
	7-60	20-35	1.20-1.50	2.0-6.0	0.13-0.17	4.5-5.5	Low-----------	0.28		
RmE3-------------- Riney	0-2	10-25	1.20-1.40	2.0-6.0	0.12-0.18	4.5-6.5	Low-----------	0.28	4	.5-3
	2-48	20-35	1.20-1.50	2.0-6.0	0.13-0.17	4.5-5.5	Low-----------	0.28		
	48-52	---	---	---	---	---	--------------	---		
Ro---------------- Robertsville	0-8	12-27	1.30-1.50	0.6-2.0	0.19-0.23	4.5-7.3	Low-----------	0.43	3	1-3
	8-20	15-35	1.40-1.60	0.6-2.0	0.18-0.22	4.5-5.5	Low-----------	0.43		
	20-43	18-35	1.50-1.65	0.06-0.2	0.08-0.12	4.5-5.5	Low-----------	0.43		
	43-70	15-45	1.40-1.60	0.2-0.6	0.08-0.12	4.5-7.3	Low-----------	0.37		
SaA, SaB---------- Sadler	0-8	12-27	1.30-1.50	0.6-2.0	0.19-0.23	4.5-7.3	Low-----------	0.43	3	.5-3
	8-26	18-35	1.35-1.55	0.6-2.0	0.18-0.22	4.5-5.5	Low-----------	0.43		
	26-44	12-35	1.55-1.75	0.06-0.2	0.07-0.12	4.5-5.5	Low-----------	0.43		
	44-60	12-40	1.50-1.70	0.2-2.0	0.07-0.12	4.5-5.5	Low-----------	0.43		
Sk---------------- Skidmore	0-8	7-18	1.20-1.40	2.0-6.0	0.07-0.13	5.6-7.8	Low-----------	0.17	5	<2
	8-47	7-18	1.30-1.60	2.0-6.0	0.04-0.10	5.6-7.8	Low-----------	0.17		
	47	---	---	---	---	---	--------------	----		
VeC2-------------- Vertrees	0-5	27-40	1.20-1.40	0.6-2.0	0.14-0.22	4.5-7.3	Low-----------	0.32	4	.5-3
	5-75	40-60	1.40-1.65	0.2-0.6	0.14-0.18	4.5-6.0	Moderate-----	0.28		

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/cc	In/hr	In/in	pH				Pct
WeB----------- Wellston	0-7	13-27	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.37	4	1-3
	7-48	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37		
	48-55	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37		
	55	---	---	---	---	---	-------------	----		
WeC2----------- Wellston	0-4	13-27	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.0	Low----------	0.37	4	1-3
	4-44	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37		
	44-51	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37		
	51	---	---	---	---	---	-------------	----		
WeD----------- Wellston	0-7	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	1-3
	7-48	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37		
	48-55	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37		
	55	---	---	---	---	---	-------------	----		
WlC3, WlD3------- Wellston	0-8	27-32	1.35-1.55	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37	3	.5-2
	8-22	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37		
	22-47	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37		
	47	---	---	---	---	---	-------------	----		
ZaB----------- Zanesville	0-6	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.43	3	1-2
	6-26	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37		
	26-43	18-33	1.50-1.75	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.37		
	43-60	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	Low----------	0.28		
	60	---	---	---	---	---	-------------	----		
ZaC2----------- Zanesville	0-6	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.43	3	1-2
	6-23	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37		
	23-40	18-33	1.50-1.75	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.37		
	40-57	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	Low----------	0.28		
	57	---	---	---	---	---	-------------	----		
ZnC3----------- Zanesville	0-6	27-35	1.35-1.40	0.6-2.0	0.18-0.23	4.5-5.5	Low----------	0.37	3	.5-2
	6-20	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37		
	20-37	18-33	1.50-1.75	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.37		
	37-54	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	Low----------	0.28		
	54	---	---	---	---	---	-------------	----		

* 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 "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > 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			
BaD---------------- Baxter	B	None------	---	---	>6.0	---	---	>60	---	High-----	High.
CaB, CaC, CnD3---- Caneyville	C	None------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
CoD*:											
Caneyville--------	C	None------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
Rock outcrop.											
CrA, CrB, CrC2---- Crider	B	None------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
DkF*:											
DeKalb-----------	C	None------	---	---	>6.0	---	---	20-40	Hard	Low------	High.
Frondorf---------	B	None------	---	---	>6.0	---	---	20-40	Soft	Moderate	High.
Rock outcrop.											
Du---------------- Dunning	D	Occasional	Brief-----	Dec-May	0-0.5	Apparent	Dec-May	>60	---	High-----	Moderate.
ElA, ElB, ElC----- Elk	B	Rare------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
EpB--------------- Epley	C	None------	---	---	1.5-2.5	Perched	Dec-Apr	>48	Hard	High-----	Moderate.
FdC--------------- Fredonia	C	None------	---	---	>6.0	---	---	20-40	Hard	High-----	Moderate.
FnC2, FnC3-------- Frondorf	B	None------	---	---	>6.0	---	---	20-40	Soft	Moderate	High.
FwD*, FwF*:											
Frondorf---------	B	None------	---	---	>6.0	---	---	20-40	Soft	Moderate	High.
Weikert----------	D	None------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate.
HbB*, HbC2*, HbC3*:											
Hammack---------	B	None------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Baxter----------	B	None------	---	---	>6.0	---	---	>60	---	High-----	High.
Jo---------------- Johnsburg	D	None------	---	---	1.0-2.0	Perched	Dec-Apr	48-72	Hard	High-----	High.
La---------------- Lawrence	C	Occasional	Very brief	Jan-Apr	1.0-2.0	Perched	Dec-Apr	>60	---	High-----	High.
Ln---------------- Lindside	C	Occasional	Brief-----	Dec-May	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
Me----------------- Melvin	D	Occasional	Brief-----	Dec-May	0-1.0	Apparent	Dec-May	>60	---	High-----	Low.
Ne----------------- Newark	C	Occasional	Brief-----	Jan-Apr	0.5-1.5	Apparent	Dec-May	>60	---	High-----	Low.
NhA, NhB, NhC2---- Nicholson	C	None------	---	---	1.5-2.5	Perched	Jan-Apr	>60	---	High-----	Moderate.
No----------------- Nolin	B	Occasional	Brief to long.	Jan-May	3.0-6.0	Apparent	Jan-Mar	>60	---	Low------	Moderate.
PmA, PmB, PmC2---- Pembroke	B	None------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
ReC2, ReD2, RmE3-- Riney	B	None------	---	---	>6.0	---	---	>48	Soft	Moderate	High.
Ro----------------- Robertsville	D	Occasional	Brief-----	Dec-Apr	0-1.0	Perched	Dec-May	>60	---	High-----	High.
SaA, SaB---------- Sadler	C	None------	---	---	1.5-2.0	Perched	Jan-Apr	>50	Hard	Moderate	High.
Sk----------------- Skidmore	B	Occasional	Very brief	Dec-May	3.0-4.0	Apparent	Dec-Mar	>40	Hard	Low------	Moderate.
VeC2-------------- Vertrees	B	None------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
WeB, WeC2, WeD, WlC3, WlD3------- Wellston	B	None------	---	---	>6.0	---	---	>40	Hard	Moderate	High.
ZaB, ZaC2, ZnC3--- Zanesville	C	None------	---	---	2.0-3.0	Perched	Dec-Apr	>40	Hard	Moderate	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, report number, horizon, and depth (in inches)	Classification		Grain-size distribution											Liquid limit	Plasticity index	Moisture density		Specific gravity
	AASHTO	Unified	Percentage passing sieve--								Percentage smaller than--					Max-dry density	Optimum moisture	
			3 inch	2 inch	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.02 mm	.005 mm	.002 mm					
														Pct		Lb/ft^3	Pct	
Caneyville 1/ silt loam 78KY-219-22																		
Ap - - - - 0-6	A-6(12)	CL	100	100	100	100	100	100	100	94	61	29	19	34	12	107	17	2.66
B22t - - - 16-26	A-7-6(25)	CL	100	100	100	100	100	100	100	100	81	49	39	44	23	101	21	2.71
Frondorf 1/, 2/ silt loam 78KY-219-21																		
A2 - - - - 1-4	A-4(0)	ML	100	100	99	91	83	74	73	64	41	12	10	NP	NP	110	17	2.64
IIB22t - - 16-26	A-4(0)	GM	100	93	69	59	54	44	43	36	24	7	3	NP	NP	113	12	2.69
Hammack 3/ silt loam 78KY-219-26																		
Ap - - - - 0-9	A-4(3)	CL-ML	100	100	100	100	100	100	74	69	65	23	13	28	7	104	17	2.68
B21t - - - 9-25	A-6(13)	CL	100	100	100	100	100	100	97	94	65	30	19	35	13	108	16	2.71
B&A2 - - - 25-35	A-6(4)	CL	100	96	85	79	75	66	62	56	40	24	15	32	12	104	19	2.71
B22T - - - 35-52	A-7-6(7)	ML	100	98	91	88	84	69	65	58	47	34	27	42	14	98	23	2.74
Newark 4/ silt loam 78KY-219-23																		
B22g - - - 14-35	A-4(0)	ML	100	100	100	100	100	100	100	100	65	19	13	NP	NP	107	16	2.67
Pembroke 1/ silt loam 78KY-219-25																		
Ap - - - - 0-9	A-4(9)	CL	100	100	100	100	100	100	100	100	68	26	13	29	9	105	17	2.67
B1, B21t - 9-33	A-6(19)	CL	100	100	100	100	100	100	100	100	71	36	26	39	18	105	19	2.69
B22t - - - 33-53	A-6(17)	CL	100	100	100	100	100	100	98	88	68	36	26	39	19	106	18	2.61
Zanesville 1/ silt loam 78KY-219-24																		
B2t - - - 6-26	A-6(14)	CL	100	100	100	100	100	100	100	100	78	36	26	35	13	105	18	2.69
Bx - - - 26-43	A-6(11)	CL	100	100	100	100	100	100	100	100	61	29	19	31	11	110	16	2.78
IIB3 - - 43-60	A-6(8)	CL	100	100	100	100	100	100	98	84	35	29	19	29	12	113	15	2.67

TABLE 17.--ENGINEERING INDEX TEST DATA--Continued

1/ Location of pedon sample is the same as the pedon as typical for series in "Soil Series and Their Morphology."

2/ Frondorf silt loam. The percent passing sieve sizes 4, 10, 40, and 200 for the A2 horizon and sieve sizes 4 and 10 for the IIB22t horizon are slightly lower than the minimum allowed for the series. The content of coarse fragments in the IIB22t horizon is slightly more than is allowed for the series. For these reasons, this pedon is considered to be a taxadjunct.

3/ Hammack silt loam: 525 feet north of graveled road, 0.8 miles west of Kentucky Highway 104, 4.5 miles south of Trenton. The percent passing the No. 4 sieve in the B22t horizon is slightly higher than is allowed for the series; however, it is within the range of laboratory and sampling error. Therefore, this pedon is not considered to be a taxadjunct.

4/ Newark silt loam: 460 feet north of Squire Groves Road, 0.5 mile northeast of Kentucky Highway 107, 1 mile east of Kirkmansville. This pedon contains 5 percent less clay in the B22g horizon than the minimum allowed for the series. It is also nonplastic in the B22g horizon which is outside the range of the series. This pedon is therefore considered to be a taxadjunct.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
1/ Baxter	Fine, mixed, mesic Typic Paleudalfs
Caneyville	Fine, mixed, mesic Typic Hapludalfs
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
DeKalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Dunning	Fine, mixed, mesic Fluvaquentic Haplaquolls
Elk	Fine-silty, mixed, mesic Ultic Hapludalfs
Epley	Fine-silty, mixed, mesic Glossic Hapludalfs
Fredonia	Fine, mixed, mesic Typic Hapludalfs
1/ Frondorf	Fine-loamy, mixed, mesic Ultic Hapludalfs
Hammack	Fine-silty, mixed, mesic Glossic Paleudalfs
Johnsburg	Fine-silty, mixed, mesic Aquic Fragiudults
Lawrence	Fine-silty, mixed, mesic Aquic Fragiudalfs
Lindside	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Melvin	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nicholson	Fine-silty, mixed, mesic Typic Fragiudalfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Pembroke	Fine-silty, mixed, mesic Mollic Paleudalfs
2/ Riney	Fine-loamy, siliceous, mesic Typic Hapludults
Robertsville	Fine-silty, mixed, mesic Typic Fragiaqualfs
Sadler	Fine-silty, mixed, mesic Glossic Fragiudalfs
Skidmore	Loamy-skeletal, mixed, mesic Dystric Fluventic Eutrochrepts
Vertrees	Fine, mixed, mesic Typic Paleudalfs
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
Zanesville	Fine-silty, mixed, mesic Typic Fragiudalfs

1/ The soil is a taxadjunct to the series. See the soil series description in the text for a description of those characteristics of the soil that are outside the range of the series.

2/ The Riney soil in the map unit Riney gravelly loam, 12 to 30 percent slopes, severely eroded is a taxadjunct to the series. See the Riney soil series description in the text for a description of those characteristics of the soil that are outside the range of the series.

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