USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with Ohio Department of Natural Resources, Division of Soil and Water Conservation; Ohio Agricultural Research and Development Center; and Ohio State University Extension

Soil Survey of Holmes County, Ohio

How to Use This Soil Survey

General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

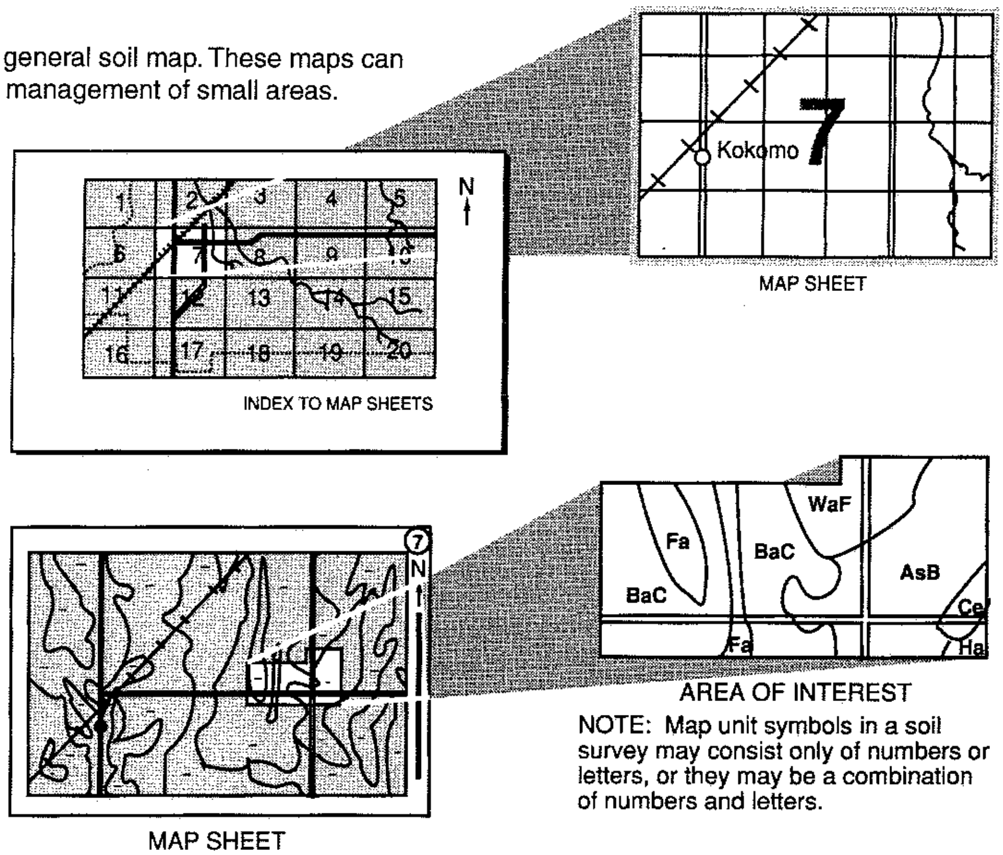
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets,** which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map units symbols that are in that area. Turn to the **Contents,** which lists the map units by symbol and name and shows the page where each map unit is described.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

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 Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1988. Soil names and descriptions were approved in 1989. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1988. This survey was made cooperatively by the Natural Resources Conservation Service and the Ohio Department of Natural Resources, Division of Soil and Water Conservation; the Ohio Agricultural Research and Development Center; and the Ohio State University Extension. The survey is part of the technical assistance furnished to the Holmes Soil and Water 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.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Wheat shocks and contour strips in an area of the Wooster-Canfield association.

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Issued 1998

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Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure 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.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

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 water table near the surface 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 Natural Resources Conservation Service or the Ohio State University Extension.

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Soil Survey of Holmes County, Ohio

By J.E. Seaholm and T.E. Graham, Natural Resources Conservation Service

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
Ohio Department of Natural Resources, Division of Soil and Water Conservation; the Ohio Agricultural Research and Development Center; and the Ohio State University Extension

HOLMES COUNTY is located in northeastern Ohio (fig. 1). The total area is 424 square miles, or 271,104 acres. In 1980, the population was 29,469. Millersburg, the county seat, is the largest town and has a population of 3,247. Other towns and their populations include Killbuck, 937; Holmesville, 436; Glenmont, 270; and Nashville, 211 (*6*).

Holmes County is second in Ohio in number of milk cows, second in hay production, second in oat production, and third in number of cattle and calves (*5*). Erosion is a major hazard in the gently sloping to very steep areas of the county. Poor drainage is the major limitation on more level areas. If adequate artificial drainage is provided, if erosion is controlled by conservation practices, and if the soils are well managed, most of the soils in the county are highly productive. The southern part of the county has rough topography and therefore has fewer farmable areas than the northern part.

Figure 1.—Location of Holmes County in Ohio.

General Nature of the County

This section provides general information about Holmes County. It describes early settlement, industry, transportation, natural resources, physiography and relief, geology, drainage, and climate.

Early Settlement

Before European settlement, the area now called Holmes County was populated by Delaware Indians and smaller groups of Shawnees, Mingoes, Mohicans, Wyandots, and Iroquois. The Indian population was greatest during 1740-1800 (*10*).

The Treaty of Greenville, signed August 3, 1795, established the area north of the Greenville Treaty Line as Indian land. The area south of that line became part of the U.S. Military District. After the Treaty of Fort Industry, signed July 4, 1805, Indians ceded to the United States the area north of the Greenville Treaty Line in what is now Holmes County. This area became part of the Congress Lands (*21*). Gradually, the Indians moved to western Ohio and Indiana.

The first permanent settlers arrived in 1809-10. On February 4, 1810, Hannah Butler was born in her parents' cabin near the Big Spring, just north of Holmesville, on present State Route 83 (*11*).

At about the same time Amish Mennonites from eastern Pennsylvania crossed the Alleghenies and made the first Amish settlement. A young Amish man, Jonas Stutzman, took up two quarter sections of land just south of the present village of Walnut Creek. This Amish settlement has grown into the largest in the United States (*11*).

Holmes County was established in 1824 with territory from Wayne County to the north, Tuscarawas County to the east, and Coshocton County to the south (*11*). Soon thereafter, Millersburg was established as the county seat (*16*). The county was named in honor of Major Andrew Holmes, a young officer killed in the War of 1812 during the unsuccessful attack on Fort Mackinac, August 4, 1814 (*16*).

Farming

Farming is the principal land use in Holmes County. In 1982, about 40 percent of the land was used for cropland and 20 percent for pasture (*27*). Dairy products account for about 44 percent of all cash receipts from farm marketing (*18*). A large percentage of milk produced is used in the processing of cheese. Also, cattle and calves account for about 17 percent; poultry and other livestock, 16 percent; hogs, 12 percent; corn, 5 percent; oats and hay, 2 percent; wheat, 1 percent; soybeans, 1 percent; and other crops, 1 percent of the total cash farm receipts (*18*).

In 1987, 3,144,500 bushels of corn to be used for grain were harvested. Also, 205,400 bushels of wheat, 858,900 bushels of oats for grain, and 149,200 tons of hay were harvested (*5*). The oats are mostly used by local Amish to feed horses.

In 1987, Holmes County had about 1,530 farms averaging 129 acres each (*5*). Many of the smaller farms are in the eastern and southern, predominantly Amish, parts of the county (fig. 2).

Industry

Major industries in Holmes County include sandstone, limestone, coal, dairy and other farm products, lumbering, plastic, rubber, oil and gas, business machines, and finished wood products. Tourism as an industry has increased dramatically in recent years. Tourism provides good income and a market for local vegetables, dairy products, and handicrafts (fig. 3).

Transportation

Transportation in Holmes County includes a network of both local and interstate trucking firms. Local bus lines provide transportation throughout the county. Two railroads pass through the county. A main line of the Consolidated Rail Corporation passes through the northwestern part of the county near Big Prairie, Lakeville, and Loudonville. This line also is used by Amtrack passenger trains. A branch line of the Norfolk Southern Corporation Railroad passes through the southeast part of the county near Baltic. An airport west of Millersburg accommodates private and business planes, including small jets.

Millersburg, the county seat, is located on three major highways: U.S. 62, northeast 34 miles to Canton and southwest 76 miles to Columbus; State Route 39, west 18 miles to Loudonville and east 23 miles to New Philadelphia and Interstate 77; and State Route 83, north 17 miles to Wooster and south 23 miles to Coshocton. A system of state highways and county and township roads provides access to all parts of the county.

Natural Resources

Soil, the most important resource in Holmes County, provides a growing medium for crops and grasses. Other resources include ground water, timber, sandstone, limestone, oil and gas, sand and gravel, coal, and clay.

The county has a supply of ground water, the best area for which is Killbuck Creek Valley (*7*). Water is also found in a sandstone bedrock aquifer that extends throughout the county along the buried valleys of smaller streams. Most areas of the county have sufficient ground water supplies for domestic use.

Timber harvesting and processing is an important industry in Holmes County, particularly in the southwestern part. Oak, hickory, ash, and maple are the most desirable species.

Sandstone has been quarried from many commercial operations in Killbuck and Richland Townships (*30*).

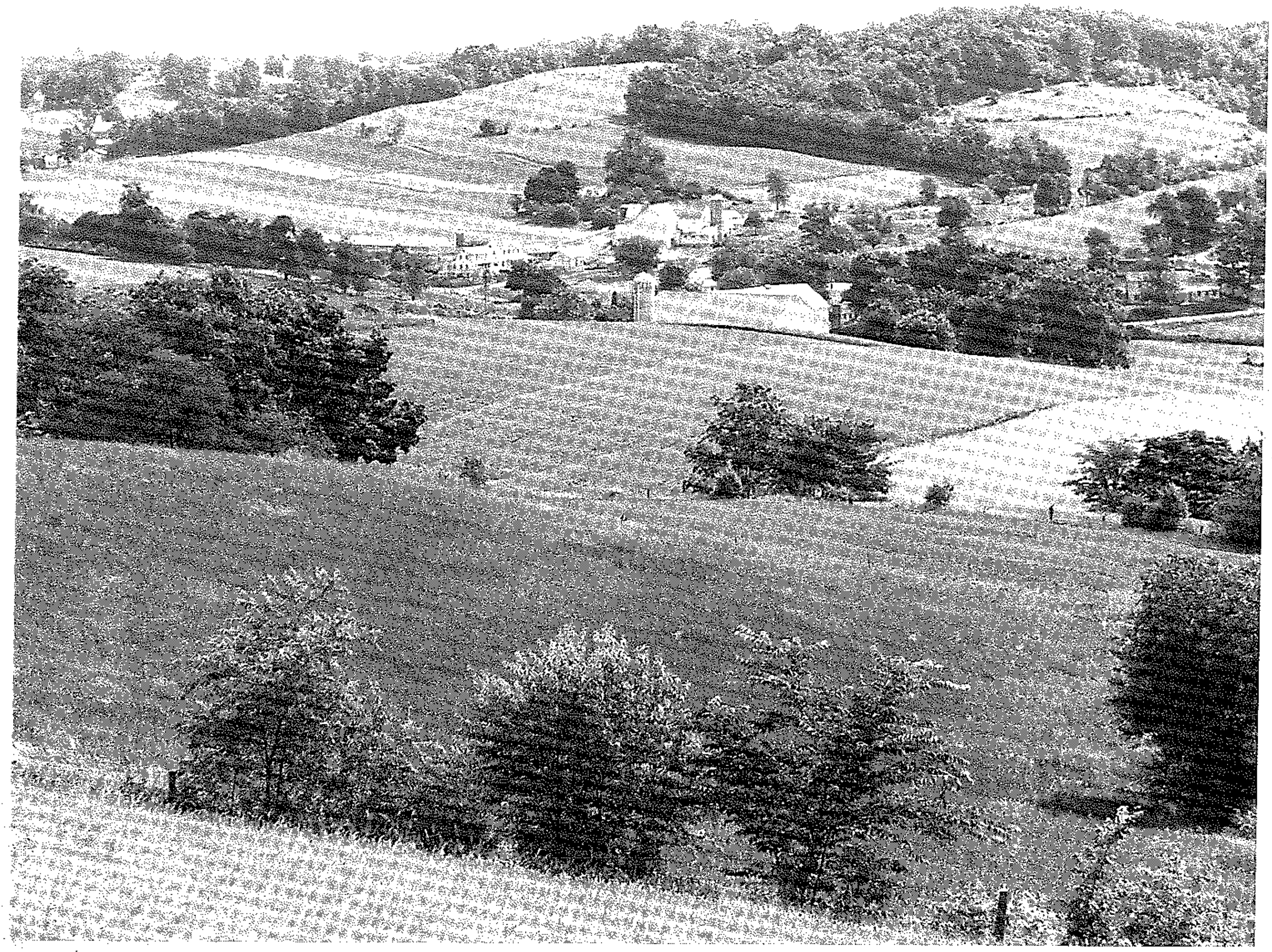

Figure 2.—Small farms on the Wooster-Canfield Association.

Limestone mined locally is an important source of agricultural lime. Limestone has also been used in small amounts for gravel roads and as aggregate in concrete (*30*). Limestone has been quarried in almost every township in the county.

Deposits of sand and gravel are found mainly along the Killbuck Creek Valley and its tributaries and along Lake Fork, Sigafoos Run, and Plum Run. They are found to a lesser extent along small stream valleys and terraces in the glaciated part of the county.

Coal, oil, and gas are also important resources in the county. The most widely distributed and most important coalbed is Lower Kittanning (*30*). All the coal in Holmes County is now surface mined (fig. 4). In the past, some coal was obtained from small underground mines. Commercial production of either gas or oil has been developed in nearly every township in the county.

Brookville clay is another very important mineral resource of Holmes County. It is present in every township except Washington Township and is used for high-grade building brick (*30*).

Physiography and Relief

Holmes County lies in the Appalachian Plateau physiographic province. The northern half of the county is in the Glaciated Plateau section, the southern half in the Unglaciated Plateau section (*30*).

The northern part of the county owes its gently rolling landscape to glacial action. During the Pleistocene, glacial ice smoothed, covered, and filled in the rough bedrock topography (*31*). Most of the upland soils in this part of the county formed from materials, generally glacial till, laid down by glaciers.

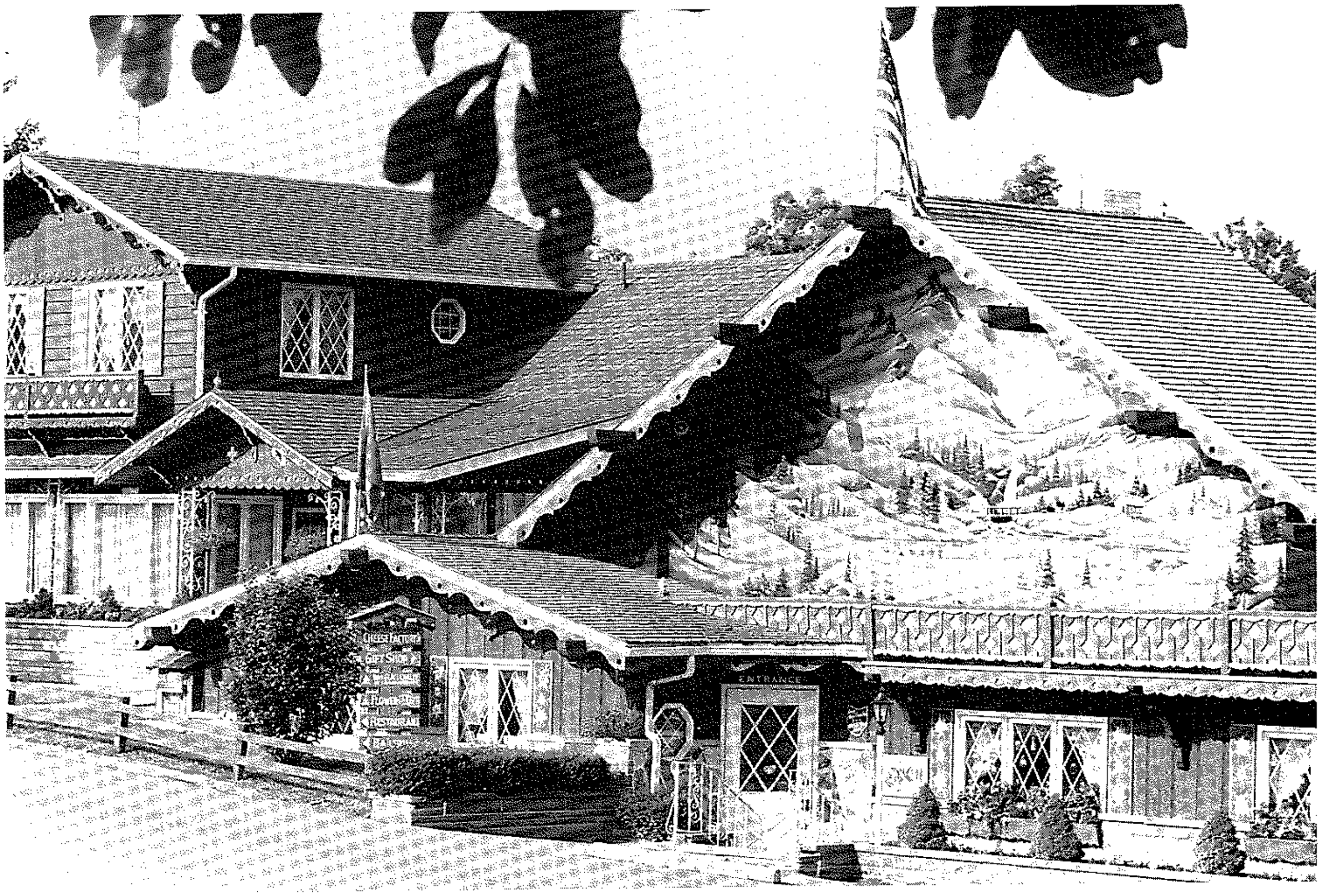

Figure 3.—Tourists are attracted to small retailers that sell cheese and other dairy products of Holmes County.

The unglaciated, southern part of the county retains its rough, bedrock relief. It is characterized by long, steeply inclined slopes and sharp hilltops and ridges. The dominant soils formed either directly from the underlying bedrock or from masses of material that eroded downslope to more stable positions.

An east-west strip across the center of the county forms a transition zone between the rugged unglaciated and the gently rolling glaciated parts of the county. The southern margin of this transition zone is the glacial boundary. In the transition zone, the glacial material is thinner than in areas further north in the county and rock outcrops are common.

The highest elevation in Holmes County, 1,410 feet, is a hilltop 1 mile southeast of Nashville in the northeastern part of Knox Township (*30*). The lowest elevation, 790 feet, is where Killbuck Creek leaves the county. Total relief is about 620 feet. However, local relief is not usually more than 200 to 300 feet; in many places it is less than 200 feet (*30*). The steepest slopes are along the Black Creek Valley and the Mohican River Valley.

The broad valley of Killbuck Creek has a conspicuous topography. Its flat valley bottom is 1/2 mile in width and lies 250 to 400 feet below the upland surfaces (*30*). The valleys of major tributaries of Killbuck Creek likewise have prominent features. In the northwestern part of the county, the deep Mohican River Valley and its tributary, Lake Fork, are major topographic features (*30*). These two valleys are narrower than Killbuck Creek Valley. In the eastern part of the county, the valleys of tributaries of Sugar Creek are conspicuous.

A prominent feature of northern Washington Township is the valley that enters the county at Loudonville and trends east-northeast to Big Prairie, where it passes into Wayne County (*30*). Although this valley is more than 1 mile wide, it does not have a stream, but Lake Fork flows directly across it. This is an ancient valley whose stream was diverted by glaciation.

Geology

Holmes County is underlain by almost horizontal beds of sandstone, siltstone, and shale, and some beds of coal and limestone. The underlying bedrock is derived from sediments laid down during the Mississippian or Pennsylvanian periods. Later, these rocks were elevated above sea level and then were eroded and at least partially leveled. Many of the ridges in the county are at elevations of about 1,240 feet (*30*).

The underlying sedimentary rocks belong to the Allegheny and Pottsville Formations of the Pennsylvanian System and the Logan and Cuyahoga Formations of the Mississippian System. The oldest rocks exposed in Holmes County are of Mississippian age. They make up the surface beds of the lower parts of the Killbuck Creek Valley and its tributary valleys in the central part of the county and the greater part of the valley walls and hillsides in the western part of the county. The Mississippian strata exposed in Holmes County are almost entirely those of the Logan Formation. Some strata of the Cuyahoga Formation are found in the Mohican River Valley (*30*).

Only the Pottsville and Allegheny Formations of the Pennsylvania System are in Holmes County. The Pennsylvanian rocks are the predominant bedrock of the county in every township except Washington, Prairie, and Killbuck. They are the only bedrock at the surface in Paint, Walnut Creek, and Clark Townships (*30*).

Glacial material overlies the bedrock in the northern part of Holmes County. The southern part of the county has no such material, except along some streams where sand and gravel of glacial origin have been carried from the north (*30*).

Figure 4.—Surface mining for coal is important in Holmes County.

The glacial deposits in Holmes County are of Wisconsinan age. The Illinoian glacier likely advanced well into Holmes County. It may have reached a position close to the present glacial boundary. There is no evidence of Illinoian surface drift at the outer margin. The drift in Killbuck Valley south of the glacial boundary is possibly entirely Wisconsinan outwash (*31*).

In a very few places in Holmes County, till with remnants of weathered material at the surface is found below other tills. The till with remnants may be pre-Wisconsinan, probably Illinoian or older (*31*).

Three, possibly four ice sheets entered the northern part of the county. The next-to-last extended the furthest; the southern margin of its deposits is the glacial boundary. The drift in Holmes County represents deposits of the central part of the Killbuck Lobe, and is one of the sublobes of the larger Erie Lobe (*31*). The glacial boundary is, at most places in Holmes County, not marked by a terminal moraine.

The glacial deposits in Holmes County are made up of till and outwash material. Till is an unsorted mixture of clay, silt, sand, pebbles, cobbles, and boulders deposited directly by the ice. Gravel and sand was deposited by streams of meltwater flowing away from the ice or alongside masses of ice in valleys (*31*).

Glacial drift overlies bedrock in varying thickness. In places ledges crop out; in other places mainly in the greater valleys, the drift may be more than 200 feet thick. On the uplands and the upper valley sides, the drift generally ranges in thickness from less than 10 feet to about 20 feet or more (*31*). The thinner drift is relatively smooth. It mantles the underlying bedrock surface. Its relief conforms to the irregularity of the bedrock surface. Thicker drift generally has a more irregular, hummocky surface form.

In Holmes County, as the ice sheet waned, it lost all forward motion. The ice sheet melted down and back. The hilltops appeared first above the ice and the last of the ice to disappear was, in most places, elongated blocks in the major valleys. Meltwater from the ice blocks flowed between the blocks and valley sides. Stratified deposits were laid down. When the ice blocks finally melted in the valleys, they left gravel deposits in terrace-like forms along the valley sides. The former positions of the ice blocks became kettles (*30*).

Valley trains and valley-train remnants exist in several valleys in Holmes County. Most of the valley trains are outside the Wisconsinan boundary, but some originated within the boundary. Many of them are continuations of kame terrace deposits. The valley trains were laid down by meltwater from the ice, but not in association with ice blocks, as were the kame terraces. Post-Wisconsinan stream erosion has dismembered the valley trains into terraces along the valley walls or into terrace remnants (*30*).

The ice-laid deposits of till are spread unevenly over the surface of the glaciated part of Holmes County. A large part of them are fairly smooth at the surface and small to moderate in thickness. Such areas are classified as ground moraines. Areas of more noticeable constructional topography in which the drift is of greater thickness are classified as hummocky moraines (*31*).

A considerable proportion of the glaciated part of Holmes County is an area of ground moraines in the uplands. It is interpenetrated by, or surrounded by, areas of hummocky moraines (*30*).

The oldest Wisconsinan till in Holmes County is Altonian Millbrook Till. This till crops out in many places; it probably forms the bulk of the drift in the county (*31*).

The Millbrook Till is overlain by the Navarre Till or the Haysville Till. Where the overlying tills are very thin, they have been weathered and incorporated into the present surface soil so that the Millbrook Till appears on the surface.

The Navarre Till, the oldest till of Woodfordian age, is the surface material of much of the glaciated part of Holmes County. The Hayesville Till is discontinuous and occurs as irregular small patches or is thin and has been incorporated into the soil and thus is difficult to identify.

The different glacial deposits are the parent materials for soils of widely different characteristics. Not only are the soils formed in till different from those formed in outwash, but those soils formed in Hayesville Till are different from soils developed in Navarre and Millbrook Tills. The soils of the glacial drift in the northern part of the county are quite different from those of the unglaciated remainder of the county.

Drainage

All the present drainage of the county is to the south, either directly or indirectly. But the preglacial drainage was both northerly and southerly from an ancient divide across the central part of the county. The glaciations reversed the northward drainage and now the major streams flow through the old divide. The old valleys have rock floors as much as 200 feet below the present valley bottoms. They were partly filled with glacial and alluvial materials of various ages (*31*).

Holmes County is entirely within the Muskingum River watershed. The primary drainage system in the county is Killbuck Creek, which flows through the center of the county. The major tributaries of Killbuck Creek include Salt, Martins, and Doughty Creeks on the east side of Killbuck Creek and Paint, Shrimplin, Black, and Wolf Creeks on the west side.

The western part of Holmes County is drained by the Mohican River and its tributary, Lake Fork. The eastern side of the county is drained by Walnut Creek, the Middle and South Forks of Sugar Creek, and Indian Trail Creek.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Millersburg in the period 1951 to 1983. 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 29 degrees F and the average daily minimum temperature is 20 degrees. The lowest temperature on record, which occurred on February 3, 1951, is -27 degrees. In summer, the average temperature is 70 degrees and the average daily maximum temperature is 82 degrees. The highest recorded temperature, which occurred on June 26, 1952, is 99 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 about 37 inches. Of this, 22 inches, or 60 percent, usually falls during 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 18 inches. The heaviest 1-day rainfall during the period of record was 6.75 inches on July 5, 1969. Thunderstorms occur on about 38 days each year, and most occur in summer.

The average seasonal snowfall is about 28 inches. The greatest snow depth at any one time during the period of record was 20 inches. On the average, 25 days of the year have at least 1 inch of snow 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 60 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in spring.

How This Survey Was Made

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

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area 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-vegetation-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 color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, 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. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are 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 are 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 predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict 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.

Survey Procedures

The general procedures followed in making this survey are described in the National Soils Handbook of the Natural Resources Conservation Service and the Soil Survey Manual (*29*). The soil survey maps made for conservation planning on individual farms prior to the start of the project soil survey, the Geology of Holmes County (*30*), and the Glacial Geology of Holmes County (*31*) were among the references used.

Before the actual fieldwork began, preliminary boundaries of slopes and landforms were plotted stereoscopically on aerial photographs flown in 1983 and enlarged to a scale of 1:15,840. USGS topographic maps at a scale of 1:24,000 were studied to relate land and image features. A reconnaissance was then made by vehicle prior to traversing the surface.

Traverses were made on foot to examine the soils. In areas such as the Chili-Fitchville association where the soil pattern is very complex, traverses were as close as 100 yards. In areas such as the Wooster-Canfield association, the soil pattern is relatively simple and traverses were about an eighth of a mile apart.

As the traverses were made, the soil scientists divided the landscape into segments in which use and management of soil were different. A hillside would be separated from a swale, a gently sloping ridgetop from a very steep side slope, etc. In most areas, soil examinations along the traverses were made 100 to 800 yards apart, depending upon the landscape and soil pattern (*13*). Observations of such items as landform, windthrow, vegetation, roadbanks, and animal burrows were made continuously without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined with the aid of a hand auger or a spade to a depth of about 6 feet or to bedrock if the bedrock was within a depth of 6 feet. The pedons described as typical were observed and studied in pits that were dug with spade and shovel.

At the beginning of the survey, sample blocks were selected to represent the major landscapes in the county. These were mapped at a rate roughly half that used in the remainder of the county. Extensive notes were taken on the composition of map units in these preliminary study areas. As mapping progressed, these preliminary notes were modified to reach the final assessment of the composition of the individual map units.

Soil transects were made to determine the composition of soil complexes, especially the Westmoreland-Coshocton complex in the nonglaciated part of the county.

Samples for chemical analysis, physical analysis, and engineering properties were taken from representative sites of several of the soils in the survey area. The chemical and physical analyses were made by the Soil Characterization Laboratory, School of Natural Resources, The Ohio State University, Columbus, Ohio. The results of the analyses are stored in a computerized data file at the laboratory. The analyses for engineering properties were made by the Ohio Department of Transportation, Division of Highways, Bureau of Testing, Soils and Foundation Section, Columbus, Ohio. The laboratory procedures can be obtained by request from these respective laboratories. The results of laboratory analyses can be obtained from the School of Natural Resources, The Ohio State University, Columbus, Ohio; The Ohio Department of Natural Resources, Division of Soil and Water Conservation, Columbus, Ohio; and the Natural Resources Conservation Service, State Office, Columbus, Ohio.

After completion of the soil mapping on aerial photographs, map unit delineations were transferred by hand to another set of the same photographs. Surface drainage was mapped in the field. Cultural features were recorded from visual observations.

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, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another, but in a different pattern.

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

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

Soil Descriptions

1. Wooster-Canfield Association

Deep, gently sloping to strongly sloping, well drained and moderately well drained soils on glaciated uplands

This association is on till plains and moraines that have low to moderate relief. The landscape is dominantly broad, gently sloping and sloping till plains that have low hills and ridges with broad bases and other areas near major streams and on the border moraines characterized by strongly sloping hillsides and high ridges that have well defined, local relief. Most moderately sloping and strongly sloping areas used for cropland are eroded. Slopes range from 2 to 18 percent.

This association makes up about 35 percent of the county. It is about 45 percent Wooster soils, 20 percent Canfield soils, and 35 percent soils of minor extent.

Wooster soils are well drained. They are gently sloping to strongly sloping and on convex hilltops and convex side slopes. They have a fragipan at a depth of 20 to 36 inches that restricts root growth. Permeability is moderately slow. The content of organic matter is moderate or moderately low. The available water capacity in the zone above the fragipan is low. A seasonal high water table is at a depth of 30 to 48 inches. These soils formed in glacial till. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown silt loam and loam. It is mottled in the fragipan. The substratum is yellowish brown gravelly loam glacial till. Bedrock is below a depth of 80 inches. Some areas of these soils are eroded.

Canfield soils are moderately well drained. They are gently sloping and moderately sloping and are on concave hilltops, side slopes in small valleys, and concave foot slopes. They have a fragipan at a depth of 15 to 30 inches that restricts root growth. Permeability is moderate above the fragipan and slow in the fragipan. The content of organic matter is moderate or moderately low. The available water capacity in the zone above the fragipan is low. A seasonal high water table is at a depth of 18 to 36 inches. These soils formed in a thin mantle of loess and in the underlying glacial till. Typically, the surface layer is brown silt loam. The subsoil is brown and strong brown silt loam in the upper part, yellowish brown and dark yellowish brown, mottled loam in the middle part, and dark yellowish brown, mottled, very firm and brittle, loam (fragipan) in the lower part. The substratum is olive brown and light olive brown loam glacial till. Bedrock is below a depth of 80 inches. Some areas of these soils are eroded.

Included with this association in mapping are Amanda, Berks, Chili, Coshocton, Fitchville, Loudonville, Orrville, and Ravenna soils. The somewhat poorly drained Ravenna soils are in depressions and shallow drainageways. All the other soils, Amanda, Berks, Chili, Coshocton, Fitchville, Loudonville, and Orrville, do not have a fragipan. Amanda soils formed in glacial till on steep side slopes in stream valleys. Coshocton soils formed in shaly residuum on high hilltops and side slopes. Loudonville soils formed in glacial till and the underlying siltstone and sandstone residuum on hilltops and side slopes. The moderately deep Berks soils formed in residuum, and have a higher content of coarse fragments in the subsoil than the major soils. They are on moderately steep to very steep side slopes below areas of glacial till. Chili soils formed in kames and glacial outwash. Chili and Wooster soils are on kames on uplands or on low outwash plains or stream terraces.

Fitchville soils formed in silty lacustrine deposits on terraces along streams. Orrville soils formed in alluvium on flood plains.

Most areas of this association are used for farming and some areas are wooded. Dairy enterprises are dominant. Most of the soils on the gentler slopes are used as cropland (fig. 5). The soils on the steeper slopes are used as pasture or woodland. Forage, corn, wheat, and oats are the principal crops. The less sloping soils are well suited to row crops, small grains, hay, pasture, and urban uses such as buildings. The soils on the steeper slopes are poorly suited to most of these uses. These soils are well suited to woodland.

The erosion hazard is the main management concern if these soils are used for cultivated crops. In many areas erosion can be controlled by contour stripcropping and by a system of conservation tillage that leaves crop residue on the surface. Other major management concerns affecting most land uses are the seasonal wetness of Canfield soils and the moderately slow or slow permeability.

2. Centerburg-Amanda-Wooster Association

Deep, gently sloping to steep, moderately well drained and well drained soils on glaciated uplands

This association is on till plains and moraines that have moderate relief. The landscape consists of elongated sloping plains separated by narrow valleys that have strongly sloping to steep sides. Most moderately sloping and strongly sloping areas used for cropland are eroded. Slopes range from 2 to 25 percent.

This association makes up about 2 percent of the county. It is about 35 percent Centerburg soils, 30 percent Amanda soils, 20 percent Wooster soils, and 15 percent soils of minor extent.

Centerburg soils are moderately well drained. They are gently sloping and moderately sloping and are on concave hilltops and side slopes in small valleys. Permeability is moderately slow. The content of organic matter is moderate or moderately low. The available water capacity is high. A seasonal high water table is at a depth of 18 to 36 inches. These soils formed in glacial till. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown silty clay loam in the upper part and yellowish brown, dark yellowish brown, and light olive brown, mottled clay loam in the lower part. The substratum is light olive brown loam glacial till. Bedrock is below a depth of 80 inches. Some areas of these soils are eroded.

Amanda soils are well drained. They are gently sloping to steep and are on gently sloping, convex hilltops and on side slopes along drainageways and stream valleys. Permeability is moderately slow. The content of organic matter is moderate or moderately low. The available water capacity is moderate or high. These soils formed in glacial till. Typically, the surface layer is brown silt loam. The subsoil is dark yellowish brown and yellowish brown loam and clay loam. The substratum is light olive brown loam glacial till. Bedrock is below a depth of 80 inches. Some areas of these soils are eroded.

Wooster soils are well drained. They are gently sloping and moderately sloping and are on gently sloping, convex hilltops and on side slopes along drainageways and stream valleys. They have a fragipan between depths of 20 and 36 inches that restricts root growth. Permeability is moderately slow. The content of organic matter is moderate or moderately low. The available water capacity in the zone above the fragipan is low. A seasonal high water table is at a depth of 30 to 48 inches. These soils formed in glacial till. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown and dark yellowish brown silt loam and loam. It is mottled in the fragipan. The substratum is yellowish brown gravelly loam glacial till. Bedrock is below a depth of 80 inches. Some areas of these soils are eroded.

Included with this association in mapping are Berks, Chili, Lobdell, Luray, and Orrville soils. Berks soils formed in residuum and have a higher content of coarse fragments in the subsoil than the major soils. Berks soils are on moderately steep to very steep side slopes below areas of glacial till. Chili soils formed in glacial outwash on low outwash plains or stream terraces. The very poorly drained Luray soils formed in silty lacustrine sediments in depressions on outwash plains and till plains. Lobdell and Orrville soils formed in alluvium on flood plains.

Most areas of this association are used for farming and a few areas are wooded. Dairy enterprises are dominant. Most of the soils on the gentler slopes are used as cropland and the soils on the steeper slopes are used as pasture or woodland. Forage, corn, and wheat are the principal crops. The less sloping soils are well suited or moderately well suited to row crops, small grains, hay, pasture, and urban uses such as buildings. The soils on the steeper slopes are generally unsuited or poorly suited to most of these uses. These soils are well suited to woodland.

The erosion hazard is the main management concern if these soils are cultivated. In many areas erosion can be controlled by contour stripcropping and a system of conservation tillage that leaves crop residue on the surface. Other major management concerns affecting most land uses are the steep slopes, the seasonal wetness of Centerburg soils, and the moderately slow permeability.

3. Coshocton-Rigley Association

Deep, gently sloping to steep, moderately well drained and well drained soils on unglaciated uplands

This association is in unglaciated, hilly areas. The hills have gently sloping to strongly sloping ridgetops and strongly sloping to steep side slopes (fig. 6). Many side slopes border broad valleys of other soil associations. Most areas used for cropland are eroded. Slopes range from 2 to 40 percent.

This association makes up about 27 percent of the county. It is about 60 percent Coshocton soils, 10 percent Rigley soils, and 30 percent soils of minor extent.

Coshocton soils are deep and moderately well drained. They are gently sloping to steep on ridgetops and side slopes. Permeability is moderately slow or slow. The content of organic matter is moderate or moderately low. The available water capacity is moderate. A seasonal high water table is at a depth of 18 to 42 inches. These soils formed in loamy colluvium and residuum derived from thin-bedded shale and siltstone. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown silty clay loam. It is mottled in the lower part. The substratum is yellowish brown and dark grayish brown, mottled silty clay loam. Thin-bedded, soft, shale bedrock is at a depth of about 65 inches. Many areas of these soils are eroded.

Rigley soils are deep and well drained. They are gently sloping to moderately steep on ridgetops and side slopes. Permeability is moderately rapid. The content of organic matter is moderate. The available water capacity is low or moderate. These soils formed in residuum or in residuum and colluvium derived mainly from sandstone, siltstone, and small amounts of shale. Typically, the surface layer is very dark grayish brown sandy loam. The subsurface layer is yellowish brown sandy loam. The subsoil is brown and strong brown sandy loam and channery sandy loam. The substratum is yellowish brown channery sandy loam. Thin-bedded, soft shale bedrock is at a depth of about 78 inches.

Included with this association in mapping are Berks, Farmerstown, Fitchville, Hazleton, Orrville, and Westmoreland soils. Berks and Hazleton soils have a higher content of coarse fragments in the subsoil than the major soils. They are on side slopes. Westmoreland soils are on ridgetops and side slopes. They have more clay than Rigley soils and are better drained than Coshocton soils. Farmerstown soils are on ridgetops and side slopes in areas surfaced mined for coal. Farmerstown soils have 20 to 40 inches of reconstructed soil material. They do not have a subsoil. The somewhat poorly drained Fitchville soils are on terraces along streams. Orrville soils formed in alluvium on flood plains.

Many areas of this association are used for farming and some areas are wooded. Dairy enterprises are dominant. Most of the soils on the gentler slopes are used as cropland. The soils on the steeper slopes are used as pasture or woodland. Forage, corn, wheat, and oats are the principal crops. The less sloping soils are well suited or moderately well suited to row crops, small grains, hay, pasture, and urban uses such as buildings. The soils on the steeper slopes are generally unsuited or poorly suited

Figure 5.—Hay and corn are among the important crops on the Wooster-Canfield Association.

to most of these uses. These soils are well suited to woodland.

If these soils are cultivated, erosion is a moderate to severe hazard. In many areas it can be controlled by contour stripcropping and a system of conservation tillage that leaves crop residue on the surface. Other major management concerns are moderately steep and steep slopes, the seasonal wetness of Coshocton soils, droughtiness caused by the low or moderate available water capacity of the Rigley soils, and the moderately slow or slow permeability in the Coshocton soils. The north- and east-facing slopes are better woodland sites than the south- and west-facing slopes because of less evaporation and cooler temperatures. These sites are less exposed to the drying effects of the prevailing winds and the sun.

4. Coshocton-Brownsville-Berks Association

Deep and moderately deep, gently sloping to very steep, moderately well drained and well drained soils on unglaciated uplands

This association is in very hilly, unglaciated areas. The hills have gently sloping to strongly sloping ridgetops and strongly sloping to very steep side slopes. The ridgetops are about 50 to 750 feet wide. Most areas used for cropland are eroded. Slopes range from 2 to 70 percent.

This association makes up about 20 percent of the county. It is about 35 percent Coshocton soils, 30 percent Brownsville soils, 15 percent Berks soils, and 20 percent soils of minor extent.

Coshocton soils are deep and moderately well drained. They are gently sloping to steep on ridgetops and side slopes. Permeability is moderately slow or slow. The content of organic matter is moderate or moderately low. The available water capacity is moderate. A seasonal high water table is at a depth of 18 to 42 inches. These soils formed in loamy colluvium and residuum derived from thin-bedded shale and siltstone. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown silty clay loam. It is mottled in the lower part. The substratum is yellowish brown and dark grayish brown, mottled silty clay loam. Thin-bedded, soft shale bedrock is at a depth of about 65 inches. Many areas of these soils are eroded.

Brownsville soils are deep and well drained. They are moderately steep to very steep on the lower parts of valley side slopes. Permeability is moderate or moderately rapid. The content of organic matter is moderate. The available water capacity is low. These soils formed in colluvium weathered from siltstone and fine grained sandstone. Typically, the surface layer is very dark grayish brown channery silt loam. The subsoil is light yellowish brown and yellowish brown. It is very channery silt loam in the upper part and extremely channery silt loam in the lower part. Fine grained sandstone bedrock is at a depth of about 42 inches.

Berks soils are moderately deep and well drained. They are moderately steep to very steep on the lower parts of valley side slopes. Permeability is moderate or moderately rapid. The content of organic matter is moderate. The available water capacity is very low. These soils formed in residuum derived from siltstone, shale, and fine grained sandstone. Typically, the surface layer is very dark grayish brown silt loam. The subsoil is yellowish brown. It is channery silt loam, very channery silt loam, and extremely channery loam. Siltstone and fine grained sandstone bedrock is at a depth of about 23 inches.

Included with this association in mapping are Chili, Gilpin, Glenford, Rigley, Orrville, and Westmoreland soils. The moderately deep, well drained Gilpin soils and the deep, well drained Westmoreland soils have more clay in the subsoil than Berks and Brownsville soils. They are better drained than Coshocton soils. Rigley soils have more sand in the subsoil than the major soils. Gilpin, Rigley, and Westmoreland soils are primarily on ridgetops and the upper side slopes. Chili soils formed in glacial outwash on stream terraces. Glenford soils formed in silty lacustrine deposits on terraces along streams. Orrville soils formed in alluvium on flood plains.

Many areas of this association are used for farming and some areas are wooded. Dairy enterprises are dominant. Most of the soils on gentler slopes are used as cropland and the soils on the steeper slopes are used as pasture or woodland. Forage, corn, and wheat are the principal crops. The less sloping soils are well suited or moderately well suited to row crops, small grains, hay, pasture, and urban uses such as buildings. The soils on the steeper slopes are generally unsuited or poorly suited to most of these uses. These soils are moderately well suited or well suited to woodland.

Slope, the erosion hazard, droughtiness caused by the low and very low available water capacity of the Brownsville and Berks soils, the seasonal wetness of the Coshocton soils, bedrock at a depth of 20 to 40 inches in the Berks soils, and the moderately slow or slow permeability in the Coshocton soils are all management concerns. The erosion hazard of many of the soils on the gentler slopes can be controlled by contour stripcropping and a system of conservation tillage that leaves crop residue on the surface. The north- and east-facing slopes are better woodland sites than the south- and west-facing slopes because of less evaporation and cooler temperatures. These sites are less exposed to the drying effects of the prevailing winds and the sun.

5. Chili-Fitchville Association

Deep, nearly level to very steep, well drained and somewhat poorly drained soils on stream terraces, kames, and outwash plains

This association is on outwash plains, kames, and terraces along streams in valleys. The landscape consists of nearly level to moderately sloping terraces that have steep and very steep terrace breaks. Some areas are hummocky and have low knolls and ridges. Slopes range from 0 to 70 percent.

This association makes up about 7 percent of the county. It is about 60 percent Chili soils, 10 percent Fitchville soils, and 30 percent soils of minor extent.

Chili soils are well drained and are nearly level to very steep. They are on the higher and better drained parts of the outwash plains and large terraces and on small terraces and kames. Permeability is moderately rapid. The content of organic matter is moderate or moderately low. The available water capacity is low or moderate. These soils formed in noncalcareous glacial outwash. Typically, the surface layer is brown loam. The subsurface layer is yellowish brown loam. The subsoil is yellowish brown and dark yellowish brown. It is loam in the upper part and very gravelly sandy loam in the lower part. The substratum is dark yellowish brown, very gravelly loamy sand and very gravelly sand. Some areas of these soils are eroded.

Fitchville soils are somewhat poorly drained and are nearly level and gently sloping. They are on terraces along streams. Permeability is moderately slow. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is at a depth of 12 to 30 inches. These soils formed in stratified, glacial meltwater deposits. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and light brownish gray, mottled silt loam and silty clay loam. The substratum is light brownish gray and yellowish brown, mottled silt loam.

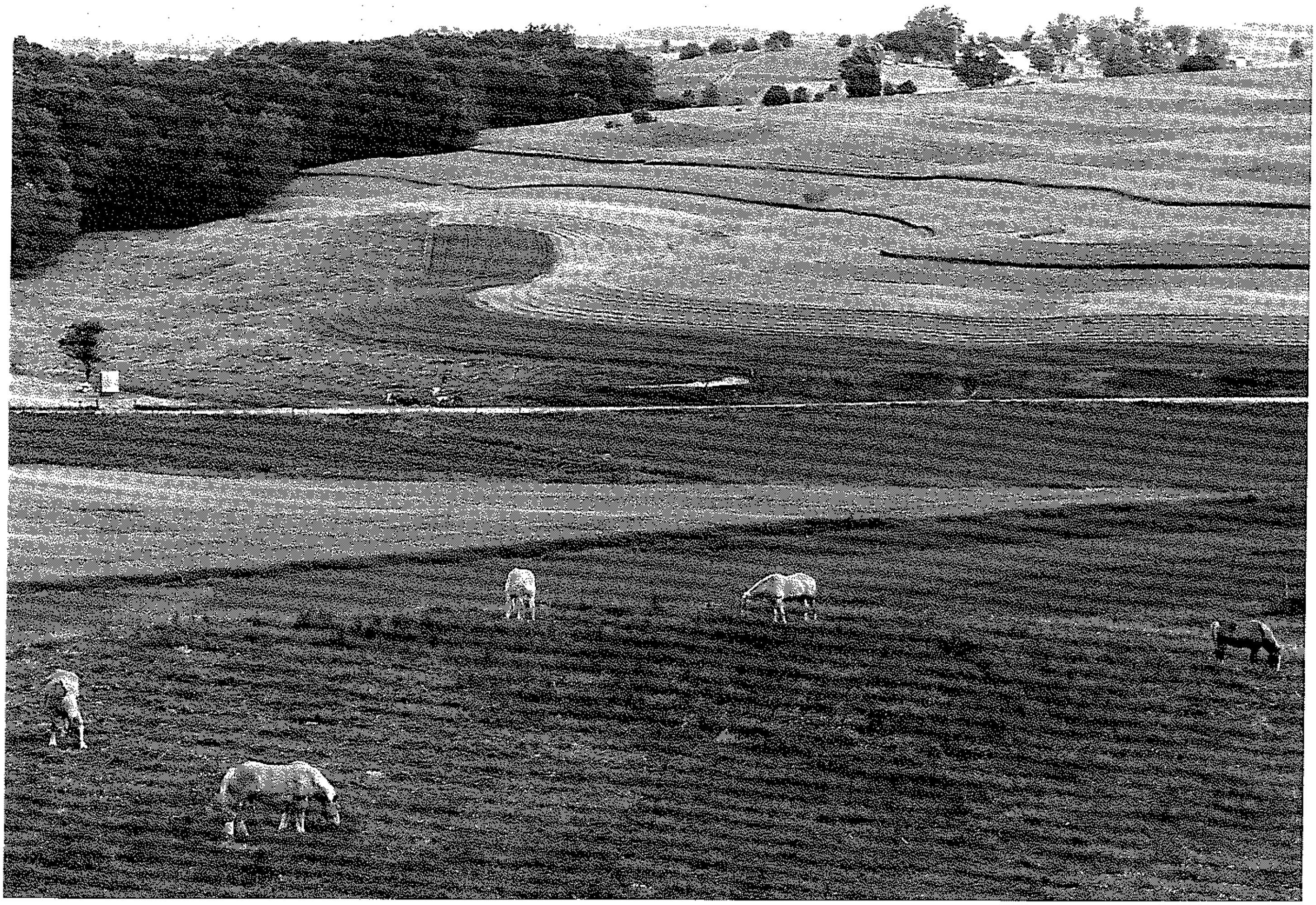

Figure 6.—Contour stripcropping is a common practice on the Coshocton-Rigley Association.

Included with this association in mapping are Carlisle, Glenford, Luray, Melvin, Orrville, Sebring, and Tioga soils. The moderately well drained Glenford soils are on terraces along streams and outwash plains. The poorly drained Sebring soils are in depressions on terraces. The very poorly drained Carlisle and Luray soils are in depressions on outwash plains. Tioga, Orrville, and Melvin soils formed in alluvium on flood plains.

Most areas of this association are used as cropland or pasture. Corn, wheat, and hay are the principal crops. All of the less sloping soils are well suited to row crops, hay, and pasture. Most of the less sloping soils are well suited or moderately well suited to most urban uses such as buildings. The somewhat poorly drained soils are poorly suited to most urban uses. All the soils are well suited to woodland.

For row crops, erosion is a hazard on the steeper soils, drainage is needed on the wetter soils, and droughtiness is a management concern on the well drained soils. The less sloping, well drained soils are suited to irrigation. The seasonal wetness and moderately slow permeability on the Fitchville soils are limitations affecting buildings and septic tank absorption fields. Effluent in septic tank absorption fields placed too deep into the Chili soils can pollute ground water because of rapid permeability in the substratum.

6. Orrville-Lobdell-Tioga Association

Deep, nearly level, somewhat poorly drained to well drained soils on flood plains

This association is on flood plains in valleys that range in width from less than 1/8 to 1/2 mile. They are subject to occasional flooding. Slopes range from 0 to 2 percent.

This association makes up about 5 percent of the county. It is about 40 percent Orrville soils, 20 percent Lobdell soils, 20 percent Tioga soils, and 20 percent soils of minor extent.

Orrville soils are somewhat poorly drained. They are on flood plains and are occasionally flooded. Permeability is moderate. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is at a depth of 12 to 30 inches. These soils formed in alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown, grayish brown, and light brownish gray, mottled silt loam and loam. The substratum is light brownish gray and grayish brown, mottled loam.

Lobdell soils are moderately well drained. They are on flood plains and are occasionally flooded. Permeability is moderate. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is at a depth of 24 to 42 inches. These soils formed in alluvium. Typically, the surface layer is brown silt loam. The subsoil is brown silt loam. It is mottled in the lower part. The substratum is light brownish gray, mottled silt loam, sandy loam, and loam in the upper part; it is yellowish brown, gray, and strong brown, mottled silt loam and sandy clay loam in the lower part.

Tioga soils are well drained. They are on flood plains and are subject to occasional flooding. Permeability is moderate or moderately rapid. The content of organic matter is moderate. The available water capacity is moderate. A seasonal high water table is at a depth of 36 to 72 inches. These soils formed in alluvium. Typically, the surface layer is brown loam. The subsoil is brown and dark yellowish brown loam and sandy loam. The substratum is dark yellowish brown, stratified silt loam and loam.

Included with this association in mapping are Chili, Cidermill, Fitchville, Glenford, Melvin, and Sebring soils. The poorly drained Melvin soils are in depressions on flood plains. Chili soils formed in glacial outwash. Cidermill soils formed in a silty mantle and in stratified glacial outwash deposits. Chili and Cidermill soils are on stream terraces. Fitchville, Glenford, and Sebring soils formed in silty lacustrine deposits on terraces.

Most areas of this association are used as cropland or pasture. Corn and hay are the principal crops. All these soils are well suited to row crops, hay, and pasture. They are generally unsuited to most urban uses because of flooding. They are well suited to woodland.

Flooding, the seasonal wetness, and droughtiness are the major management concerns. These soils are occasionally flooded during the growing season. A drainage system is needed if the somewhat poorly drained Orrville soils are used for crops. Tioga soils are somewhat droughty.

7. Melvin-Orrville Association

Deep, nearly level, poorly drained and somewhat poorly drained soils on flood plains

This association is on flood plains in valleys 1/2 to more than 1 mile in width. They are subject to frequent or occasional flooding. Some areas are ponded. Slopes range from 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 60 percent Melvin soils, 25 percent Orrville soils, and 15 percent soils of minor extent.

Melvin soils are poorly drained. They are on flood plains. They are subject to frequent flooding or ponding. Ponding is in swampy areas. Permeability is moderate. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is near or above the surface. These soils formed in alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark gray and grayish brown, mottled silt loam and silty clay loam. The substratum is dark grayish brown very fine sandy loam and dark gray loamy very fine sand.

Orrville soils are somewhat poorly drained. They are on flood plains and are subject to occasional flooding. Permeability is moderate. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is at a depth of 12 to 30 inches. These soils formed in alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown, grayish brown, and light brownish gray, mottled silt loam and loam. The substratum is light brownish gray and grayish brown, mottled loam.

Included with this association in mapping are Chili, Fitchville, Glenford, Lobdell, Sebring, and Tioga soils. Chili soils formed in glacial outwash on stream terraces. Fitchville, Glenford, and Sebring soils formed in silty lacustrine deposits on terraces. The well drained Tioga soils and the moderately well drained Lobdell soils are on flood plains mainly of major streams.

Some drained areas of this association are used as cropland. Other areas are used as pasture. Some undrained areas are wooded. Ponded areas are used as habitat for wetland wildlife. Corn is the principal crop. Drained areas of these soils are moderately well suited or well suited to row crops. The soils in this association are generally unsuited to most urban uses because of flooding and ponding. They are moderately well suited or well suited to woodland.

Flooding, ponding, and the seasonal wetness are the major management concerns. These soils are subject to frequent or occasional flooding during the growing season. A drainage system is needed if these soils are used for corn or hay. If these soils are used as woodland, flooding and wetness limit the use of equipment for planting and harvesting trees. Logging is possible when the soils are frozen or during the drier parts of the year.

8. Euclid-Fitchville-Orrville Association

Deep, nearly level and gently sloping, somewhat poorly drained soils on low stream terraces, lake plains terraces, and flood plains

This association is on broad flats in valleys that range from 1/4 to 1/2 mile wide. The narrow, meandering streams in the valley have been straightened to improve the drainage of the soils for cropland. Euclid soils are on low stream terraces, and Fitchville soils are on slightly higher terraces that border the uplands. Euclid soils are subject to occasional flooding. Slopes range from 0 to 6 percent.

This association makes up about 2 percent of the county. It is about 45 percent Euclid soils, 25 percent Fitchville soils, 10 percent Orrville soils, and 20 percent soils of minor extent.

Euclid soils are somewhat poorly drained. They are on nearly level, low stream terraces and are subject to occasional flooding. Permeability is moderately slow. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is at a depth of 12 to 30 inches. These soils formed in stratified silty deposits. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and grayish brown, mottled silt loam. The substratum is grayish brown, mottled silt loam and dark yellowish brown, mottled silty clay loam.

Fitchville soils are somewhat poorly drained and nearly level and gently sloping. They are on terraces and lake plains. Permeability is moderately slow. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is at a depth of 12 to 30 inches. These soils formed in glacial meltwater deposits. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and light brownish gray, mottled silt loam and silty clay loam. The substratum is light brownish gray and yellowish brown, mottled silt loam.

Orrville soils are somewhat poorly drained. They are on flood plains and are subject to occasional flooding. Permeability is moderate. The content of organic matter is moderate. The available water capacity is high. A seasonal high water table is at a depth of 12 to 30 inches. These soils formed in alluvium. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown, grayish brown, and light brownish gray, mottled silt loam and loam. The substratum is light brownish gray and grayish brown, mottled loam.

Included with this association in mapping are Glenford, Lobdell, Melvin, and Sebring soils. The moderately well drained Glenford soils are on terraces adjacent to uplands. The poorly drained Sebring soils are in depressions on terraces. Melvin and Lobdell soils formed in alluvium on flood plains.

Most areas of this association are used as cropland. Some areas are used as pasture. Corn and hay are the principal crops. Drained areas of these soils are well suited to row crops, hay, and pasture. The soils included in this association in mapping are generally unsuited to most urban uses because of flooding. They are well suited to woodland.

Flooding, the seasonal wetness, and moderately slow permeability are the major management concerns. Also, a moderate hazard of erosion is a management concern on the gently sloping Fitchville soils. Euclid and Orrville soils are occasionally flooded during the growing season. A drainage system is needed if these soils are used for row crops or hay.

Detailed Soil Map Units

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

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. 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 other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties 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, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit 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, 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, slope, stoniness, 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, Canfield silt loam, 2 to 6 percent slopes, is a phase of the Canfield series.

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

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

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. Pits, gravel, is an example.

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 or miscellaneous areas.

AmE—Amanda loam, 18 to 25 percent slopes

This deep, moderately steep, well drained soil is on side slopes of deeply entrenched drainageways on moraines and dissected till plains. Most areas are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is brown, friable loam about 6 inches thick. The subsurface layer, about 2 inches thick, is yellowish brown, friable loam. The subsoil is yellowish brown, friable and firm, loam about 50 inches thick. It is mottled in the lower part. The substratum to a depth of about 80 inches is dark yellowish brown, friable, loam glacial till. Some areas have a silt loam surface layer. A few areas have more sand in the subsoil and substratum. Some areas have slopes of 25 to 40 percent. A few places have bedrock at a depth of 40 to 60 inches. Some areas are moderately well drained.

Included with this soil in mapping and making up about 10 percent of most areas are small areas of Chili soils and small seeps and springs. Chili soils have more sand and gravel in the substratum than the Amanda soil. They are on the lower parts of side slopes near larger drainageways.

A seasonal high water table in this Amanda soil is at a depth of more than 48 inches. Permeability is moderately slow. The root zone is deep. Available water capacity is moderate or high. Tilth is good. Runoff is very rapid. The content of organic matter is moderate.

Most areas are used for pasture and woodland.

Because of the moderately steep slope and the very severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to the grasses and legumes used for pasture. The good natural drainage permits early spring grazing. If the pasture is overgrazed, the hazard of erosion is very severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Plant competition is severe. Slope and low strength limit the use of equipment. Erosion is a hazard. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover are also used to reduce erosion. Log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings will improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, this soil is poorly suited as a site for buildings. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Locating roads and streets on the contour will reduce the steepness of grade. Diversions are used to carry away runoff from higher, adjacent soils, to reduce seasonal wetness, and to control erosion.

This soil is poorly suited as a site for septic tank absorption fields. The main limitations are slope and the moderately slow permeability. Effluent from absorption fields may surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is VIe. The woodland ordination symbol is 5R. The pasture and hayland suitability group is A-2.

AwB—Amanda-Wooster complex, 2 to 6 percent slopes

These deep, gently sloping, well drained soils are on slightly convex areas on till plains and moraines. Most areas are about 50 percent Amanda silt loam and 40 percent Wooster silt loam. The Amanda and Wooster soils are very intermingled on the landscape. They are so intricately mixed or in areas so small that mapping them separately was not practical. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the Amanda soil has a brown, friable, silt loam surface layer about 8 inches thick. The subsoil is yellowish brown, firm, loam and clay loam about 50 inches thick. It is mottled in the lower part. The substratum to a depth of about 80 inches is yellowish brown, mottled, firm, loam glacial till. In places the surface layer is loam. In some small eroded spots subsoil material is mixed into the surface layer. In some areas the soil is moderately well drained.

Typically, the Wooster soil has a dark grayish brown, friable, silt loam surface layer about 9 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown, friable, silt loam and loam; the lower part is a dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 80 inches is dark yellowish brown, mottled, firm, loam glacial till. Some areas have a loam surface layer. A few places have bedrock at a depth of 40 to 60 inches. Some areas are moderately well drained.

Included with this unit in mapping are small areas of somewhat poorly drained soils in depressions and small drainageways. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 30 to 48 inches during extended wet periods in the Wooster soil. It is at a depth of more than 48 inches in the Amanda soil. A fragipan is at a depth of 20 to 36 inches in the Wooster soil. Permeability is moderately slow in both soils. The root zone is deep in the Amanda soil. It mainly is restricted to the 20- to 36-inch zone above the dense fragipan in the Wooster soil. Available water capacity is moderate or high in the Amanda soil and low in the zone above the fragipan in the Wooster soil. Tilth is good in both soils. Runoff is medium. The content of organic matter is moderate in both soils.

Most areas of these soils are in cropland. Some areas are used as pasture and a few areas are woodland.

These soils are well suited to corn, small grains, and hay. The good natural drainage is favorable to alfalfa. A moderate hazard of erosion and surface crusting are the main concerns of management. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. These soils are well suited to no-till. Deferring plowing until spring, after leaving crop residue on the surface over winter, also protects these soils against erosion. Returning crop residue or other organic matter to the soil increases water intake, improves tilth and fertility, and reduces crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

Most areas of pasture are in rotation with cultivated crops. These soils are well suited to a variety of pasture plants. They can be grazed early in spring. If the pasture is overgrazed or if the soils are plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding help to reduce the risk of erosion.

These soils are well suited to trees; however, most wooded areas are small. On the Wooster soil, trees are subject to windthrow, and plant competition is severe. On the Amanda soil, plant competition is severe, and low strength is a concern during harvest for haul roads and log landings. Applying gravel or crushed stone on haul roads and log landings will improve soil strength. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

These soils are well suited as a site for buildings. On the Amanda soil, the main limitations are seasonal wetness and shrinking and swelling of the soil. On the Wooster soil, the main limitation is seasonal wetness. On both soils, building sites should be landscaped to provide good surface drainage away from foundations. On the Wooster soil, water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. On the Amanda soil, backfilling along basement walls with a low shrink-swell material reduces damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material improve soil strength and help prevent damage caused by frost action to local roads and streets.

The Amanda soil is moderately well suited as a site for septic tank absorption fields. The Wooster soil is poorly suited to this use. The main limitation in both soils is the moderately slow permeability. Seasonal wetness is a limitation in the Wooster soil. Perimeter drains around a septic tank absorption field help to lower the seasonal high water table in the Wooster soil. Effluent from septic tank absorption fields may seep along the top of the fragipan in the Wooster soil and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIe. The woodland ordination symbols are 5A on the Amanda soil and 5D on the Wooster soil. The pasture and hayland suitability groups are A-1 for the Amanda soil and F-3 for the Wooster soil.

AwC2—Amanda-Wooster complex, 6 to 12 percent slopes, eroded

These deep, moderately sloping, well drained soils are on complex slopes on till plains and moraines. Most areas are about 50 percent Amanda silt loam and 40 percent Wooster silt loam. In both soils, erosion has removed part of the original surface layer. The present surface layer of both soils is a mixture of the original surface layer and the subsoil material. The Amanda and Wooster soils are so intricately mixed or in areas so small that mapping them separately is not practical. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the Amanda soil has a brown, friable, silt loam surface layer about 8 inches thick. Generally, plowing has mixed some streaks and pockets of dark yellowish brown subsoil material into the surface layer. The subsoil is about 58 inches thick. The upper part is dark yellowish brown, friable loam and yellowish brown, firm loam; the lower part is yellowish brown, mottled, firm, clay loam and loam. The substratum to a depth of about 80 inches is light olive brown, mottled, firm, loam glacial till. In places the surface layer is loam. In some areas the soil is moderately well drained. The wooded areas are not eroded.

Typically, the Wooster soil has a brown, friable, silt loam surface layer about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 40 inches thick. The upper part is yellowish brown, friable, silt loam and loam; the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 80 inches is dark yellowish brown, mottled, firm, loam glacial till. Some areas have a loam or gravelly loam surface layer. A few places have bedrock at a depth of 40 to 60 inches. Some areas are moderately well drained. The wooded areas are not eroded.

Included with this unit in mapping are small areas of somewhat poorly drained soils in depressions and small drainageways. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 30 to 48 inches during extended wet periods in the Wooster soil. It is at a depth of more than 48 inches in the Amanda soil. A fragipan is at a depth of 20 to 36 inches in the Wooster soil. Permeability is moderately slow in both soils. The root zone is deep in the Amanda soil. It is mainly restricted to the 20- to 36-inch zone above the fragipan in the Wooster soil. Available water capacity is moderate or high in the Amanda soil and low in the zone above the fragipan in the Wooster soil. Tilth is good in both soils. Runoff is rapid. The content of organic matter is moderately low in both soils.

Most areas of these soils are cropland. Some areas are used as pasture. A few areas are woodland.

These soils are moderately well suited to corn and small grains and well suited to hay. The good natural drainage is favorable to alfalfa. A severe hazard of further erosion, surface crusting, and the restricted rooting depth in the Wooster soil are the main concerns of management. Erosion reduces the thickness of the root zone above the fragipan in the Wooster soil, thus reducing the volume of soil from which crops can extract moisture and plant nutrients. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. These soils are well suited to no-till. In areas that have smooth, uniform slopes, this unit is well suited to such erosion control practices as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Crop residue or other organic matter returned to the soil increases water infiltration, improves tilth and fertility, and reduces crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

On pasture, these soils are well suited to grasses and legumes. These soils can be grazed early in spring. If these soils are plowed for seedbed preparation or the pasture is overgrazed, continued erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to reduce the risk of erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soils in good condition.

These soils are well suited to trees; however, most wooded areas are small. In the Wooster soil, trees are subject to windthrow and plant competition is moderate. On the Amanda soil, plant competition is severe, and low strength is a harvest concern for haul roads and log landings. Slope is a harvest concern for log landings on both soils. Log landings should be located on less sloping soils nearby, or landing sites can be improved on these soils by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings will improve soil strength. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, these soils are moderately well suited as a site for buildings. Other than slope, the main limitations on the Amanda soil are seasonal wetness and the shrinking and swelling of the soil. On the Wooster soil, the other main limitation is seasonal wetness. On both soils, building sites should be landscaped to provide good surface drainage away from foundations. On the Wooster soil, water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. On the Amanda soil, backfilling along basement walls with a low shrink-swell material reduces damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material improve soil strength and help to prevent damage caused by frost action to local roads and streets.

The Amanda soil is moderately well suited and the Wooster soil is poorly suited as a site for septic tank absorption fields. The main limitation on both soils is the moderately slow permeability. Seasonal wetness is a limitation on the Wooster soil. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help to lower the seasonal high water table. On the Wooster soil, effluent from absorption fields can seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIIe. The woodland ordination symbols are 5A on the Amanda soil and 5D on the Wooster soil. The pasture and hayland suitability groups are A-1 for the Amanda soil and F-3 for the Wooster soil.

AwD2—Amanda-Wooster complex, 12 to 18 percent slopes, eroded

These deep, strongly sloping, well drained soils are on side slopes of natural drainageways and ridges on moraines and dissected till plains. Most areas are about 50 percent Amanda silt loam and 40 percent Wooster silt loam. On both soils, erosion has removed part of the original surface layer. The surface layer of both soils is a mixture of the original surface layer and the subsoil material. The Amanda and Wooster soils are so intricately mixed or in areas so small that mapping them separately is not practical. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the Amanda soil has a brown, friable, silt loam surface layer about 7 inches thick. It has some streaks and pockets of yellowish brown subsoil material. The subsoil is yellowish brown, friable and firm, loam and clay loam about 40 inches thick. It is mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled, firm, loam glacial till. In places the surface layer is loam. In some areas the soil is moderately well drained. Most of the wooded areas are not eroded.

Typically, the Wooster soil has a brown, friable, silt loam surface layer about 7 inches thick. Generally, plowing has mixed some streaks and pockets of dark yellowish brown subsoil material into the surface layer. The subsoil is about 37 inches thick. The upper part is yellowish brown, firm, silt loam and loam; the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm, loam glacial till. Some areas have a loam or gravelly loam surface layer. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. Some areas are moderately well drained. Most of the wooded areas are not eroded.

Included with this unit in mapping are small areas of somewhat poorly drained soils in small drainageways. A few areas contain seep spots. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 30 to 48 inches during extended wet periods in the Wooster soil. It is at a depth of more than 48 inches in the Amanda soil. A fragipan is at a depth of 20 to 36 inches in the Wooster soil. Permeability is moderately slow in both soils. The root zone is deep in the Amanda soil. It is mainly restricted to the 20- to 36-inch zone above the fragipan in the Wooster soil. Available water capacity is moderate or high in the Amanda soil. It is low in the zone above the fragipan in the Wooster soil. Tilth is good in both soils. Runoff is rapid. The content of organic matter is moderately low in both soils.

A few areas of these soils are in cropland. Many areas are used as pasture. Some areas are native hardwoods.

These soils are poorly suited to corn and small grains and moderately well suited to hay. The good natural drainage is favorable to alfalfa. Slope and the very severe hazard of further erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion control practices. On the Wooster soil, continued erosion further reduces the thickness of the root zone above the fragipan and reduces the volume of soil from which crops can extract moisture and plant nutrients. Row crops can be grown occasionally in this unit if erosion is controlled. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations with grasses and legumes, and planting cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in areas of concentrated runoff.

On pasture, these soils are moderately well suited to grasses and legumes. If the soils are plowed for seedbed preparation or if the pasture is overgrazed, the hazard of continued erosion is very severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to reduce the risk of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soils in good condition.

These soils are well suited to trees; however, most wooded areas are small. On both soils, slope limits the use of equipment, runoff can cause erosion, and plant competition is severe. On the Wooster soil, trees are subject to windthrow. On the Amanda soil, low strength is a harvest concern for haul roads and log landings. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover are also used to reduce erosion. Log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings will improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, these soils are poorly suited as a site for buildings. On both soils, building sites should be landscaped to provide good surface drainage away from foundations. Diversions are used to carry away runoff from higher adjacent soils, to reduce seasonal wetness, and to control erosion. The buildings should be designed so they conform to the natural slope of the land. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Locating roads and streets on the contour will reduce the steepness of grade.

These soils are poorly suited as a site for septic tank absorption fields. The main limitations in both soils are slope and the moderately slow permeability. Seasonal wetness is a limitation on the Wooster soil. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help to lower the seasonal high water table. On the Wooster soil effluent from absorption fields can seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IVe. The woodland ordination symbol is 5R for both soils. The pasture and hayland suitability groups are A-1 in the Amanda soil and F-3 in the Wooster soil.

BkD—Berks silt loam, 15 to 25 percent slopes, very stony

This moderately deep, moderately steep, well drained soil is on the upper parts of side slopes of valleys cut into hills on the unglaciated uplands. Stones, 10 to 24 inches in diameter, cover 1 to 3 percent of the surface. Most areas are above steeper slopes and below less sloping ridgetops. Most areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 3 inches thick. The subsoil is yellowish brown, friable, channery silt loam, very channery silt loam, and extremely channery loam, about 20 inches thick. Light olive brown, fine grained sandstone and siltstone bedrock is at a depth of about 23 inches. In some areas the surface layer is loam or channery silt loam. Also, in places bedrock is below a depth of 40 inches. In a few places the surface is free of stones. In other places stones are more than 24 inches in diameter.

Included with this soil in mapping are small areas of the deep Coshocton and Westmoreland soils on narrow foot slopes. Coshocton and Westmoreland soils are not as stony as the Berks soil. Also included are scattered areas of rock outcrops that have little or no soil cover and small, wet areas at the heads of drainageways. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Berks soil is moderate or moderately rapid. The root zone is moderately deep and slightly restricted by the larger rock fragments in the subsoil. Available water capacity is very low. Runoff is rapid. The content of organic matter is moderate.

Nearly all areas of this soil are wooded. A few areas are in pasture.

This soil is generally unsuited to corn, small grains, and hay because of large stones on the surface.

On pasture, this soil is poorly suited to grasses and legumes because of large stones on the surface. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of the summer. Overgrazing or cultivation of this soil will increase the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is moderately well suited to trees. Slope and very low available moisture are the main concerns in management. Building haul roads and skid trails on the contour facilitates the use of equipment. The moderately deep bedrock is rippable with construction equipment. Also, log landings should be located on less sloping soils nearby or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is poorly suited as a site for buildings because of slope. Also, large stones are a nuisance. Building sites should be located on the less sloping areas of this unit. The buildings should be designed to conform to the natural slope of the land. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures.

This soil is generally unsuited as a site for septic tank absorption fields because of slope and depth to rock.

The land capability classification is VIs. The woodland ordination symbol is 4F on north aspects and 3F on south aspects. The pasture and hayland suitability group is A-4.

BkE—Berks silt loam, 25 to 35 percent slopes, very stony

This moderately deep, steep, well drained soil is on side slopes of valleys cut into hills on the unglaciated uplands. Stones, 10 to 24 inches in diameter, cover 1 to 3 percent of the surface. Most areas are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 3 inches thick. The subsoil is yellowish brown, friable, channery silt loam, very channery silt loam, and extremely channery loam, about 23 inches thick. Yellowish brown, fine grained sandstone and siltstone bedrock is at a depth of about 26 inches. In some areas the surface layer is loam or channery silt loam. Also, in places bedrock is below a depth of 40 inches. In a few places the surface is free of stones. In other places stones are greater than 24 inches in diameter.

Included with this soil in mapping are small areas of the deep Coshocton and Westmoreland soils on narrow foot slopes. The Berks soil is stonier than Coshocton and Westmoreland soils. Also included are scattered areas of rock outcrops that have little or no soil cover and small, wet areas at the heads of drainageways. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Berks soil is moderate or moderately rapid. The root zone is moderately deep and slightly restricted by the larger rock fragments in the subsoil. Available water capacity is very low. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this soil are wooded. A few areas are used as pasture.

Because of the steep slope, very severe erosion hazard, and large stones, this soil is generally unsuited to cropland and pasture.

This soil is moderately well suited to trees. Slope and very low available moisture are the main concerns in management. Building logging roads and skid trails on the contour facilitates the use of equipment. The moderately deep bedrock is rippable with construction equipment. Also, log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields. The steep slope and depth to bedrock are the main limitations.

The land capability classification is VIIs. The woodland ordination symbol is 4F on north aspects and 3F on south aspects. The pasture and hayland suitability group is A-4.

BkF—Berks silt loam, 35 to 70 percent slopes, very stony

This moderately deep, very steep, well drained soil is on valley side slopes on unglaciated uplands. Most delineations include one side slope of a major valley or both side slopes of narrow tributary valleys. Stones, 10 inches to 24 inches in diameter, cover 1 to 3 percent of the surface. Most areas are long and narrow and range from 5 to 150 acres in size.

Typically, the surface soil is very dark grayish brown and dark grayish brown, friable silt loam about 5 inches thick. The subsoil is yellowish brown, friable, channery silt loam, very channery silt loam, and extremely channery silt loam, about 22 inches thick. Yellowish brown, fine grained sandstone and siltstone bedrock is at a depth of about 27 inches. In some areas the surface layer is loam or channery silt loam. Also, in places bedrock is below a depth of 40 inches. In a few places the surface is free of stones. In other places stones are greater than 24 inches in diameter.

Included with this soil in mapping are small areas of the deep Coshocton and Westmoreland soils on narrow foot slopes. The Berks soil is stonier than Coshocton and Westmoreland soils. Also included are scattered areas of rock outcrops that have little or no soil cover. Wet areas around springs on the lower parts of the slope are also included. Many delineations include the bottoms of some narrow valleys that carry streams in wet weather. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Berks soil is moderate or moderately rapid. The root zone is moderately deep and slightly restricted by the larger rock fragments in the subsoil. Available water capacity is very low. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this soil are woodland.

Because of the very steep slope, very severe erosion hazard, and large stones, this soil is generally unsuited to cropland and pasture.

This soil is moderately well suited to trees. The main concerns in management are the very low available moisture, the erosion hazard, and the equipment limitation. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover are also used to reduce erosion. The moderately deep bedrock is rippable with construction equipment. Log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields because of the very steep slope and the moderately deep bedrock.

The land capability classification is VIIs. The woodland ordination symbol is 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is H-1.

BnB—Bethesda very channery clay loam, 0 to 8 percent slopes

This deep, nearly level and gently sloping, well drained soil is in upland areas that have been surface mined for coal. It is on top of mine-spoil ridges and benches. Slopes dominantly are 3 to 8 percent. The soil is a mixture of rock fragments and partly weathered fine-earth materials that were in or below the profile of the original soil. Most of the rock fragments are flat and less than 10 inches long. In most places the soil has been graded and the larger stones have been buried. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable, very channery clay loam about 5 inches thick. The substratum to a depth of about 80 inches is multicolored, firm, very channery and extremely channery silty clay loam and very channery clay loam. Some areas have a channery clay loam, channery loam, channery silt loam, or channery silty clay loam surface layer.

Included with this soil in mapping are small areas of soils that have layers of sandy loam or loamy sand in the substratum. Also included are a few ponded areas and barren areas where coal has been stockpiled. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Bethesda soil is moderately slow. The depth of the root zone varies within short distances because of differences in the density of the soil material. This causes the available water capacity to vary, but generally it is low. Tilth is poor. Runoff is medium. The content of organic matter is very low.

Some areas are seeded to grasses and are used for pasture; however, most areas are barren or only sparsely covered with broomsedge and other acid-tolerant plants. In a few areas this soil is used for trees or as habitat for wildlife.

This soil is generally unsuited to cropland because of stoniness, low fertility, acidity, and low available water.

This soil is poorly suited to pasture. Acidity, low fertility, and droughtiness are major concerns in pasture management. Much of the rainfall runs off because the soil structure is poor and the plant cover is sparse. Establishing ground cover and applying mulch reduce runoff and erosion, improve tilth, increase the content of organic matter, and improve water intake. Proper stocking rates, pasture rotation, and controlled grazing are needed to maintain good pasture stands. Many areas have potential reservoir sites for livestock water.

Some areas support trees and brush. Black locust and aspen are common. This soil is best suited to trees that can tolerate strongly acid to extremely acid conditions, droughtiness, and a restricted root zone. Grasses provide the needed ground cover in sloping areas while tree seedlings are being established.

Unstable fill is possible anywhere in this map unit; however, after the fill material has settled, most of the unit is moderately well suited as a site for buildings. But some settled areas are still unstable and are generally unsuited for building sites. Onsite investigations are needed to determine the specific suitability of a given area. The control of stormwater runoff and the risk of corrosion of uncoated steel and concrete are management concerns. Stones in the substratum hinder shallow excavations. Building sites should be landscaped so that surface runoff drains away from foundations.

This unit is poorly suited as a site for septic tank absorption fields; the unstable areas are generally unsuited to this use. Onsite investigations are needed. In the stable areas, the main limitation is the moderately slow permeability. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is VIs. It is not assigned a woodland ordination symbol. The pasture and hayland suitability group is E-3.

BnC—Bethesda very channery clay loam, 8 to 20 percent slopes

This deep, strongly sloping, well drained soil is on upland areas that have been surface mined for coal. It is on mine-spoil ridges, benches, and side slopes. The soil is a mixture of rock fragments and partly weathered fine-earth materials that was in or below the profile of the original soil. Most of the rock fragments are flat and less than 10 inches long. In most places the soil has been graded and the larger stones have been buried. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable, very channery clay loam about 6 inches thick. The substratum to a depth of about 80 inches is multicolored, firm, very channery and extremely channery silty clay loam and very channery clay loam. Some areas have a channery clay loam, channery loam, channery silt loam, or channery silty clay loam surface layer.

Included with this soil in mapping are small areas of soils that have layers of sandy loam or loamy sand in the substratum. Also included are a few ponded areas and some barren areas where coal has been stockpiled. Some areas have gullies. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Bethesda soil is moderately slow. The depth of the root zone varies within short distances because of differences in the density of the soil material. This causes the available water capacity to vary, but generally it is low. Tilth is poor. Runoff is rapid. The content of organic matter is very low.

Some areas are seeded to grasses and are used for pasture; however, most areas are barren or only sparsely covered with broomsedge and other acid-tolerant plants. In a few areas this soil is used for trees or as habitat for wildlife.

This soil is generally unsuited to cropland because of stoniness, low fertility, acidity, and low available water.

This soil is poorly suited to pasture. Acidity, low fertility, and droughtiness are major concerns in pasture management. Much of the rainfall runs off because the soil structure is poor and the plant cover is sparse. Establishing ground cover and applying mulch reduce runoff, control erosion, improve tilth, increase the content of organic matter, and improve water intake. Proper stocking rates, pasture rotation, and controlled grazing are needed to maintain good pasture stands. Many areas have potential reservoir sites for livestock water.

Most areas support trees and brush. Black locust and aspen are common. This soil is best suited to trees that can tolerate strongly acid to extremely acid conditions, droughtiness, and a restricted root zone. Grasses provide the needed ground cover in sloping areas while tree seedlings are being established.

Unstable fill is possible anywhere in this map unit; however, after the fill material has settled, most of the unit is moderately well suited as a site for buildings. But some settled areas are still unstable and are generally unsuited for building sites. Onsite investigations are needed to determine the specific suitability of a given area. The control of stormwater runoff and the risk of corrosion of uncoated steel and concrete are management concerns. Stones in the substratum hinder shallow excavations. Building sites should be landscaped so that surface runoff drains away from foundations.

This unit is poorly suited as a site for septic tank absorption fields; the unstable areas are generally unsuited to this use. Onsite investigations are needed. In the stable areas the main limitations are the moderately slow permeability and slope. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is VIs. It is not assigned a woodland ordination symbol. The pasture and hayland suitability group is E-3.

BnF—Bethesda very channery clay loam, 20 to 70 percent slopes

This deep, steep and very steep, well drained soil is in upland areas that have been surface mined for coal. It is on side slopes. Slopes dominantly are 40 to 70 percent. The soil is a mixture of rock fragments and partly weathered fine-earth materials that were in or below the profile of the original soil. Most of the rock fragments are flat and less than 10 inches long. Hillside slips are common. Areas are irregularly shaped and range from 20 to 250 acres in size.

Typically, the surface layer is dark grayish brown, friable, very channery clay loam about 3 inches thick. The substratum to a depth of about 80 inches is multicolored, firm, very channery and extremely channery silty clay loam and very channery clay loam. Some areas have a very channery loam, very channery silt loam, or very channery silty clay loam surface layer. Some stones and boulders are found on and under the surface layer.

Included with this soil in mapping are small areas where the surface layer is sandy loam. Some places have deep gullies. In other areas vertical highwalls cut into rock are common. Small, narrow areas of water occur in V-shaped valleys between the spoil piles and at the base of highwalls. Also included are small, gently sloping and strongly sloping areas on top of spoil piles. Some small, highly acid, toxic areas are included. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Bethesda soil is moderately slow. The depth of the root zone varies within short distances because of differences in the density of the soil material. This causes the available water capacity to vary, but generally it is low. Tilth is poor. Runoff is very rapid. The content of organic matter is very low.

Most of the acreage is idle land and is barren or sparsely vegetated. Black locust has been planted in some areas. In some areas this soil is used as habitat for wildlife.

This soil is generally unsuited to cropland and pasture. Slope, acidity, and low available water are the main limitations.

This soil is best suited to trees that can tolerate strongly acid to extremely acid conditions, droughtiness, and a restricted root zone. The steep and very steep slope makes mechanical planting impractical.

This soil is generally unsuited as a site for buildings and septic tank absorption fields because of the steep and very steep slope, unstable fill material, and the moderately slow permeability.

The land capability classification is VIIe. It is not assigned a woodland ordination symbol. The pasture and hayland suitability group is H-1.

BtA—Bogart silt loam, 0 to 2 percent slopes

This deep, nearly level, moderately well drained soil is on outwash plains and stream terraces. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 36 inches thick. The yellowish brown, upper part is friable silt loam and mottled, firm loam; the lower part is yellowish brown and dark yellowish brown, mottled, firm, gravelly sandy clay loam and mottled, friable, very gravelly sandy loam. The substratum to a depth of about 80 inches is yellowish brown, loose, very gravelly loamy sand. In places the surface layer is loam or gravelly loam. In some areas the soil is well drained.

Included with this soil in mapping are small areas of Fitchville soils. The somewhat poorly drained Fitchville soils have less sand in the subsoil than the Bogart soil and are in slight depressions. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Bogart soil is at a depth of 24 to 42 inches during extended wet periods. Permeability is moderate or moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are in cropland. Some areas are used as pasture. A few areas are woodland.

This soil is well suited to corn, small grains, and hay. Returning crop residue or other organic material to the soil increases water infiltration, improves fertility, and increases the water holding capacity. The natural drainage is adequate for crops. This soil is well suited to no-till.

Most of the pasture areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture, especially deep-rooted plants, such as alfalfa.

This soil is well suited to woodland. Plant competition is moderate, but it can be controlled by removing vines and the less desirable trees and shrubs.

This soil is moderately well suited as a site for buildings. Seasonal wetness is the main limitation. Building sites should be landscaped to provide good surface drainage away from foundations. Open ditches and subsurface drains are used to lower the seasonal high water table. Diversions and drainage ditches help to divert runoff from higher, adjacent soils. Drains at the base of footings remove excess water around foundations and basement walls. Exterior basement wall coatings are also used to help prevent wet basements. Wherever possible, buildings should be located on the included, better drained soils. Sloughing and cave-ins are also a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. Artificial drainage and the use of suitable base material help prevent damage caused by frost action to local roads and streets.

Because of seasonal wetness, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help to lower the seasonal high water table. Effluent from septic tank absorption fields leaches freely, but inadequately filtered effluent may pollute underground water supplies if the distribution lines are placed too deep. Placing septic tank absorption fields in suitable fill material reduces this hazard.

The land capability classification is I. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-6.

BtB—Bogart silt loam, 2 to 6 percent slopes

This deep, gently sloping, moderately well drained soil is on outwash plains and stream terraces. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part is yellowish brown, friable silt loam and mottled, friable and firm, loam; the lower part is yellowish brown and dark yellowish brown, mottled, firm, gravelly sandy clay loam and mottled, friable, very gravelly coarse sandy loam. The substratum to a depth of about 80 inches is dark grayish brown, loose, very gravelly loamy sand. In places the surface layer is loam or gravelly loam. In some small eroded spots subsoil material is mixed into the surface layer. In some areas the soil is well drained.

Included with this soil in mapping are small areas of Glenford and Fitchville soils. The moderately well drained Glenford soils and the somewhat poorly drained Fitchville soils have less sand in the subsoil than the Bogart soil. Glenford soils are on foot slopes. Fitchville soils are in slight depressions and on foot slopes. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Bogart soil is at depths of 24 to 42 inches during extended wet periods. Permeability is moderate or moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is moderate, and tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are used as woodland.

This soil is well suited to corn, small grains, and hay. This soil tends to be droughty in extended dry periods. Controlling erosion and conserving moisture are the main concerns of management. Cover crops, rotations that include grasses and legumes, grassed waterways, and conservation tillage, which leaves crop residue on the surface, all help to reduce runoff and to control erosion. This soil is well suited to no-till. Leaving crop residue on the surface in fall and not plowing until spring protect the soil against erosion. Returning crop residue or other organic material to the soil increases water infiltration, improves fertility, and increases the water holding capacity.

Most areas of pasture are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture, especially deep-rooted plants, such as alfalfa. Erosion is a moderate hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding reduce the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help keep the plants and soil in good condition.

This soil is well suited to woodland. Plant competition is moderate, but can be controlled by removing vines and the less desirable trees and shrubs.

This soil is moderately well suited as a site for buildings. Seasonal wetness is the main limitation. Building sites should be landscaped to provide good surface drainage away from foundations. Diversions and drainage ditches that intercept runoff from higher adjacent soils help to reduce seasonal wetness and to control erosion. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Open ditches and subsurface drains are used to lower the seasonal high water table. Drains at the base of footings remove excess water around foundations and basement walls. Exterior basement wall coatings are also used to help prevent wet basements. Wherever possible, buildings should be located on the included better drained soils. Sloughing and cave-ins are also a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. Artificial drainage and the use of suitable base material help to prevent damage caused by frost action to local roads and streets.

Because of seasonal wetness, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help to lower the seasonal high water table. Effluent from septic tank absorption fields leaches freely, but inadequately filtered effluent may pollute underground water supplies if the distribution lines are placed too deep. Placing septic tank absorption fields in suitable fill material reduces this hazard.

The land capability classification is IIe. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-6.

BvD—Brownsville channery silt loam, 15 to 25 percent slopes

This deep, moderately steep, well drained soil is on the upper parts of side slopes of valleys cut into hills on the unglaciated uplands. Most areas are above steeper slopes and below less sloping ridgetops. Areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable channery silt loam about 4 inches thick. The subsoil is yellowish brown, friable and firm very channery silt loam and channery loam, about 38 inches thick. The substratum, about 18 inches thick, is yellowish brown, friable very channery silt loam. Siltstone bedrock is at a depth of about 60 inches. In some areas the surface layer is very channery silt loam. In places the subsoil has more clay. Also, in places, bedrock is above a depth of 40 inches.

Included with this soil in mapping are small areas of Coshocton and Westmoreland soils on narrow foot slopes. The Brownsville soil is stonier than Coshocton and

Westmoreland soils. Also included are some scattered areas of rock outcrops that have little or no soil cover and small wet areas at the heads of drainageways. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Brownsville soil is moderate or moderately rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low, and tilth is fair. Runoff is rapid. The content of organic matter is moderate.

Most areas of this soil are woodland. Some areas are used as pasture. A few areas are used as cropland.

This soil is poorly suited to corn, small grains, and hay. Controlling erosion and conserving moisture are the main concerns of management. A conservation tillage system, which leaves crop residue on the surface, helps to reduce erosion and to conserve moisture; however, this channery soil is generally unsuited to no-till. Other conservation measures that control erosion are grassed waterways, contour stripcropping, and cover crops. Most surface stones are too small to interfere with cultivation but they cover enough of the surface in some areas to affect the stand of small grains and forages.

On pasture, this soil is moderately well suited to grasses and legumes. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of the summer. Overgrazing or cultivation of this soil will increase the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is moderately well suited to trees. Slope, plant competition, and low available moisture are the main concerns in management. Building haul roads and skid trails on the contour facilitates the use of equipment. Also, log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is poorly suited as a site for buildings and septic tank absorption fields. Slope is the main limitation. Building sites should be located on the less sloping areas of this unit. Most of the rock and rock fragments in the upper 4 feet can be excavated quite easily. Because of slope, the effluent from septic tank absorption fields can seep to the surface. If this soil is used as a site for septic tank absorption fields, the effluent in moderately deep included areas could possibly contaminate the ground water. Installing the distribution lines on the contour and as shallow as possible reduces the hazard of effluent seeping to the surface or contaminating ground water.

The land capability classification is IVe. The woodland ordination symbol is 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is B-1.

BvE—Brownsville channery silt loam, 25 to 35 percent slopes

This deep, steep, well drained soil is on side slopes of valleys cut into hills on unglaciated uplands. Most areas are long and narrow and range from 10 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, friable channery silt loam about 4 inches thick. The subsoil is yellowish brown, friable and firm very channery silt loam and channery silt loam, about 32 inches thick. The substratum, about 19 inches thick, is yellowish brown, friable very channery silt loam. Siltstone bedrock is at a depth of about 55 inches. In some areas the surface layer is very channery silt loam. In places the subsoil has more clay. Also, in places bedrock is above a depth of 40 inches.

Included with this soil in mapping are small areas of Coshocton and Westmoreland soils on narrow foot slopes. The Brownsville soil is stonier than Coshocton and Westmoreland soils. Also included are some scattered areas of rock outcrops that have little or no soil cover and small, wet areas at the heads of drainageways. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Brownsville soil is moderate or moderately rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low, and tilth is fair. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this soil are wooded; a few areas are used as pasture.

Because of the steep slope and very severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to grasses and legumes used as pasture. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of the summer. If the pasture is overgrazed, the hazard of erosion is very severe. Timely grazing, proper stocking rates, and pasture rotation help keep the soil and plants in good condition.

This soil is moderately well suited to trees. Slope, plant competition, and low available moisture are the main concerns in management. Building haul roads and skid trails on the contour facilitates the use of equipment. Also, log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields. The steep slope is the main limitation.

The land capability classification is VIe. The woodland ordination symbol is 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is B-2.

BvF—Brownsville channery silt loam, 35 to 70 percent slopes

This deep, very steep, well drained soil is on valley side slopes on the unglaciated uplands. Most delineations include one side slope of a major valley or both side slopes of narrow tributary valleys. Individual areas are long and narrow and range from 10 to 200 acres in size.

Typically, the surface layer is very dark grayish brown, friable channery silt loam about 2 inches thick. The subsoil, about 40 inches thick, is light yellowish brown and yellowish brown, friable and firm very channery silt loam and extremely channery silt loam. Fine grained sandstone bedrock is at a depth of about 42 inches. In some areas the surface layer is very channery silt loam. In places the subsoil has more clay. Also, in places bedrock is above a depth of 40 inches.

Included with this soil in mapping are small areas of Coshocton and Westmoreland soils on narrow foot slopes. The Brownsville soil is stonier than Coshocton and Westmoreland soils. Also included are some scattered areas of rock outcrops that have little or no soil cover. Wet areas around springs on the lower parts of the slope are also included. Many delineations include the bottoms of some narrow valleys that carry streams in wet weather. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Brownsville soil is moderate or moderately rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low, and tilth is fair. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this soil are used as woodland.

Because of the very steep slope and the very severe erosion hazard, this soil is generally unsuited to cropland and pasture.

This soil is moderately well suited to trees. Controlling erosion, slope, plant competition, and low available moisture are the main concerns in management. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover are also used to reduce erosion. Log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields because of the very steep slope.

The land capability classification is VIIe. The woodland ordination symbol is 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is H-1.

ByF—Brownsville-Rock outcrop complex, 35 to 70 percent slopes

This map unit consists of deep, very steep, well drained soils and rock outcrops on side slopes on the unglaciated uplands. Most areas are about 70 percent Brownsville channery silt loam and 20 percent Rock outcrop. The Brownsville soil and Rock outcrop are very intermingled on the landscape. They are so intricately mixed or in areas so small that mapping them separately was not practical. Most areas are long and narrow and range from 10 to 100 acres in size.

Typically, the Brownsville soil has a very dark grayish brown, friable channery silt loam surface layer about 3 inches thick. The subsoil is yellowish brown, friable and firm extremely channery silt loam, very channery silt loam, and channery loam, about 30 inches thick. The substratum is yellowish brown, friable very channery silt loam. Siltstone bedrock is at a depth of about 45 inches. In some areas the surface layer is very channery silt loam. Also, in places bedrock is above a depth of 40 inches.

Typically, the Rock outcrop consists of siltstone and sandstone outcrops. Some places have small areas of shale outcrops.

Included with this unit in mapping are small areas of Coshocton and Westmoreland soils on narrow foot slopes. The Brownsville soil is stonier than Coshocton and Westmoreland soils. Also included are wet areas at the heads of drainageways. These inclusions make up about 10 percent of most areas.

Permeability of the Brownsville soil is moderate or moderately rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low, and tilth is fair. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this unit are wooded.

This map unit is generally unsuited to cropland and pasture. The very steep slope, rock outcrop, and very severe erosion hazard are the main limitations.

For woodland, this unit is poorly suited to trees because of the very steep slope, rock outcrops, and low available moisture. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover are also used to reduce erosion. Log landings should be located on less sloping soils nearby, or landing sites can be improved on this soil by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

Because of the very steep slope, this map unit is generally unsuited as a site for buildings and septic tank absorption fields.

The land capability classification is VIIe. The woodland ordination symbol of the Brownsville soil is 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group of the Brownsville soil is H-1. Rock outcrop is not assigned a woodland ordination symbol or pasture and hayland suitability group.

CdB—Canfield silt loam, 2 to 6 percent slopes

This deep, gently sloping, moderately well drained soil is on slightly convex areas on the glaciated uplands. Areas are irregularly shaped and range from 5 to 250 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 39 inches thick. The upper part is brown and strong brown, friable and firm silt loam; the middle part is yellowish brown and dark yellowish brown, mottled, firm loam; and the lower part is dark yellowish brown, mottled, very firm and brittle loam (fragipan). The substratum to a depth of about 80 inches is olive brown and light olive brown, friable loam glacial till. A few places have a surface layer of loam. In some areas the soil is well drained.

Included with this soil in mapping and making up about 10 to 15 percent of most areas are small areas of the somewhat poorly drained Ravenna soils in depressions and shallow drainageways.

A perched, seasonal high water table in this Canfield soil is at a depth of 18 to 36 inches during extended wet periods. A fragipan is at a depth of 15 to 30 inches. Permeability is moderate above the fragipan and slow in the fragipan. The root zone mainly is restricted to the 15- to 30-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Many areas of this soil are in cropland. Some areas are used as pasture. Some areas are wooded.

This soil is well suited to corn, small grains, and hay. A moderate hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns of management. Seasonal wetness delays planting in spring. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. Deferring plowing until spring, after leaving crop residue on the surface over winter, also helps to control erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting. In some areas, subsurface drains are used to lower the seasonal high water table of the Canfield soil. In other areas, only random subsurface drains are used to drain seepy spots and areas of the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to a variety of pasture plants. If the pasture is overgrazed or if the soil is plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding reduce the risk of erosion. Timely deferment of grazing when the soil is wet and soft helps to prevent surface compaction.

This soil is well suited to trees. Woodland management concerns include a moderate seedling mortality rate, a moderate plant competition limitation, and a moderate windthrow hazard (fig. 7). Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard.

This soil is moderately well suited as a site for buildings. Seasonal wetness is the main limitation. Building sites should be landscaped to provide good surface drainage away from foundations. Diversions and surface drains that intercept runoff from higher, adjacent soils reduce seasonal wetness and help to control erosion. Open ditches and subsurface drains are used to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Wherever possible, buildings should be located on the included, better drained soils. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

Because of seasonal wetness and slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help to lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope.

Figure 7.—A fragipan restricts the root zone of trees on Canfield silt loam, 2 to 6 percent slopes. On woodland, therefore, windthrow is a moderate hazard.

Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIe. The woodland ordination symbol is 5D. The pasture and hayland suitability group is F-3.

CdC—Canfield silt loam, 6 to 12 percent slopes

This deep, moderately sloping, moderately well drained soil is on side slopes of small, natural drainageways and on complex slopes on glaciated uplands. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, firm silt loam; the middle part is yellowish brown and dark yellowish brown, mottled, firm loam; and the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 80 inches is olive brown, friable loam glacial till. A few places have a surface layer of loam. In some eroded spots, yellowish brown subsoil material is mixed into the surface layer. In some areas the soil is well drained.

Included with this soil in mapping and making up about 10 to 15 percent of most areas are small areas of the somewhat poorly drained Ravenna soils in shallow drainageways and on the lower slopes.

A perched, seasonal high water table in this Canfield soil is at a depth of 18 to 36 inches during extended wet periods. A fragipan is at a depth of 15 to 30 inches. Permeability is moderate above the fragipan and slow in the fragipan. The root zone mainly is restricted to the 15- to 30-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

A few areas of this soil are used as cropland. Some areas are used as pasture. Most areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. A severe hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns of management. Erosion reduces the thickness of the root zone above the fragipan, thus reducing the volume of soil from which crops can extract moisture and plant nutrients. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Crop residue or other organic material returned to the soil increases the rate of water infiltration, improves tilth and fertility, and reduces crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

On pasture, this soil is well suited to grasses and legumes. If the soil is plowed for seedbed preparation or if the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. However, trees are subject to windthrow, seedlings have a moderate mortality rate, plant competition is moderate, and slope is a concern during harvest for log landings. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Log landings should be located on less sloping soils nearby; or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard.

This soil is moderately well suited as a site for buildings. Slope and seasonal wetness are the main limitations. Building sites should be landscaped to provide good surface drainage away from foundations and subsurface drains are used to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings and exterior coatings on basement walls help to prevent wet basements. Diversions carry away runoff from higher adjacent soils, reduce seasonal wetness, and help to control erosion. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material minimize the damage caused by frost action to local roads and streets.

Because of seasonal wetness and slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field help lower the seasonal high water table. Effluent from absorption fields can seep along the top of the fragipan and surface downslope. Placing the distribution lines across the slope reduces seepage to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIIe. The woodland ordination symbol is 5D. The pasture and hayland suitability group is F-3.

CdC2—Canfield silt loam, 6 to 12 percent slopes, eroded

This deep, moderately sloping, moderately well drained soil is on side slopes of small natural drainageways and on complex slopes on glaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm silt loam; the middle part is yellowish brown, mottled, firm loam; and the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 60 inches is olive brown, friable loam glacial till. A few places have a surface layer of loam. In some areas bedrock is between a depth of 48 and 60 inches. In some areas the soil is well drained.

Included with this soil in mapping are small areas of the somewhat poorly drained Ravenna soils in shallow drainageways and on the lower slopes. Also included are a few small areas of severely eroded soils on knolls. These severely eroded soils have poor tilth. Included soils make up about 10 to 15 percent of most areas.

A perched, seasonal high water table in this Canfield soil is at a depth of 18 to 36 inches during extended wet periods. A fragipan is at a depth of 15 to 30 inches. Permeability is moderate above the fragipan and slow in the fragipan. The root zone mainly is restricted to the 15- to 30-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Most areas of this soil are used as cropland. Other areas are used as pasture.

This soil is moderately well suited to corn and small grains and well suited to hay. Controlling the severe hazard of erosion and reducing crusting are the main concerns of management. Further erosion reduces the thickness of the root zone above the fragipan and the volume of soil from which crops can extract moisture and plant nutrients. Conservation tillage, which leaves crop residue on the surface, contour stripcropping, winter cover crops, and grassed waterways help to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. Crop rotations that include a high percentage of hay and pasture and regular applications of barnyard manure and other organic material also help to control erosion and to reduce surface crusting. Areas of this soil on side slopes along drainageways can be easily adapted to contour stripcropping. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture. If the soil is plowed to prepare a seedbed or if the pasture is overgrazed, continued erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees, but all areas have been cleared for cropland or pasture. However, trees are subject to windthrow, seedlings have a moderate mortality rate, the plant competition is moderate, and slope is a concern during harvest for log landings. Planting seedlings that have been transplanted once reduces the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Log landings should be located on less sloping soils nearby; landing sites on this soil can be improved by cutting and filling to a more desirable slope. Frequent, light thinning and harvesting increases stand vigor and reduces the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated also reduce the windthrow hazard.

This soil is moderately well suited as a site for buildings. Slope and seasonal wetness are the main limitations. Building sites should be landscaped to provide good surface drainage away from foundations. Subsurface drains are used to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings and exterior coatings on basement walls help to prevent wet basements. Diversions carry away runoff from higher adjacent soils, reduce seasonal wetness, and help to control erosion. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material minimize the damage caused by frost action to local roads and streets.

Because of seasonal wetness and slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field help lower the seasonal high water table. Effluent from absorption fields can seep along the top of the fragipan and surface downslope. Placing the distribution lines across the slope reduces seepage to the surface. Enlarging the absorption field or installing a double absorption field system increases absorption of effluent.

The land capability classification is IIIe. The woodland ordination symbol is 5D. The pasture and hayland suitability group is F-3.

Ce—Carlisle muck

This deep, nearly level, very poorly drained soil is in bogs and depressions on lake plains and outwash plains. The slope is less than 2 percent. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is black, friable muck about 10 inches thick. Below the surface layer, to a depth of about 60 inches, are layers of black, very dark brown, dark reddish brown, and very dark grayish brown, friable muck. Some places have a thin surface layer of silt loam. In other places the organic layer is thinner.

Included with this soil in mapping and making up about 10 to 15 percent of most areas are small areas of Luray soils, which formed in mineral material. Luray soils typically form a narrow rim around the outer edge of the Carlisle soil. Also included are areas of Carlisle soils that are ponded for long periods.

The seasonal high water table in this Carlisle soil is near or above the surface during extended wet periods. Permeability is moderately slow to moderately rapid. The root zone is deep. Available water capacity is very high. Tilth is good. Runoff is very slow or the soil is ponded. The content of organic matter is very high.

Most drained areas of this soil are used for crops (fig. 8). Undrained areas are mainly used as habitat for wetland wildlife. Some undrained areas are used as pasture. A few areas are wooded.

If drained, this soil is moderately well suited to corn. Special crops, such as vegetables, are grown in some areas. This soil is poorly suited to hay and generally not suited to small grains because of ponding. Undrained areas are too wet for cultivated crops. Commonly, subsurface drains and open ditches are used to drain an area. The banks of open ditches are unstable and subject to sloughing. Subsidence or soil shrinkage takes place as the organic material dries out and becomes oxidized; consequently, subsurface drains may eventually shift out of alignment. Controlled drainage, by which the water table can be raised or lowered as needed, reduces the shrinkage. This soil is subject to wind erosion, but soil blowing generally can be controlled by planting cover crops and using shrub and tree windbreaks.

On pasture, this soil is moderately well suited to grass but poorly suited to legumes; however, it is poorly suited to grazing because of wetness. Although pastures on this soil are productive even in long, dry periods, the soil is very soft most of the year. Because the soil is very soft in spring and during other extended wet periods, grazing during these periods can cause considerable damage to plants and reduce air and water movement through the soil.

This soil is moderately well suited to trees adapted to wet sites and well suited to habitat for wetland wildlife. Included areas that are ponded for long periods are generally unsuited to trees. Trees are subject to windthrow. Seasonal wetness and low strength limit site preparation and planting. Seedlings have a severe mortality rate. Plant competition is severe for seedlings and wetness and low strength are management concerns during harvest for haul roads and log landings. Site preparation and planting can be done during dry periods. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Logging can be done when the soil is frozen or skid trails can be built on better suited soils nearby.

Because of ponding, low strength, and subsidence, this soil is generally unsuited as a site for buildings and septic tank absorption fields.

The land capability classification is IIIw. The woodland ordination symbol is 6W. The pasture and hayland suitability group is D-1.

CgB—Centerburg silt loam, 2 to 6 percent slopes

This deep, gently sloping, moderately well drained soil is on slightly convex areas on the glaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, firm silty clay loam; the middle part is yellowish brown, mottled, firm clay loam; and the lower part is dark yellowish brown and light olive brown, mottled, firm clay loam. The substratum to a depth

Figure 8.—Drained areas of Carlisle muck, in the foreground, are well suited to corn.

of about 80 inches is light olive brown, mottled, firm loam glacial till. A few low knolls are eroded and have subsoil material mixed into the surface layer. In some areas the soil is well drained.

Included with this soil in mapping and making up about 10 to 15 percent of most areas are small areas of somewhat poorly drained soils in depressions.

A perched, seasonal high water table in this Centerburg soil is at a depth of 18 to 36 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Controlling erosion and maintaining tilth are the main concerns of management. This soil remains wet later in spring than adjacent well drained soils. No-till and other forms of conservation tillage that leave crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces surface crusting. Random subsurface drains commonly are used to drain areas of the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture. If the soil is plowed to prepare a seedbed or if the pasture overgrazed, erosion is a moderate hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Timely deferment of grazing when the soil is wet and soft helps to prevent surface compaction.

This soil is well suited to trees. Plant competition is severe and low strength is a concern during harvest for haul roads and log landings. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is moderately well suited as a site for buildings. Seasonal wetness and the shrinking and swelling of the soil are the main limitations. Building sites should be landscaped to permit surface runoff to drain away from foundations. Subsurface drains also reduce wetness. Drains at the base of footings are used to remove excess water from around foundations and basement walls. Exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. Diversions and surface drains that intercept runoff from higher adjacent soils help to reduce seasonal wetness and to control erosion. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

Because of seasonal wetness and moderately slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table. Effluent from absorption fields can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the absorption field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIe. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-6.

CgC2—Centerburg silt loam, 6 to 12 percent slopes, eroded

This deep, moderately sloping, moderately well drained soil is on side slopes along small drainageways and on complex slopes on glaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 35 inches thick. It is yellowish brown and dark yellowish brown, firm silty clay loam and clay loam. It is mottled in the middle and lower parts. The substratum to a depth of about 80 inches is yellowish brown, mottled, firm loam glacial till. In some areas the soil is well drained. Wooded areas are not eroded.

Included with this soil in mapping and making up about 10 to 15 percent of most areas are small areas of somewhat poorly drained soils on toe slopes and in depressions.

A perched, seasonal high water table in this Centerburg soil is at a depth of 18 to 36 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Most areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. Controlling further erosion and reducing surface crusting are the main management concerns. Continued erosion is a severe hazard. No-till and other forms of conservation tillage that leave crop residue on the surface, contour tillage, contour stripcropping, planting winter cover crops, and grassed waterways help to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. Rotations that include a high percentage of hay or pasture and regular applications of barnyard manure and other organic material also help to control erosion and surface crusting. Many areas of this soil can be easily adapted to contour stripcropping. Random subsurface drains commonly are used to drain areas of the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture. If the soil is plowed to prepare a seedbed or if the pasture is overgrazed, further erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Timely deferment of grazing when the soil is wet and soft helps to prevent surface compaction.

This soil is well suited to trees. Plant competition is severe for seedlings. Slope is a concern during harvest for log landings and low strength is a concern during harvest for haul roads and log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is moderately well suited as a site for buildings. Slope, seasonal wetness, and shrinking and swelling of the soil are the main limitations. Building sites should be landscaped to permit surface runoff to drain away from foundations. Drains at the base of footings are used to remove excess water from around foundations and basement walls. Exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. Diversions that intercept runoff from higher adjacent soils help to reduce seasonal wetness and to control erosion. Maintaining the plant cover and using water control practices during construction will also help to control erosion. In constructing local roads and streets, artificial drainage and a suitable base material reduce damage from frost action.

Because of seasonal wetness and moderately slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from absorption fields help lower the seasonal high water table. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIIe. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-6.

CnA—Chili loam, 0 to 2 percent slopes

This deep, nearly level, well drained soil is on outwash plains and stream terraces. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is brown, friable loam about 10 inches thick. The subsoil is about 40 inches thick. In the upper part it is brown and dark yellowish brown, friable and firm clay loam and gravelly clay loam; and in the lower part it is yellowish brown, friable and firm, gravelly sandy clay loam and very gravelly sandy loam. The substratum to a depth of about 80 inches is yellowish brown, loose, very gravelly loamy sand. In some areas the surface layer and the upper part of the subsoil are silt loam. In a few places the surface layer is gravelly loam. In a few areas the subsoil has more silt and less gravel. In some areas the soil is moderately well drained.

Included with this soil in mapping are small areas of Glenford and Fitchville soils. The moderately well drained Glenford soils and the somewhat poorly drained Fitchville soils have less sand in the subsoil than this Chili soil and are in slight depressions and on foot slopes. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Chili soil is moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. It can be tilled early in spring. The surface layer can be worked throughout a fairly wide range in moisture content. Droughtiness is a hazard. Returning crop residue or other organic material to the soil increases the rate of water infiltration, improves fertility, and increases the water holding capacity. The natural drainage is adequate for crops. This soil is well suited to no-till. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent or timely applications of fertilizer than to a large application.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture, especially deep-rooted plants, such as alfalfa. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of summer.

This soil is well suited to trees. Plant competition is moderate, but can be controlled by removing vines and the less desirable trees and shrubs.

This soil is well suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. Sloughing is a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. If the distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply because of rapid permeability in the substratum. Placing septic tank absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action. This soil is a good source of roadfill and a probable source of sand and gravel.

The land capability classification is IIs. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-1.

CnB—Chili loam, 2 to 6 percent slopes

This deep, gently sloping, well drained soil is on outwash plains, stream terraces, and low kames. The smaller areas are rounded, and the larger areas are long and narrow. Areas range from 5 to 40 acres in size.

Typically, the surface layer is dark brown, friable loam about 4 inches thick. The subsurface layer is yellowish brown, friable loam about 4 inches thick. The subsoil, about 48 inches thick, is yellowish brown and dark yellowish brown, friable, firm, and very friable loam and very gravelly sandy loam. The substratum to a depth of about 80 inches is dark yellowish brown, very friable very gravelly loamy sand and loose, very gravelly sand. In places the surface layer is silt loam or gravelly loam. In some small eroded spots, subsoil material is mixed into the surface layer. In some areas the soil is moderately well drained.

Included with this soil in mapping are small areas of Glenford and Fitchville soils. The moderately well drained Glenford soils and the somewhat poorly drained Fitchville soils have less sand in the subsoil than the Chili soil and are in slight depressions and on foot slopes. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Chili soil is moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is well suited to corn, small grains, and hay. Controlling erosion and conserving moisture are the main concerns of management. This soil can be tilled early in spring. The surface layer can be worked throughout a fairly wide range in moisture content. Contour tillage, cover crops, rotations that include grasses and legumes, grassed waterways, and conservation tillage, which leaves crop residue on the surface, all help to reduce runoff and to control erosion. This soil is well suited to no-till. In many areas this soil is not adapted to contour stripcropping because the slopes are complex. Leaving crop residue on the surface in fall and not plowing until spring help to protect the soil against erosion. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity and improves the fertility of the soil. Because nutrients are moderately rapidly leached, crops generally respond better to small but frequent and timely applications of fertilizer than to a large application.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture, especially deep-rooted plants, such as alfalfa. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of summer. Erosion is a moderate hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the plants and soil in good condition.

This soil is well suited to trees. Plant competition is moderate, but it can be controlled by removing vines and the less desirable trees and shrubs.

This soil is well suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. Sloughing and cave-ins are a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. If the distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply because of rapid permeability in the substratum. Placing septic tank absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action. This soil is a good source of roadfill and a probable source of sand and gravel.

The land capability classification is IIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-1.

CnC2—Chili loam, 6 to 12 percent slopes, eroded

This deep, moderately sloping, well drained soil is on outwash plains, stream terraces, and kames. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and subsoil material. Areas on kames are rounded and generally range from 5 to 10 acres in size. Areas on terraces are long and narrow and range from 5 to 50 acres in size. Areas on outwash plains are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The yellowish brown and strong brown subsoil is about 42 inches thick. The upper part is friable and firm, gravelly loam and gravelly clay loam; the lower part is friable, very gravelly loam. The substratum to a depth of about 80 inches is yellowish brown, very friable, very gravelly loamy sand. In places the surface layer is silt loam or gravelly loam. In some areas the soil is moderately well drained. Wooded areas are not eroded.

Included with this soil in mapping are small areas of Glenford and Fitchville soils. The moderately well drained Glenford soils and the somewhat poorly drained Fitchville soils have less sand in the subsoil than the Chili soil and are in shallow drainageways and slight depressions and on foot slopes. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Chili soil is moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Most areas of this soil are used as cropland (fig. 9). Some areas are used as pasture. A few areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. Controlling erosion and conserving moisture are the main concerns of management. Continued erosion is a severe hazard. This soil can be tilled early in spring. The surface layer can be worked throughout a fairly wide range in moisture content. This soil is well suited to no-till and other forms of conservation tillage that keep crop residue on the surface. Contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. The areas of this soil that have simple slopes are well suited to such erosion-control measures as contour stripcropping, but these practices are not adapted to the shorter, more complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also help to protect the soil against

Figure 9.—In many areas, Chili loam, 6 to 12 percent slopes, eroded, is used for corn, small grains, and hay.

erosion. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity and improves the fertility of the soil. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent, and timely applications of fertilizer than to one large application.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of summer. Erosion is a severe hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion.

This soil is well suited to trees. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs. Also, slope is a concern during harvest for log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope.

Because of slope, this soil is moderately well suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. Sloughing and cave-ins are a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. If distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply. Placing the absorption fields in suitable fill material reduces this hazard. Placing distribution lines across the slope reduces seepage of effluent to the surface. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action. This soil is a good source of roadfill and a probable source of sand and gravel.

The land capability classification is IIIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-1.

CnD2—Chili loam, 12 to 18 percent slopes, eroded

This deep, strongly sloping, well drained soil is on outwash plains, stream terraces, and kames. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and subsoil material. The areas are rounded, long and narrow, or irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The yellowish brown and strong brown subsoil is about 40 inches thick. The upper part is friable and firm gravelly loam and gravelly clay loam; the lower part is friable very gravelly loam. The substratum to a depth of about 60 inches is yellowish brown, very friable, very gravelly loamy sand. In some areas the surface layer is gravelly loam. Wooded areas are not eroded.

Included with this soil in mapping are small areas of droughtier, severely eroded soils, the surface layer of which consists almost entirely of subsoil material. Also included are some seeps and springs. The included areas make up about 10 to 15 percent of most mapped areas.

Permeability in this Chili soil is moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Some areas of this soil are used as cropland. Other areas are used as pasture. A few areas are wooded.

This soil is poorly suited to corn and small grains and moderately well suited to hay. Slope and the severe hazard of further erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. Row crops can be grown occasionally if erosion is controlled. No-till or other conservation tillage systems that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not suited because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways, where runoff concentrates. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent, and timely applications of fertilizer than to one large application.

On pasture, this soil is moderately well suited to grasses and legumes. If the soil is plowed for seedbed preparation or if the pasture is overgrazed, the hazard of continued erosion is severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and soil in good condition.

This soil is well suited to trees. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs. Also, slope limits the use of equipment and runoff can cause erosion. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting.

Because of slope, this soil is poorly suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. Sloughing and cave-ins are a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. If the distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply. Placing the absorption fields in suitable fill material reduces this hazard. Placing distribution lines across the slope reduces seepage of effluent to the surface. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action. This soil is a good source of roadfill and a probable source of sand and gravel.

The land capability classification is IVe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is A-1.

CnE—Chili loam, 18 to 25 percent slopes

This deep, moderately steep, well drained soil is on side slopes of deeply entrenched drainageways on stream terraces. Most areas are long and narrow and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable loam about 6 inches thick. The yellowish brown and strong brown subsoil is about 38 inches thick. The upper part is friable and firm gravelly loam and gravelly clay loam; the lower part is friable very gravelly loam. The substratum to a depth of about 60 inches is yellowish brown, very friable, very gravelly loamy sand. In places the surface layer is gravelly loam.

Included with this soil in mapping are small areas of droughtier, severely eroded soils; the surface layer of which consists almost entirely of subsoil material. Also included are some seeps and springs. The included areas make up about 10 to 15 percent of most mapped areas.

Permeability in this Clili soil is moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is very rapid. The content of organic matter is moderate.

Most areas of this soil are in pasture. Other areas are used for woodland.

Because of slope and the very severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to grasses and legumes used as pasture. The natural drainage permits early spring grazing, but little forage is produced during the dry part of summer. If the pasture is overgrazed, the hazard of erosion is very severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs. Also, slope limits the use of equipment and runoff can cause erosion. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting.

Because of slope, this soil is poorly suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. Sloughing and cave-ins are a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. If the distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply. Placing the absorption fields in suitable fill material reduces this hazard. Placing distribution lines across the slope reduces seepage of effluent to the surface. This soil is a good source of roadfill and a probable source of sand and gravel.

The land capability classification is VIe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is A-2.

CnF—Chili loam, 25 to 70 percent slopes

This deep, very steep, well drained soil is on side slopes of deeply entrenched drainageways on stream terraces and on slope breaks between terraces and flood plains. Most areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable loam about 6 inches thick. The yellowish brown and strong brown subsoil is about 36 inches thick. The upper part is friable and firm gravelly loam and gravelly clay loam; the lower part is friable very gravelly loam. The substratum to a depth of about 60 inches is yellowish brown, very friable very gravelly loamy sand. In places the surface layer is gravelly loam.

Included with this soil in mapping and making up about 10 percent of most areas are small areas of somewhat poorly drained soils near seeps and springs.

Permeability in this Chili soil is moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is very rapid. The content of organic matter is moderate.

Most areas are used as woodland and as wildlife habitat.

Because of slope and the very severe erosion hazard, this soil is generally unsuited to cropland and pasture.

This soil is well suited to trees. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs. Also, slope severely limits the use of equipment and runoff can cause erosion. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting.

This soil is generally unsuited as a site for buildings and septic tank absorption fields. The very steep slope is the main limitation.

The land capability classification is VIIe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is H-1.

CoE—Chili-Amanda complex, 18 to 25 percent slopes

This complex consists of deep, moderately steep, well drained soils on side slopes of deeply entrenched drainageways on stream terraces and low, glaciated uplands adjacent to stream valleys. Most areas are about 50 percent Chili loam and 40 percent Amanda loam. The Chili soil typically is on the lower parts of slopes and the Amanda soil is on the upper parts. They are so intricately mixed or in areas so small that mapping them separately was not practical. Most areas are long and narrow and range from 5 to 30 acres in size.

Typically, the Chili soil has a brown, friable loam surface layer about 8 inches thick. The yellowish brown and strong brown subsoil is about 36 inches thick. The upper part is friable and firm gravelly loam and gravelly clay loam; the lower part is friable, very gravelly loam. The substratum to a depth of about 60 inches is yellowish brown, very friable very gravelly loamy sand. In places the surface layer is gravelly loam. Some areas have slopes of 25 to 40 percent.

Typically, the Amanda soil has a brown, friable loam surface layer about 8 inches thick. The subsoil, about 48 inches thick, is yellowish brown, friable and firm loam. It is mottled in the lower part. The substratum to a depth of about 60 inches is dark yellowish brown, friable loam glacial till. Some areas have a silt loam surface layer. A few areas have more sand in the subsoil and substratum. Some areas have slopes of 25 to 40 percent. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained.

Included with this soil in mapping and making up about 10 percent of most areas are small areas of somewhat poorly drained soils near seeps and springs.

A seasonal high water table is at a depth of more than 48 inches in the Amanda soil. Permeability is moderately rapid in the subsoil and rapid in the substratum of the Chili soil, and moderately slow in the Amanda soil. The root zone is deep in both soils. Available water capacity is low or moderate in the Chili soil and moderate or high in the Amanda soil. Tilth is good in both soils. Runoff is very rapid. The content of organic matter is moderate in both soils.

Some areas of these soils are in pasture. Other areas are used for woodland.

Because of the moderately steep slope and the severe erosion hazard, these soils are generally unsuited to cropland.

These soils are poorly suited to grasses and legumes used as pasture. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of summer on the Chili soil. If the pasture is overgrazed, the hazard of erosion is severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soils and plants in good condition.

These soils are well suited to trees. Slope limits the use of equipment and runoff can cause erosion. Plant competition is moderate on the Chili soil and severe on the Amanda soil. Also, low strength on the Amanda soil limits the use of harvesting equipment. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, these soils are poorly suited as a site for buildings. Other than slope, the main limitations on the Amanda soil are seasonal wetness and shrinking and swelling of the soil. Building sites should be landscaped to provide good surface drainage away from foundations. Diversions carry away runoff from higher adjacent soils, reduce seasonal wetness, and prevent further erosion. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the Amanda soil. Sloughing and cave-ins are a hazard if the Chili soil is excavated. Special safety precautions are needed in digging basements or trenches. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Locating roads and streets on the contour will reduce the steepness of grade. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

These soils are poorly suited as a site for septic tank absorption fields. Slope is the major limitation. But on the Amanda soil, seasonal wetness and the moderately slow permeability also are serious limitations. On the Chili soil, if distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply. Placing the absorption fields in suitable fill material reduces this hazard. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table on the Amanda soil. Because of slope, effluent from absorption fields may surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is VIe. The woodland ordination symbols are 4R on the Chili soil and 5R on the Amanda soil. The pasture and hayland suitability group is A-2 for both soils.

CpA—Cidermill silt loam, 0 to 2 percent slopes

This deep, nearly level, well drained soil is on stream terraces. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 10 inches thick. The yellowish brown and brown subsoil is about 50 inches thick. The upper part is friable silt loam; the middle part is firm silty clay loam; and the lower part is firm, very gravelly clay loam. The substratum to a depth of about 80 inches is yellowish brown, very friable very gravelly coarse sandy loam.

Included with this soil in mapping are small areas of Chili, Fitchville, and Glenford soils. Chili soils contain more sand and gravel in the upper part of the subsoil and are on knolls. The somewhat poorly drained Fitchville soils and the moderately well drained Glenford soils have less sand and gravel in the lower part of the subsoil than the Cidermill soil and are in slight depressions and on foot slopes. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Cidermill soil is moderate in the upper part of the subsoil and moderately rapid in the substratum. The root zone is deep. Available water capacity is moderate or high. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Reducing surface crusting is the main concern of management. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity, improves tilth and fertility, and reduces crusting. The natural drainage is adequate for crops. This soil is well suited to no-till.

On pasture, this soil is well suited to grasses and legumes, especially such deep-rooted plants as alfalfa. The natural drainage permits grazing early in spring.

This soil is well suited to trees. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Also, low strength is a concern during harvest. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

This soil is well suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. This soil has a hazard of sloughing or caving in when excavated. If the distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply because of rapid permeability in the substratum. Placing septic tank absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action.

The land capability classification is I. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-1.

CpB—Cidermill silt loam, 2 to 6 percent slopes

This deep, gently sloping, well drained soil is on stream terraces. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The dark yellowish brown, yellowish brown, and brown subsoil is about 41 inches thick. The upper part is friable silt loam and silty clay loam; the middle part is firm, gravelly loam and very gravelly loam; the lower part is friable, very gravelly coarse sandy loam. The substratum to a depth of 80 inches is dark yellowish brown, very friable, very gravelly coarse sandy loam.

Included with this soil in mapping are small areas of Chili, Fitchville, and Glenford soils. Chili soils contain more sand and gravel in the upper part of the subsoil and are on knolls. The somewhat poorly drained Fitchville soils and the moderately well drained Glenford soils have less sand and gravel in the lower part of the subsoil than the Cidermill soil and are in slight depressions and on foot slopes. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Cidermill soil is moderate in the upper part of the subsoil and rapid in the substratum. The root zone is deep. Available water capacity is moderate or high. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Controlling erosion and reducing surface crusting are the main concerns of management. Contour stripcropping, cover crops, rotations with grasses and legumes, and conservation tillage, which leaves crop residue on the surface, help to control erosion. This soil is well suited to no-till. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity, improves tilth and fertility, and reduces crusting.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa. The natural drainage permits grazing early in spring. Erosion is a moderate hazard if the soil is plowed to prepare a seedbed or if the pasture overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion.

This soil is well suited to trees. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Low strength is a concern during harvest. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

This soil is well suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. This soil has a hazard of sloughing or caving in when excavated. If the distribution lines are placed too deep when installing septic tank absorption fields in this soil, effluent can pollute the underground water supply because of the rapid permeability in the substratum. Placing absorption fields in suitable fill material reduces the pollution hazard. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-1.

CtB—Coshocton silt loam, 2 to 6 percent slopes

This gently sloping, moderately well drained soil is on ridgetops on the unglaciated uplands. Most areas are elongated and range from 5 to 75 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown, firm silty clay loam about 34 inches thick. It is mottled in the lower part. The substratum, about 23 inches thick, is yellowish brown and dark grayish brown, mottled, firm silty clay loam. Thin-bedded, soft shale bedrock is at a depth of about 65 inches. In some areas the subsoil contains more clay. In places the upper part of the solum contains some rounded gravel fragments, and in other places the subsoil contains less sand and fewer siltstone fragments. Also, in other places the substratum overlies sandstone bedrock.

Included with this soil in mapping are small areas of Gilpin and Westmoreland soils, small areas of soils where thin-bedded, soft shale is above a depth of 40 inches, and areas of somewhat poorly drained soils. The well drained Gilpin soils are moderately deep to rippable bedrock. Gilpin soils and soils where thin-bedded, soft shale is above a depth of 40 inches are near the edges of the map unit or on the crest of some ridgetops. The somewhat poorly drained soils are on the summit of some broader ridgetops and in drainageways. The well drained Westmoreland soils are on the more convex slopes near the edges of the unit or on the crest of some ridgetops. Also included are a few seepy areas on the lower parts of the slope. Included soils make up about 15 percent of most areas.

A perched, seasonal high water table in this Coshocton soil is at a depth of 18 to 42 inches during extended wet periods. Permeability is moderately slow or slow. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Many areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Controlling erosion and maintaining tilth are the main concerns of management. A conservation tillage system, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces surface crusting. Subsurface drains are used to drain areas of the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture. If the soils are plowed to prepare a seedbed or if the pasture is overgrazed, erosion is a moderate hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, timely grazing, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to woodland. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Low strength is a concern during harvest. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

Because of seasonal wetness and shrinking and swelling of the soil, this map unit is moderately well suited as a site for buildings. Building sites should be landscaped to permit surface runoff to drain away from foundations. Subsurface drains also reduce wetness. Drains at the base of footings are used to remove excess water from around foundations and basement walls. Exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and the use of suitable base material help to reduce damage from frost action.

This soil is poorly suited as a site for septic tank absorption fields. Seasonal wetness and moderately slow or slow permeability are the main limitations. Perimeter drains around a septic tank absorption field help to lower the seasonal high water table. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-6.

CtC2—Coshocton silt loam, 6 to 15 percent slopes, eroded

This strongly sloping, moderately well drained soil is on side slopes and ridgetops on the unglaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Most areas are elongated and range from 5 to 75 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is yellowish brown, friable and firm silt loam, clay loam, and silty clay loam about 28 inches thick. It is mottled in the lower part. The substratum is light yellowish brown and yellowish brown, mottled, firm silty clay loam. Thin-bedded, soft shale bedrock is at a depth of about 47 inches. In some areas the subsoil contains more clay. In places the upper part of the solum contains some rounded gravel fragments. In other places the subsoil contains less sand and fewer siltstone fragments. Also, in other places the substratum overlies sandstone bedrock. Wooded areas are not eroded.

Included with this soil in mapping are small areas of Gilpin, Rigley, and Westmoreland soils. Also included are small areas of soils where thin-bedded, soft shale is above a depth of 40 inches on narrow ridgetops. The well drained Gilpin and Rigley soils are on narrow ridgetops or steeper side slopes. The well drained Westmoreland soils also are scattered throughout the unit or on the steeper slopes. Also included are areas of somewhat poorly drained soils in seeps. Included soils make up about 15 percent of most areas.

A perched, seasonal high water table in this Coshocton soil is at a depth of 18 to 42 inches during extended wet periods. Permeability is moderately slow or slow. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Many areas of this soil are used as cropland (fig. 10). Some areas are used as pasture. Other areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. Controlling erosion and maintaining tilth are the main concerns of management. Further erosion is a severe hazard. A conservation tillage system, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces surface crusting. Subsurface drains are used to drain areas of the included wetter soils.

On pasture, this soil is well suited to grasses and legumes. If the soil is plowed to prepare a seedbed or if the pasture is overgrazed, further erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Grazing when the soil is wet causes surface compaction, increased runoff, and reduces yields. Proper stocking rates, timely grazing, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Harvest concerns include slope for log landings and low strength for haul roads and log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

This soil is moderately well suited as a site for buildings. Slope, seasonal wetness, and shrinking and swelling of the soil are the main limitations. Building sites should be landscaped to permit surface runoff to drain away from foundations. Subsurface drains also reduce wetness. Drains at the base of footings are used to remove excess water from around foundations and basement walls. Exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. Diversions that carry away runoff from higher adjacent soils help to reduce seasonal wetness and to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and the use of suitable base material help to reduce damage from frost action.

Because of seasonal wetness and moderately slow or slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from absorption fields help to lower the seasonal high water table. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-6.

CtD2—Coshocton silt loam, 15 to 25 percent slopes, eroded

This moderately steep, moderately well drained soil is on side slopes on the unglaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Areas are irregularly shaped and range from 5 to 75 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is yellowish brown, friable and firm silt loam, clay loam, and silty clay loam, about 28 inches thick. It is mottled in the lower part. The substratum is light yellowish brown and yellowish brown, mottled, firm silty clay loam. Thinly-bedded soft shale bedrock is at a depth of about 44 inches. In some areas the subsoil contains clay. In places the upper part of the solum contains some rounded gravel fragments, and in other places the subsoil contains less sand and fewer siltstone fragments. Also, in other places sandstone bedrock is below the substratum. Wooded areas are not eroded.

Included with this soil in mapping are small areas of the Gilpin, Rigley, and Westmoreland soils. Also included are small areas of soils with thin-bedded, soft shale bedrock above a depth of 40 inches on narrow ridgetops. The well drained Gilpin and Rigley soils are on narrow ridgetops or upper side slopes. The well drained Westmoreland soils also are scattered throughout the unit or on the steeper slopes. Also included are areas of somewhat poorly drained soils in seeps. These included soils make up about 15 percent of most areas.

A perched, seasonal high water table in this Coshocton soil is at a depth of 18 to 42 inches during extended wet periods. Permeability is moderately slow or slow. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Some areas of this soil are used as cropland. Many areas are used as pasture. Other areas are wooded.

This soil is poorly suited to corn and small grains and moderately well suited to hay. Slope and the very severe hazard of further erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. Row crops can be grown occasionally if erosion is controlled. No-till or other conservation tillage systems that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates.

On pasture, this soil is moderately well suited to grasses and legumes. If the soil is plowed for seedbed preparation or if the pasture is overgrazed the hazard of further erosion is very severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, timely grazing, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Plant competition is severe, the mortality rate of seedlings is moderate on south- and west-facing slopes, slope limits the use of equipment, and runoff can cause erosion. Another concern during harvest is low strength for haul roads and log landings. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once will reduce the seedling mortality rate on south- and west-facing slopes. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

Because of wetness and slope this soil is poorly suited as a site for buildings. Buildings should be designed so that they conform to the natural slope of the land and sites should be landscaped to permit surface runoff to drain away from foundations. Diversions that carry runoff away from higher adjacent soils help to reduce seasonal wetness and to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and the use of suitable base material help to reduce damage from frost action.

This soil is poorly suited as a site for septic tank absorption fields. Slope, seasonal wetness, and moderately slow or slow permeability are the main limitations. Interceptor drains placed upslope from absorption fields help lower the seasonal high water table. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

Figure 10.—Stripcropping on Coshocton silt loam, 6 to 15 percent slopes, eroded, helps to reduce runoff and to control erosion.

The land capability classification is IVe. The woodland ordination symbols are 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is A-2.

CtE—Coshocton silt loam, 25 to 40 percent slopes

This steep, moderately well drained soil is on side slopes on the unglaciated uplands. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown, friable and firm silt loam, clay loam, and silty clay loam about 30 inches thick. It is mottled in the lower part. The substratum is light yellowish brown and yellowish brown, mottled, firm silty clay loam. Thin-bedded, soft shale bedrock is at a depth of about 48 inches. In some small eroded spots subsoil is mixed into the surface layer. In places the subsoil contains more clay. Also, in other places the substratum overlies sandstone bedrock.

Included with this soil in mapping are small areas of Hazleton and Westmoreland soils. The well drained Hazleton soils are on the upper side slopes. The well drained Westmoreland soils also are scattered throughout the unit. Also included are areas of somewhat poorly drained soils in seeps. These included soils make up about 15 percent of most areas.

A perched, seasonal high water table in this Coshocton soil is at a depth of 18 to 42 inches during extended wet periods. Permeability is moderately slow or slow. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this soil are wooded, except for a few areas in pasture.

Because of slope and the very severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to grasses and legumes used as pasture. If the pasture is overgrazed, the hazard of erosion is very severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Plant competition is severe, the mortality rate of seedlings is moderate on south- and west-facing slopes, slope limits the use of equipment, and runoff can cause erosion. Another concern during harvest is low strength for haul roads and log landings. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once will reduce the seedling mortality rate on south- and west-facing slopes. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields. The steep slope is the main limitation.

The land capability classification is VIe. The woodland ordination symbols are 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is A-3.

CvD—Coshocton silt loam, 12 to 25 percent slopes, very stony

This deep, moderately steep, moderately well drained soil is on side slopes on the unglaciated uplands. Stones, 10 to 24 inches in diameter, cover 1 to 3 percent of the surface. They generally make cultivating with conventional farm equipment impractical. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 3 inches thick. The subsurface layer, about 5 inches thick, is yellowish brown, friable loam. The subsoil is about 40 inches thick. The upper part is yellowish brown, friable and firm loam; the middle part is yellowish brown and dark yellowish brown, mottled, firm clay loam and silty clay loam; the lower part is light brownish gray and dark yellowish brown, mottled, firm silty clay loam and channery loam. The substratum to a depth of 60 inches is dark yellowish brown, mottled, firm, channery clay loam. In places the stones are more than 24 inches in diameter.

Included with this soil in mapping are small areas of Rigley and Westmoreland soils. The well drained Rigley soils are on the upper side slopes. The well drained Westmoreland soils are scattered throughout the unit or on the steeper slopes. Also included are areas of somewhat poorly drained soils in seeps. Included soils make up about 15 percent of most areas.

A perched, seasonal high water table in this Coshocton soil is at a depth of 18 to 42 inches during extended wet periods. Permeability is moderately slow or slow. The root zone is deep. The available water capacity is moderate. Runoff is rapid. The content of organic matter is moderate.

Nearly all areas of this soil are wooded, except for a few areas in pasture.

Because of the very stony surface, this soil is generally unsuited to cropland.

This soil is poorly suited to pasture because of the very stony surface.

This soil is well suited to trees. Plant competition is severe, the mortality rate of seedlings is moderate on south- and west-facing slopes, slope limits the use of equipment, and runoff can cause erosion. Another concern during harvest is low strength for haul roads and log landings. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once will reduce the seedling mortality rate on south- and west-facing slopes. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

Because of wetness and slope, this soil is poorly suited as a site for buildings. Buildings should be designed so that they conform to the natural slope of the land and sites should be landscaped to permit surface runoff to drain away from foundations. Diversions that carry away runoff from higher adjacent soils help to reduce seasonal wetness and to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and the use of suitable base material help to reduce damage from frost action.

This soil is poorly suited as a site for septic tank absorption fields. Slope, seasonal wetness, and moderately slow or slow permeability are the main limitations. Interceptor drains placed upslope from absorption fields help to lower the seasonal high water table. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is VIs. The woodland ordination symbols are 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is A-4.

EuA—Euclid silt loam, occasionally flooded

This deep, nearly level, somewhat poorly drained soil is on low stream terraces (fig. 11). This soil is subject to flooding for brief periods in winter and spring. The slope is 0 to 2 percent. Areas are irregularly shaped and range from 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil, about 33 inches thick, is yellowish brown and grayish brown, mottled, firm and friable silt loam. The substratum to a depth of about 80 inches is grayish brown, mottled, firm silt loam and dark yellowish brown, mottled, firm silty clay loam. In some areas the surface layer is loam.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in slight depressions. Also included are small areas of the somewhat poorly drained Orrville soils and the poorly drained Melvin soils on flood plains. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Euclid soil is at a depth of 12 to 30 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

If drained, this soil is well suited to corn and hay, but poorly suited to small grains. Flooding and seasonal wetness are the main concerns of management. Winter and spring floods damage small grains, and spring planting is delayed in some years because of flooding. However, flooding is less common during the growing season. Floodwater sometimes leaves sediments on forage, making the crop unfit for hay. Subsurface drains commonly are used to lower the seasonal high water table. In some areas drainage outlets are difficult to install because of the low position of the soil on the landscape. The surface layer crusts after hard rains, reducing the infiltration of water. Returning crop residue will reduce crusting.

On pasture, this soil is well suited to water-tolerant grasses and legumes, but it is poorly suited to grazing early in spring. Grazing when the soil is wet and soft causes surface compaction and poor tilth and damages the plants.

This soil is well suited to trees. Seasonal wetness and low strength limit site preparation, planting, and harvesting of trees. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Site preparation and planting can be done during dry periods. Logging can be done during dry periods or when the soil is frozen.

Because of flooding, this soil is generally unsuited as a site for buildings and septic tank absorption fields. In the construction of local roads and streets, artificial drainage and strengthening or replacing the base material help to prevent the damage caused by frost action and low soil strength. Fill can be used to elevate local roads above the flood level. This soil is a good source of topsoil.

The land capability classification is IIw. The woodland ordination symbol is 5A. The pasture and hayland suitability group is C-3.

FaB—Fairpoint silt loam, 0 to 8 percent slopes

This deep, nearly level and gently sloping, well drained soil is in upland areas that have been surface mined for coal. This reclaimed soil has 4 to 12 inches of reconstructed, natural soil material over medium acid to neutral regolith from surface mine operations. It is on graded and reclaimed ridges and side slopes. The medium acid to neutral regolith below the natural soil material is a mixture of rock fragments and partly weathered fine-earth materials that was below the profile of the original soil. Most of the rock fragments are flat and less than 10 inches long. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is yellowish brown, firm silt loam about 9 inches thick. The substratum to a depth of about 80 inches is multicolored, firm, extremely channery silty clay loam and very channery silty clay loam. Some areas have a surface layer of loam and other areas have reconstructed natural soil material that is 12 to 18 inches thick.

Permeability in this Fairpoint soil is moderately slow. The depth of the root zone varies within short distances because of differences in the density of the reconstructed

Figure 11.—In most areas, Euclid silt loam, occasionally flooded, is used for crops.

soil material, but in most cases it ranges from 4 to 12 inches. Available water capacity generally is low, but varies with the degree of surface compaction. Tilth is fair. Runoff is medium. The content of organic matter is low.

Most areas are seeded to grasses and legumes and are used for hay and pasture. A few areas are used for crops.

This soil is poorly suited to corn, small grains, and other crops. It is well suited to hay. Conserving moisture in the shallow root zone and the moderate hazard of erosion are the main concerns of management. Row crops can be grown occasionally if erosion is controlled. Conservation tillage, which leaves crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. This soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. It is well suited to no-till. Grassed waterways are used to reduce gullying in waterways where runoff water concentrates.

On pasture, this soil is well suited to grasses and legumes. Little forage is produced during the dry part of summer. Overgrazing or cultivation of this soil will increase the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is best suited to trees that can tolerate droughtiness and a restricted root zone. Grasses provide the needed ground cover in sloping areas while tree seedlings are being established.

Unstable fill is possible anywhere in this map unit; however, after the fill material has settled, most of the unit is moderately well suited as a site for buildings. But some settled areas are still unstable and are generally unsuited to building site development. Onsite investigations are needed to determine the specific suitability of a given area. Besides the stability and bearing strength of the fill material, the control of stormwater runoff and the risk of corrosion of uncoated steel and concrete are management concerns. Stones in the substratum hinder shallow excavations. Building sites should be landscaped so that surface runoff drains away from foundations.

This unit is poorly suited as a site for septic tank absorption fields, except for the unstable areas that are generally unsuited to absorption fields. Onsite investigations are needed. In the stable areas the main limitation is the moderately slow or slow permeability. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIIs. The soil is not assigned a woodland ordination symbol. The pasture and hayland suitability group is B-4.

FaC—Fairpoint silt loam, 8 to 20 percent slopes

This deep, strongly sloping, well drained soil is in upland areas that have been surface mined for coal. This reclaimed soil has 4 to 12 inches of reconstructed natural soil material over medium acid to neutral regolith from surface mine operations. It is on graded reclaimed ridges and side slopes. The medium acid to neutral regolith below the natural soil material is mixed rock fragments and partly weathered fine-earth materials that were below the profile of the original soil. Most of the rock fragments are flat and less than 10 inches long. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark yellowish brown and yellowish brown, firm silt loam about 8 inches thick. The substratum to a depth of about 80 inches is multicolored, firm, extremely channery silty clay loam and very channery silty clay loam. Some areas have a surface layer of loam; other areas have reconstructed natural soil material 12 to 18 inches thick.

Permeability in this Fairpoint soil is moderately slow. The depth of the root zone varies within short distances because of differences in the density of the reconstructed soil material, but in most cases it ranges from 4 to 12 inches. Available water capacity generally is low, but varies with the degree of surface compaction. Tilth is fair. Runoff is rapid. The content of organic matter is low.

Most areas are seeded to grasses and legumes and are used for hay and pasture. A few areas are used for crops.

This soil is poorly suited to corn and small grains and moderately well suited to hay. Conserving moisture in the shallow root zone and the severe hazard of erosion are the main concerns of management. Row crops can be grown occasionally if erosion is controlled. Conservation tillage, which leaves crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. This soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. It is well suited to no-till. Grassed waterways are used to reduce gullying in waterways where runoff water concentrates.

On pasture, this soil is moderately well suited to grasses and legumes. Little forage is produced during the dry part of summer. Overgrazing or cultivation of this soil will increase the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is best suited to trees that can tolerate droughtiness and a restricted root zone. Grasses provide the needed ground cover in sloping areas while tree seedlings are being established.

Unstable fill is possible anywhere in this map unit. However, after the fill material has settled, most of the unit is moderately well suited as a site for buildings. But some settled areas are still unstable and are generally unsuited to building site development. Onsite investigations are needed to determine the specific suitability of a given area. Besides the stability and bearing strength of the fill material, slope, the control of stormwater runoff, and the risk of corrosion of uncoated steel and concrete are management concerns. Stones in the substratum hinder shallow excavations. Building sites should be landscaped so that surface runoff drains away from foundations.

This unit is generally poorly suited as a site for septic tank absorption fields; most of the unstable areas are unsuited to absorption fields. Onsite investigations are needed. In the stable areas the main limitations are the moderately slow or slow permeability and slope. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IVs. The soil is not assigned a woodland ordination symbol. The pasture and hayland suitability group is B-4.

FcB—Farmerstown silt loam, 0 to 8 percent slopes

This deep, nearly level and gently sloping, well drained soil is in upland areas that have been surface mined for coal. This reclaimed soil has 20 to 40 inches of reconstructed natural soil material over acid regolith from surface mine operations. It is on graded, reclaimed ridges and side slopes. The acid regolith below the topsoil is a mixture of rock fragments and partly weathered fine-earth material that was below the profile of the original soil. Most of the rock fragments are flat and less than 10 inches long. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 8 inches thick. The upper part of the substratum is reconstructed natural soil material about 16 inches thick. It is variegated yellowish brown and grayish brown, firm silt loam and loam. The lower part of the substratum to a depth of about 80 inches is varigated, very firm and firm, very shaly silty clay loam. Some areas have a surface layer of loam. In other areas the substratum is less acid. In places the thickness of reconstructed natural soil material is less than 20 inches or more than 40 inches.

Permeability in this Farmerstown soil is moderately slow or slow. The depth of the root zone varies within short distances because of differences in the density of the reconstructed soil material, but in most cases it ranges from 10 to 24 inches. Available water capacity, generally low, varies with the degree of surface compaction. Tilth is fair. Runoff is medium. The content of organic matter is low.

Most areas are seeded to grasses and legumes and are used for hay and pasture. Some areas are used for crops.

This soil is moderately well suited to corn and small grains and well suited to hay. Erosion is a moderate hazard. Conserving moisture in the shallow root zone, increasing the depth of the root zone by planting deep-rooted legumes such as alfalfa, and controlling erosion are the main concerns of management. Maintaining prolonged years of good stands of alfalfa will help to reduce surface compaction, increase the depth of the root zone, and increase the available water capacity of this soil. Row crops can be grown occasionally during the process of increasing the productivity of this reclaimed soil. Conservation tillage, which leaves crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. This soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. It is well suited to no-till. Grassed waterways are used to reduce gullying in waterways, where runoff water concentrates.

On pasture, this soil is well suited to grasses and legumes. Little forage is produced during the dry part of summer. Overgrazing or cultivation of this soil will increase the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is moderately well suited to trees, but few trees are now grown in these reclaimed areas. Site index studies are not available. It is best suited to trees that can tolerate droughtiness and a restricted root zone. Grasses provide the needed ground cover in sloping areas while tree seedlings are being established.

Areas of unstable fill are located everywhere in this map unit; however, once the fill material has settled, most of the unit is moderately well suited as a site for buildings. But some settled areas are still unstable and are generally unsuited to building site development. Onsite investigations are needed to determine the specific suitability of a given area. Besides the stability and bearing strength of the fill material, the control of stormwater runoff and the risk of corrosion of uncoated steel and concrete are management concerns. Stones in the substratum hinder shallow excavations. Building sites should be landscaped so that surface runoff drains away from foundations.

This unit generally is poorly suited as a site for septic tank absorption fields; most of the unstable areas are unsuited to absorption fields. Onsite investigations are needed. In the stable areas the main limitation is the moderately slow or slow permeability. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIIe. The soil is not assigned a woodland ordination symbol. The pasture and hayland suitability group is B-4.

FcC—Farmerstown silt loam, 8 to 20 percent slopes

This deep, strongly sloping, well drained soil is in upland areas that have been surface mined for coal. This reclaimed soil has 20 to 40 inches of reconstructed natural soil material over acid regolith from surface mine operations. It is on graded, reclaimed ridges and side slopes. The acid regolith below the topsoil is a mixture of rock fragments and partly weathered fine-earth materials that was below the profile of the original soil. Most of the rock fragments are flat and less than 10 inches long. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 9 inches thick. The upper part of the substratum is reconstructed natural soil material about 14 inches thick. It is variegated yellowish brown and grayish brown, firm and very firm loam. The lower part of the substratum to a depth of about 80 inches is variegated, very firm and firm, very shaly silt loam. Some areas have a surface layer of loam. In other areas the substratum is less acid. In places the thickness of reconstructed natural soil material is less than 20 inches or more than 40 inches.

Permeability in this Farmerstown soil is moderately slow or slow. The depth of the root zone varies within short distances because of differences in the density of the reconstructed soil material; in most cases it ranges from 10 to 24 inches. Available water capacity generally is low, but varies with the degree of surface compaction. Tilth is fair. Runoff is rapid. The content of organic matter is low.

Most areas are seeded to grasses and legumes and used for hay and pasture. Some areas are used for crops.

This soil is poorly suited to corn and small grains and moderately well suited to hay. Erosion is a severe hazard. Conserving moisture in the shallow root zone, increasing the depth of the root zone, and controlling erosion are the main concerns of management. Planting deep-rooted legumes such as alfalfa will help to reduce surface compaction, increase the depth of the root zone, and increase the available water capacity of this soil. Row crops can be grown occasionally during the process of increasing the productivity of this reclaimed soil. Conservation tillage, which leaves crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. This soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. It is well suited to no-till. Grassed waterways are used to reduce gullying in waterways, where runoff water concentrates.

On pasture, this soil is moderately well suited to grasses and legumes. Little forage is produced during the dry part of summer. Overgrazing or cultivation of this soil will increase the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is moderately well suited to trees, but few trees are now grown in these reclaimed areas. Site index studies are not available. It is best suited to trees that can tolerate droughtiness and a restricted root zone. Grasses provide the needed ground cover in sloping areas while tree seedlings are being established.

Unstable fill is possible anywhere in this map unit; however, once the fill material has settled, most of the unit is moderately well suited as a site for buildings. But some settled areas are still unstable and are generally unsuited to building site development. Onsite investigations are needed to determine the suitability of a specific area. The control of stormwater runoff and the risk of corrosion of uncoated steel and concrete are also management concerns. Stones in the substratum hinder shallow excavations. Building sites should be landscaped so that surface runoff drains away from foundations.

This unit generally is poorly suited as a site for septic tank absorption fields. Most of the unstable areas are unsuited to absorption fields. Onsite investigations are needed. In the stable areas the main limitation is the moderately slow or slow permeability. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IVe. The soil is not assigned a woodland ordination symbol. The pasture and hayland suitability group is B-4.

FhA—Fitchville silt loam, 0 to 2 percent slopes

This deep, nearly level, somewhat poorly drained soil is on terraces along streams and on lake plains. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 30 inches thick. The upper and middle parts are yellowish brown, mottled, firm silt loam and silty clay loam; the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of about 80 inches is light brownish gray and yellowish brown, mottled, friable silt loam. Some areas contain more sand and gravel in the subsoil.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in slight depressions. Also included are small areas of the moderately well drained Glenford soils in the slightly higher landscape positions. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Fitchville soil is at a depth of 12 to 30 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Seasonal wetness and surface crusting are the main concerns of management. Seasonal wetness delays planting in spring. The surface layer crusts after hard rains. Subsurface drains are used to lower the seasonal high water table and permit more timely field operations. Surface drainage also is used in some areas. In places outlets for drainage systems are difficult to install because of the low position of the soil on the landscape. Returning crop residue to the soil, planting winter cover crops, and regularly adding other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting. This soil, if drained, is moderately well suited to no-till.

On pasture, this soil is well suited to water-tolerant grasses and legumes, but it is poorly suited to early spring grazing. Grazing when the soil is wet and soft causes surface compaction and poor tilth and damages the plants.

This soil is well suited to woodland. Seasonal wetness and low strength limit site preparation, planting, and harvesting of trees. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Site preparation and planting can be done during dry periods. Logging can be done during dry periods or when the soil is frozen.

This soil is poorly suited as a site for buildings. Seasonal wetness is the main limitation. Open ditches and subsurface drains are used to lower the seasonal high water table. Diversions and drainage ditches divert runoff from higher adjacent soils. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. In the construction of local roads and streets, artificial drainage and the use of suitable base material reduce damage resulting from frost action and seasonal wetness.

Because of seasonal wetness and moderately slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIw. The woodland ordination symbol is 5A. The pasture and hayland suitability group is C-1.

FhB—Fitchville silt loam, 2 to 6 percent slopes

This deep, gently sloping, somewhat poorly drained soil is on terraces along streams and on lake plains. Areas are irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is yellowish brown, mottled, friable silt loam and firm silty clay loam in the upper and middle parts and light brownish gray, mottled, firm silty clay loam in the lower part. It is about 33 inches thick. The substratum to a depth of about 80 inches is light brownish gray and yellowish brown, mottled, friable silt loam. Some areas contain more sand and gravel in the subsoil.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in slight depressions. Also included are small areas of the moderately well drained Glenford soils in the slightly higher landscape positions. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Fitchville soil is at a depth of 12 to 30 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Wetness, a moderate hazard of erosion, and surface crusting are the main concerns of management. Seasonal wetness delays planting in spring. The surface layer crusts after hard rains. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. These practices are easily adapted to most areas. If drained, this soil is moderately well suited to no-till. Subsurface drains are used to lower the seasonal high water table and permit more timely field operations. Suitable drainage outlets are in most areas. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting.

This soil is well suited to a variety of pasture plants. If the pasture is overgrazed or if the soil is plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding help to control erosion. Timely deferment of grazing when the soil is wet and soft helps to prevent surface compaction. Subsurface drains are used where such deep-rooted legumes as alfalfa are grown. In undrained areas this soil is better suited to grasses than to deep-rooted legumes.

This soil is well suited to woodland. Seasonal wetness and low strength limit site preparation, planting, and harvesting of trees. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Site preparation and planting can be done during dry periods. Logging can be done during dry periods or when the soil is frozen.

This soil is poorly suited as a site for buildings. Seasonal wetness is the main limitation. Open ditches and subsurface drains are used to lower the seasonal high water table. Diversions and drainage ditches divert runoff from higher adjacent soils. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Maintaining a plant cover on a construction site and using other water control practices help to control erosion. In the construction of local roads and streets, artificial drainage and the use of suitable base material reduce damage resulting from frost action and seasonal wetness.

Because of seasonal wetness and moderately slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIe. The woodland ordination symbol is 5A. The pasture and hayland suitability group is C-1.

GhB—Gilpin silt loam, 3 to 8 percent slopes

This moderately deep, gently sloping, well drained soil is on ridgetops on the unglaciated uplands. Most areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 10 inches thick. The subsoil, about 20 inches thick, is yellowish brown, firm, channery silt loam and channery silty clay loam. The substratum is yellowish brown, friable, extremely channery silt loam. Yellowish brown, fractured siltstone is at a depth of about 36 inches. Some areas have a channery silt loam surface layer. In places bedrock is either below a depth of 40 inches or above a depth of 20 inches.

Included with this soil in mapping are small areas of the moderately well drained Coshocton soils on broad ridgetops. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Gilpin soil is moderate. The root zone is moderately deep. Available water capacity is low. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Drought is a hazard for shallow-rooted crops. Controlling erosion and conserving moisture are the main concerns of management. Erosion is a moderate hazard. Erosion reduces the thickness of the root zone above the bedrock, thus reducing the volume of soil from which crops can extract moisture and plant nutrients. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring protect the soil against erosion. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity and improves the fertility of the soil.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes as pasture. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of summer. Erosion is a moderate hazard if the soil is plowed to prepare a seedbed or if the pasture overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Woodland growth rates are limited by low moisture, but good stands of many desirable species can be attained. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs. The moderately deep bedrock is rippable with construction equipment.

This soil is moderately well suited as a site for buildings. The moderate depth to bedrock is the main limitation. This soil is better suited to buildings without basements than buildings with basements. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. Bedrock between depths of 20 and 40 inches interferes with excavations for basements and utility lines. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action.

Because of the limited depth to bedrock, this soil is poorly suited as a site for septic tank absorption fields. Effluent from absorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply; the volume of soil above the bedrock is not sufficient to filter the effluent adequately. Placing septic tank absorption fields in suitable fill material reduces this hazard. Effluent can also seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface.

The land capability classification is IIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is F-1.

GhC—Gilpin silt loam, 8 to 15 percent slopes

This moderately deep, strongly sloping, well drained soil is on ridgetops and side slopes on the unglaciated uplands. Most areas are long and narrow and range from 5 to 70 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil, about 17 inches thick, is yellowish brown, firm, channery silt loam and very channery silty clay loam. The substratum is yellowish brown, friable, extremely channery silt loam. Yellowish brown, fractured siltstone is at a depth of about 34 inches. Some areas have a channery silt loam surface layer. In places bedrock is at a depth of 40 to 60 inches. Areas in cropland generally are eroded.

Included with this soil in mapping are small areas of the moderately well drained Coshocton soils on gently sloping ridgetops and the deep, well drained Brownsville soils on the lower parts of side slopes. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Gilpin soil is moderate. The root zone is moderately deep. Available water capacity is low. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Most areas are used as woodland. Some areas are used as pasture. A few areas are used as cropland.

This soil is moderately well suited to corn and small grains and well suited to hay. Drought is a hazard for shallow-rooted crops. Controlling erosion and conserving moisture are the main concerns of management. Erosion is a severe hazard. Erosion reduces the thickness of the root zone above the bedrock, thus reducing the volume of the soil from which crops can extract moisture and plant nutrients. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring protect the soil against erosion. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity and improves the fertility of the soil.

On pasture, this soil is well suited to grasses and legumes. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of summer. Erosion is a severe hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Many areas are returning naturally to forest. Woodland growth rates are limited by low moisture, but good stands of many desirable species can be attained. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs. Slope is a concern during harvest for log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. The moderately deep bedrock is rippable with construction equipment.

Because of slope and the limited depth to bedrock, this soil is moderately well suited as a site for buildings. Building sites should be located on the less sloping areas of this unit. Diversions that carry away runoff from higher adjacent soils help to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. This soil is better suited to buildings without basements than buildings with basements. Bedrock between a depth of 20 and 40 inches interferes with excavations for basements and utility lines. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action.

This soil is poorly suited as a site for septic tank absorption fields. The limited depth to bedrock is the main limitation. Effluent from septic tank adsorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply because the volume of soil above the bedrock is not sufficient to filter the effluent adequately. Placing septic tank absorption fields in suitable fill material reduces this hazard. Effluent can also seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface.

The land capability classification is IIIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is F-1.

GnA—Glenford silt loam, 0 to 2 percent slopes

This deep, nearly level, moderately well drained soil is on terraces along streams, on lake plains, and in a few areas on outwash plains. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is yellowish brown, firm silt loam and silty clay loam, about 40 inches thick. It is mottled in the middle and lower parts. The substratum to a depth of 80 inches is yellowish brown, mottled, firm silty clay loam and silt loam. In a few places the soil is underlain by glacial till or stratified sand and gravel below a depth of 40 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils in shallow drainageways and the poorly drained Sebring soils in depressions. Included soils make up about 10 to 15 percent of most areas.

A perched seasonal high water table in this Glenford soil is at a depth of 24 to 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Reducing surface crusting is the main concern of management. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity, improves tilth and fertility, and reduces crusting. This soil is well suited to no-till. The natural drainage generally is adequate for farming, although random-spaced subsurface drains are used in the included wet areas.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa.

This soil is well suited to woodland. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Also, low strength is a concern during harvest for haul roads and log landings. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

Because of the shrinking and swelling of the soil and seasonal wetness, this soil is moderately well suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. In constructing local roads and streets, artificial drainage and a suitable base material help to reduce damage from frost action.

This soil is poorly suited as a site for septic tank absorption fields. Seasonal wetness and moderately slow permeability are the main limitations. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is I. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-6.

GnB—Glenford silt loam, 2 to 6 percent slopes

This deep, gently sloping, moderately well drained soil is on terraces along streams, lake plains, and a few areas on outwash plains. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, firm silt loam and firm and very firm silty clay loam. It is mottled in the middle and lower parts. The substratum to a depth of 80 inches is yellowish brown, mottled, firm silty clay loam and silt loam. In a few places the soil is underlain by glacial till or stratified sand and gravel below a depth of 40 inches. In some small eroded spots, yellowish brown subsoil material is mixed into the surface layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils in shallow drainageways and the poorly drained Sebring soils in depressions. Included soils make up about 10 to 15 percent of most areas.

A perched seasonal high water table in this Glenford soil is at a depth of 24 to 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Controlling erosion and reducing surface crusting are the main concerns of management. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, cover crops, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. Leaving crop residue on the surface in fall and not plowing until spring protect the soil against erosion. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity, improves tilth and fertility, and reduces crusting. The natural drainage generally is adequate for farming, although random-spaced subsurface drains are used in the included wet areas.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa. Erosion is a moderate hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion.

This soil is well suited to woodland. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Also, low strength is a concern during harvest. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

Because of the shrinking and swelling of the soil and seasonal wetness, this soil is moderately well suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Diversions and surface drains that intercept runoff from higher adjacent soils help to reduce seasonal wetness and to control erosion. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and a suitable base material help to reduce damage from frost action.

This soil is poorly suited as a site for septic tank absorption fields. Seasonal wetness and moderately slow permeability are the main limitations. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help to lower the seasonal high water table. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIe. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-6.

GnC2—Glenford silt loam, 6 to 12 percent slopes, eroded

This deep, moderately sloping, moderately well drained soil is on foot slopes at the base of uplands and side slopes on terraces, lake plains, and a few areas of outwash plains. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 34 inches thick. It is yellowish brown, firm silt loam and silty clay loam. It is mottled in the middle and lower parts. The substratum to a depth of 80 inches is yellowish brown, mottled, firm silty clay loam and silt loam. In a few places the soil is underlain by glacial till or stratified sand and gravel below a depth of 40 inches. Wooded areas are not eroded.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils in shallow drainageways. Included soils make up about 10 percent of most areas.

A perched seasonal high water table in this Glenford soil is at a depth of 24 to 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Many areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. Controlling erosion is the main concern of management. The surface layer crusts after hard rains. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, cover crops, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. Such practices as contour stripcropping are difficult to use on short, complex slopes. Leaving crop residue on the surface in fall and not plowing until spring protect the soil against erosion. Returning crop residue or other organic material to the soil increases the rate of water infiltration and the water holding capacity, improves tilth and fertility, and reduces crusting. The natural drainage generally is adequate for farming, although random-spaced subsurface drains are used in the included wet areas.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa. Erosion is a moderate hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion.

This soil is well suited to woodland. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Also, low strength and slope are management concerns during harvest for haul roads and log landings. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope.

Because of slope, the shrinking and swelling of the soil, and seasonal wetness, this soil is moderately well suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. Diversions carry away runoff from higher adjacent soils and help to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and a suitable base material help to reduce damage from frost action.

This soil is poorly suited as a site for septic tank absorption fields. Seasonal wetness and moderately slow permeability are the main limitations. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table. Effluent from septic tank absorption fields can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIIe. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-6.

HtC—Hazleton loam, 8 to 15 percent slopes

This deep, strongly sloping, well drained soil is on ridgetops and side slopes on the unglaciated uplands. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 8 inches thick. The subsoil, about 30 inches thick, is yellowish brown, friable channery loam and very channery loam. The substratum is yellowish brown, friable extremely channery loam. Hard sandstone bedrock is at a depth of about 53 inches. In some areas the surface layer is sandy loam, fine sandy loam, or channery loam. Areas in cropland generally are eroded. Also, in places bedrock is above a depth of 40 inches.

Included with this soil in mapping are small areas of the less stony Westmoreland soils on narrow foot slopes. Also included are small wet areas at the heads of drainageways. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Hazleton soil is moderately rapid or rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Some areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. Controlling erosion and conserving moisture are the main concerns of management. Erosion is a severe hazard. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. However, these practices are difficult to install on complex slopes. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent, and timely applications of fertilizer than to one large application.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of summer. Erosion is a severe hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is moderately well suited to woodland. Slope is a concern during harvest for log landings, and plant competition is moderate. Also, growth rates are limited by low moisture, but good stands of many desirable species can be attained. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, large stones, and depth to bedrock, this soil is moderately well suited as a site for buildings. Building sites should be located in the less sloping areas of this unit. Diversions carry away runoff from higher adjacent soils and help to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. This soil is better suited to buildings without basements than buildings with basements. Large stones in the subsoil may interfere with excavations. In constructing local roads and streets, providing a suitable base material minimizes the damage caused by frost action.

This soil is poorly suited as a site for septic tank absorption fields. The moderately rapid or rapid permeability is the main limitation. Effluent from septic tank absorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply because the permeability is moderately rapid or rapid. Placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IIIe. The woodland ordination symbol is 4F. The pasture and hayland suitability group is B-1.

HtD—Hazleton loam, 15 to 25 percent slopes

This deep, moderately steep, well drained soil is on the upper parts of side slopes on the unglaciated uplands. Most areas are above steeper slopes and below less sloping ridgetops. Most areas are long and narrow and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 6 inches thick. The subsoil, about 32 inches thick, is yellowish brown, friable channery loam and very channery loam. The substratum is yellowish brown, friable extremely channery loam. Hard sandstone bedrock is at a depth of about 52 inches. In some areas the surface layer is sandy loam or channery loam. Areas in cropland generally are eroded. Also, in places bedrock is above a depth of 40 inches.

Included with this soil in mapping are small areas of the less stony Westmoreland soils on narrow foot slopes. Also included are small wet areas at the heads of drainageways. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Hazleton soil is moderately rapid or rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Most areas are used as woodland. Some areas are used as pasture. A few areas are used as cropland.

This soil is poorly suited to corn and small grains and moderately well suited to hay. The good natural drainage is favorable to alfalfa. Slope and the very severe hazard of erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. Row crops can be grown occasionally if erosion is controlled. No-till or other conservation tillage systems that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent, and timely applications of fertilizer than to one large application.

On pasture, this soil is moderately well suited to grasses and legumes. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of summer. Overgrazing or cultivation of this soil will increase the risk of erosion. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is moderately well suited to trees. Slope and the low available water capacity are the main concerns in management. Also, plant competition is moderate on north- and east-facing slopes, and the seedling mortality rate is moderate on south- and west-facing slopes. Placing logging roads and skid trails on the contour facilitates the use of equipment. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is poorly suited as a site for buildings and septic tank absorption fields. Slope is the main limitation. Building sites should be located on the less sloping areas of this unit. Most of the rock and rock fragments in the upper 4 feet can be excavated quite easily. If this soil is used as a site for septic tank absorption fields, contamination of ground water by effluent is possible. This problem can be minimized by laying the distribution lines across the slope and as shallow as possible. Placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IVe. The woodland ordination symbol is 4F on north aspects and 3F on south aspects. The pasture and hayland suitability group is B-1.

HtE—Hazleton loam, 25 to 40 percent slopes

This deep, steep, well drained soil is on hillsides on the unglaciated uplands. Most areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 5 inches thick. The subsoil, about 34 inches thick, is yellowish brown, friable channery loam and very channery loam. The substratum is yellowish brown, friable very channery loam. Hard, fine grained, sandstone bedrock is at a depth of about 51 inches. In some areas the surface layer is sandy loam, channery loam, or channery sandy loam. Also, in places bedrock is above a depth of 40 inches.

Included with this soil in mapping are small areas of the less stony Westmoreland soils on narrow foot slopes. Also included are some scattered areas of rock outcrops with little or no soil cover and small wet areas at the heads of drainageways. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Hazleton soil is moderately rapid or rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low. Tilth is good. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this soil are wooded. A few areas are in pasture.

Because of the steep slope and severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to grasses and legumes used as pasture. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of summer. If the pasture is overgrazed, the hazard of erosion is severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is moderately well suited to trees. Slope and the low available water capacity are the main concerns in management. Also, plant competition is moderate on north- and east-facing slopes. The seedling mortality rate is moderate or severe on south- and west-facing slopes. Placing logging roads and skid trails on the contour facilitates the use of equipment. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields. The steep slope is the main limitation.

The land capability classification is VIe. The woodland ordination symbol is 4F on north aspects and 3F on south aspects. The pasture and hayland suitability group is B-2.

HvF—Hazleton loam, 25 to 70 percent slopes, very bouldery

This deep, steep and very steep, well drained soil is on side slopes on the unglaciated uplands. Boulders cover 1 to 3 percent of the surface. They are mostly angular and range in size from 2 to 20 feet across. Individual areas are long and narrow and are 10 to 400 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is brown, friable channery loam; the middle part is dark yellowish brown and yellowish brown, friable very channery sandy loam; and the lower part is yellowish brown, firm very channery loam. The substratum is yellowish brown, friable very channery loam. Hard, fine grained, sandstone bedrock is at a depth of about 50 inches. In some areas the surface layer is sandy loam, channery loam, or channery sandy loam. Also, in places bedrock is above a depth of 40 inches.

Included with this soil in mapping are small areas of Westmoreland soils on narrow foot slopes. Westmoreland soils do not have stones on the surface. Also included are some scattered areas of rock outcrops that have little or no soil cover. Wet areas around springs on the lower parts of the slope also are included. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Hazleton soil is moderately rapid or rapid. The root zone is slightly restricted by the larger rock fragments in the soil. Available water capacity is low. Runoff is very rapid. The content of organic matter is moderate.

Nearly all areas are used as woodland.

Because of the large boulders, the steep and very steep slopes, and the severe erosion hazard, this soil is generally unsuited to cropland and pasture.

This soil is moderately well suited to trees. The severe erosion hazard, slope, large boulders, and the low available water capacity are the main concerns in management. Also, plant competition is moderate on north- and east-facing slopes. The seedling mortality rate is moderate or severe on south- and west-facing slopes. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Planting seedlings that have been transplanted once and mulching around seedlings will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields because of the steep and very steep slopes.

The land capability classification is VIIs. The woodland ordination symbol is 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is H-1.

KeB—Keene silt loam, 2 to 6 percent slopes

This deep, gently sloping, moderately well drained soil is on ridgetops on the unglaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 10 inches thick. The subsoil is about 47 inches thick. The upper part is yellowish brown, friable silt loam; the middle part is yellowish brown, mottled, firm silty clay loam; and the lower part is light olive brown and yellowish brown, mottled, firm silty clay loam and channery clay loam. The substratum, about 19 inches thick, is light olive brown, mottled, firm, channery silty clay loam. Yellowish brown fractured siltstone bedrock is at a depth of about 76 inches. In some areas the subsoil has more sand. In other places thin-bedded, soft shale is above a depth of 40 inches.

Included with this soil in mapping are small areas of the moderately deep, well drained Gilpin soils on more convex slopes. Gilpin soils also have more sand in the subsoil. Included soils make up about 10 to 15 percent of most areas.

A perched, seasonal high water table in this Keene soil is at a depth of 18 to 36 inches during extended wet periods. Permeability is moderately slow or slow. The root zone is deep. Available water capacity is moderate or high. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Controlling erosion and maintaining tilth are the main concerns of management. No-till and other forms of conservation tillage that leave crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is moderately well suited to no-till because of seasonal wetness. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces surface crusting. Random subsurface drains commonly are used to drain areas of the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to grasses and legumes used as pasture. If the soil is plowed to prepare a seedbed or if the pasture is overgrazed, erosion is a moderate hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Timely deferment of grazing when the soil is wet and soft helps to prevent surface compaction.

This soil is well suited to woodland. Plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Also, low strength is a concern during harvest for haul roads and log landings. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

Because of the shrinking and swelling of the soil and seasonal wetness, this soil is moderately well suited as a site for buildings. Building sites should be landscaped to permit surface runoff to drain away from foundations. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Diversions intercept runoff from higher adjacent soils and help to reduce seasonal wetness and to control erosion. Subsurface drains also reduce wetness. Drains at the base of footings are used to remove excess water from around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. In constructing local roads and streets, artificial drainage and strengthening or replacing base material help to reduce damage from frost action and low strength.

This soil is poorly suited as a site for septic tank absorption fields. Seasonal wetness and moderately slow or slow permeability are the main limitations. Perimeter drains around septic tank absorption fields help lower the seasonal high water table. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-6.

Kk—Killbuck silt loam, frequently flooded

This deep, nearly level, poorly drained soil is on the lower and wetter parts of the flood plains. It is subject to flooding in winter and spring. The slope is 0 to 2 percent. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil, about 8 inches thick, is dark gray, mottled, friable silt loam. Below the subsoil, at a depth of about 17 inches, is a buried soil. The surface layer of the buried soil is black, mottled, firm silty clay loam about 10 inches thick. The subsoil of the buried soil is gray, mottled, firm silty clay loam about 21 inches thick. The substratum to a depth of about 80 inches is dark gray, mottled, firm silty clay loam. In a few areas the recent alluvium overlying the buried surface layer is less than 15 inches thick. Some places do not have a buried soil.

Included with this soil in mapping are small areas of the very poorly drained Luray soils and the somewhat poorly drained Orrville soils. Luray soils are in slight depressions and Orrville soils are on slight rises. Luray and Orrville soils do not overlie a buried soil as does the Killbuck soil. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Killbuck soil is near the surface during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is very slow. The content of organic matter is high.

Most drained areas of this soil are used for crops. Some areas are used as pasture. Other areas are wooded.

This soil, if drained, is moderately well suited to corn and poorly suited to hay. It is generally not suited to small grains because they are subject to damage by flooding. Undrained areas are too wet for the commonly grown crops. Flooding and wetness, which often delay spring planting, are the main concerns in management. Flooding is less common during the growing season, and crops, such as corn, generally tolerate brief flooding. However, hay crops can be damaged. Floodwater leaves sediment on grasses and legumes, often making the crop unfit for hay. Surface and subsurface drains are used to improve drainage. In many areas outlets for drainage systems are difficult to install because the soil is in low landscape positions. The surface layer crusts after hard rains. Returning crop residue to the soil reduces crusting.

Most of the pastured areas of this soil are undrained. These undrained areas are poorly suited to pasture. This soil is well suited to water-tolerant grasses and legumes, but grazing when the soil is wet and soft causes surface compaction and poor tilth and damages the plants.

This soil is well suited to trees adapted to wet sites. It is well suited to natural habitat for wetland wildlife. Seasonal wetness, flooding, and low strength limit the use of equipment for planting and harvesting trees. Also, trees are subject to windthrow, seedlings have a moderate mortality rate, and plant competition is severe. Woodland harvesting and planting can be performed during the non-flooding periods. Site preparation and planting can be done during dry periods. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Logging can be done during dry periods or when the soil is frozen.

Because of flooding, this soil is generally unsuited as a site for buildings and septic tank absorption fields. Fill can be used to elevate roads above the normal flood level.

The land capability classification is IIIw. The woodland ordination symbol is 5W. The pasture and hayland suitability group is C-3.

Lo—Lobdell silt loam, occasionally flooded

This deep, nearly level, moderately well drained soil is on flood plains. In the wider valleys it commonly is on the higher parts of flood plains adjacent to stream channels. In some narrow valleys it makes up the entire flood plain. This soil is subject to brief flooding in winter and spring. The slope is 0 to 2 percent. Most areas range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 12 inches thick. The subsoil is brown, friable and firm silt loam about 14 inches thick. It is mottled in the lower part. The substratum extends to a depth of about 80 inches. In the upper part it is light brownish gray, mottled, friable silt loam, sandy loam, and loam. In the lower part it is yellowish brown, gray, and strong brown, mottled, firm silt loam and sandy clay loam. In some areas the soil is well drained. In other areas the surface layer is loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Orrville soils, the well drained Chili soils, and the moderately well drained Bogart soils. Orrville soils are in slight depressions. Chili and Bogart soils are on alluvial fans. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Lobdell soil is at a depth of 24 to 42 inches during extended wet periods. Permeability is moderate. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are in crops. Some areas are used for pasture. A few areas are woodland.

This soil is well suited to corn and hay and poorly suited to small grain. Random subsurface drainage has been installed in areas of the wetter included soils. Flooding occurs less often during the growing season, and corn generally tolerates brief flooding. Flooding can damage hay crops. Floodwater leaves sediment, generally making grasses and legumes unfit for hay.

On pasture, this soil is well suited to grasses and legumes. Areas dissected by meander channels or covered by flood debris are used for pasture.

Areas that are in narrow stream valleys or that are irregularly shaped are used for woodland. This soil is well suited to woodland. Flooding and low strength limit site preparation and planting and harvesting of trees. Plant competition is severe. Site preparation and planting can be done during dry periods. Removing vines and the less desirable trees and shrubs helps to control plant competition. Applying gravel or crushed stone on haul roads and log landings improves soil strength. Trees can be harvested when the soil is not flooded.

Because of flooding, this soil is generally unsuited as a site for buildings and septic tank absorption fields. Diking to control flooding is difficult. Elevating roads with fill above the normal flood level helps to reduce flood damage. This soil is a good source of topsoil.

The land capability classification is IIw. The woodland ordination symbol is 5A. The pasture and hayland suitability group is A-5.

LvB—Loudonville silt loam, 2 to 6 percent slopes

This moderately deep, gently sloping, well drained soil is on ridgetops on the glaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil, about 23 inches thick, is dark yellowish brown, friable and firm silt loam and loam. The substratum is dark yellowish brown, friable, channery sandy loam. Light gray, hard, massive, fine grained sandstone bedrock is at a depth of about 36 inches. In places the surface layer is loam. In some small eroded spots subsoil material is mixed into the surface layer. In places bedrock is below a depth of 40 inches.

Included with this soil in mapping are small areas of Wooster soils. Wooster soils have a fragipan and are on ridgetops or the upper parts of side slopes. Also included are areas of somewhat poorly drained soils around seep spots. Included soils make up about 10 percent of most areas.

Permeability in this Loudonville soil is moderate. The root zone is moderately deep. Available water capacity is low or moderate, depending on the depth to bedrock. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is well suited to corn, small grains, and hay. The good natural drainage of this soil is favorable to alfalfa. A moderate hazard of erosion and surface crusting are the main concerns of management. Drought is a possible hazard for crops, depending on the depth to bedrock. Erosion reduces the thickness of the root zone above the bedrock, thus reducing the volume of soil from which crops can extract moisture and plant nutrients. This soil warms up early in spring, and can be tilled earlier than most soils in the area. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. Deferring plowing until spring, after leaving crop residue on the surface over winter, also protects this soil against erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting.

This soil is well suited to a variety of pasture plants. It can be grazed early in spring. If the pasture is overgrazed or if the soil is plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding help to control erosion.

This soil is well suited to woodland. Plant competition is moderate, trees are subject to windthrow, and low strength and depth of bedrock are management concerns during harvest for haul roads and log landings. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Because of the moderately deep, hard bedrock, blasting is required in deep excavations for haul roads and log landings. Haul roads and log landings should be located on better suited soils nearby. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

Because of the limited depth to bedrock and the shrinking and swelling of the soil, this unit is moderately well suited as a site for buildings. This soil is better suited to buildings without basements than buildings with basements. Building sites should be landscaped to provide good surface drainage away from foundations. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

This soil is poorly suited as a site for septic tank absorption fields. The limited depth to bedrock is the main limitation. Effluent from septic tank absorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply because the volume of soil above the bedrock is not sufficient to filter the effluent adequately. Effluent can also seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system and placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IIe. The woodland ordination symbol is 4D. The pasture and hayland suitability group is F-1.

LvC—Loudonville silt loam, 6 to 12 percent slopes

This moderately deep, moderately sloping, well drained soil is on ridgetops and the upper parts of side slopes on the glaciated uplands. Most areas lie below gently sloping hilltops and above the steeper part of hillsides. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The dark yellowish brown subsoil is about 25 inches thick. It is friable and firm silt loam and loam in the upper and middle parts; it is friable very channery loam in the lower part. Light gray, hard, massive, fine grained sandstone bedrock is at a depth of about 33 inches. In places the surface layer is loam. Areas used as cropland generally are eroded. In places bedrock is below a depth of 40 inches.

Included with this soil in mapping are small areas of Berks and Wooster soils. Berks soils are droughtier than the Loudonville soil and are on the lower parts of side slopes. Wooster soils have a fragipan and are on ridgetops or the upper parts of side slopes. Also included are areas of somewhat poorly drained soils around seep spots. Included soils make up about 10 percent of most areas.

Permeability in this Loudonville soil is moderate. The root zone is moderately deep. Available water capacity is low or moderate, depending on the depth to bedrock. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Some areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is moderately well suited to corn and small grains. It is well suited to hay. Drought is a possible hazard for crops, depending on the depth to bedrock. Controlling erosion and surface crusting and conserving moisture are the main concerns of management. Erosion is a severe hazard. Erosion reduces the thickness of the root zone above the bedrock, thus reducing the volume of soil from which crops can extract moisture and plant nutrients. This soil warms up early in spring, and can be tilled earlier than most soils in the area. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Crop residue and other organic material returned to the soil increase the rate of water infiltration, improve tilth and fertility, and reduce crusting.

On pasture, this soil is well suited to grasses and legumes. This soil can be grazed early in spring. If this soil is plowed for seedbed preparation or if the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to woodland. Plant competition is moderate; trees are subject to windthrow; and low strength, slope, and depth of bedrock are management concerns during harvest for haul roads and log landings. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Log landings should be located on less sloping soils nearby; because of the moderately deep, hard bedrock, blasting is required in deep excavations for log landings. Applying gravel or crushed stone on haul roads and log landings can improve soil strength.

Because of slope, shrinking and swelling of the soil, and the limited depth to bedrock, this soil is moderately well suited as a site for buildings. This soil is better suited to buildings without basements than buildings with basements. Building sites should be located on the less sloping areas of this unit and landscaped to provide good surface drainage away from foundations. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

This soil is poorly suited as a site for septic tank absorption fields. The limited depth to bedrock is the main limitation. Effluent from septic tank absorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply because the volume of soil above the bedrock is not sufficient to filter the effluent adequately. Effluent can also seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IIIe. The woodland ordination symbol is 4D. The pasture and hayland suitability group is F-1.

LvD—Loudonville silt loam, 12 to 18 percent slopes

This moderately deep, strongly sloping, well drained soil is on side slopes on the glaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil, about 20 inches thick, is dark yellowish brown, friable and firm silt loam and loam. The substratum is dark yellowish brown, friable channery sandy loam. Light gray, hard, massive, fine grained sandstone bedrock is at a depth of about 32 inches. In places the surface layer is loam. Areas in cropland generally are eroded. In places bedrock is below a depth of 40 inches.

Included with this soil in mapping are small areas of Berks and Wooster soils. Berks soils are droughtier than the Loudonville soil and are on the lower parts of side slopes. Wooster soils have a fragipan and are on ridgetops or the upper parts of side slopes. Also included are areas of somewhat poorly drained soils around seep spots. Included soils make up about 10 percent of most areas.

Permeability in this Loudonville soil is moderate. The root zone is moderately deep. Available water capacity is low or moderate, depending on the depth to bedrock. Tilth is good, and runoff is rapid. The content of organic matter is moderate.

Most areas of this soil are wooded. Some areas are used as pasture. A few areas are used as cropland.

This soil is poorly suited to corn and small grains and moderately well suited to hay. Drought is a possible hazard for crops, depending on the depth to bedrock. However, slope and the severe hazard of erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. Erosion reduces the thickness of the root zone above the bedrock, thus reducing the volume of soil from which crops can extract moisture and plant nutrients. Row crops can be grown occasionally on this soil if erosion is controlled. No-till or other conservation tillage systems that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff concentrates.

On pasture, this soil is moderately well suited to grasses and legumes. If the soil is plowed for seedbed preparation or if the pasture is overgrazed, the hazard of erosion is severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Trees are subject to windthrow. Low strength, slope, and depth to bedrock are management concerns during harvest for haul roads and log landings. Slope limits the use of equipment. Runoff can cause erosion. Because of slope, special equipment is needed for site preparation and planting. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. However, if deep excavations are needed for log landings or haul roads, they should be located on better suited soils nearby. Blasting hard bedrock is required for deep excavations in this moderately deep soil. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard.

Because of slope and the limited depth to bedrock, this soil is poorly suited as a site for buildings. Shrinking and swelling of the soil is also a limitation. Building sites should be located on the less sloping areas of this unit; they should be landscaped to provide good surface drainage away from foundations. Diversions carry away runoff from higher, adjacent soils and help to control erosion. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Locating roads and streets on the contour will reduce the steepness of grade. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

This soil is poorly suited as a site for septic tank absorption fields. The main limitations are depth to bedrock, slope, and the possibility of ground water contamination by the effluent. Effluent from septic tank absorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply; the volume of soil above the bedrock is not sufficient to filter the effluent adequately. Effluent can also seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IVe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is F-1.

LvE—Loudonville silt loam, 18 to 25 percent slopes

This moderately deep, moderately steep, well drained soil is on side slopes on the glaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil, about 19 inches thick, is dark yellowish brown, friable and firm silt loam and loam. The substratum is dark yellowish brown, friable, channery sandy loam. Light gray, hard, massive, fine grained sandstone bedrock is at a depth of about 30 inches. In places the surface layer is loam. In some small, eroded spots subsoil material is mixed into the surface layer. In places bedrock is below a depth of 40 inches.

Included with this soil in mapping are small areas of Berks soils. Berks soils are droughtier than the Loudonville soil and are on the lower parts of side slopes. Also included are somewhat poorly drained soils around seep spots. Included soils make up about 10 percent of most areas.

Permeability in this Loudonville soil is moderate. The root zone is moderately deep. Available water capacity is low or moderate, depending on the depth to bedrock. Tilth is good, and runoff is very rapid. The content of organic matter is moderate.

Nearly all areas of this soil are wooded. A few areas are in pasture.

Because of the moderately steep slope and the severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to grasses and legumes used as pasture. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of summer. If the pasture is overgrazed, the hazard of erosion is severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Plant competition is moderate. Trees are subject to windthrow. Low strength, slope, and depth to bedrock are management concerns during harvest for haul roads and log landings. Slope limits the use of equipment. Runoff can cause erosion. Because of slope, special equipment is needed for site preparation and planting. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. However, if deep excavations are needed for log landings or haul roads, they should be located on better suited soils nearby. Blasting hard bedrock is required for deep excavations in this moderately deep soil. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard.

Because of slope and the limited depth to bedrock, this soil is poorly suited as a site for buildings. Other than slope and the depth to bedrock, the main limitation is the shrinking and swelling of the soil. Building sites should be located in the less sloping areas of this unit and landscaped to provide good surface drainage away from foundations. Diversions carry away runoff from higher adjacent soils and help to control erosion. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Locating roads and streets on the contour will reduce the steepness of grade. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

This soil is generally unsuited as a site for septic tank absorption fields. The moderately steep slope and limited depth to bedrock are the main limitations.

The land capability classification is VIe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is F-1.

Ly—Luray silty clay loam

This deep, nearly level, very poorly drained soil is in depressions and on flats on lake plains and outwash plains in the broad valleys and in scattered, small areas in depressions and along drainageways on till plains. In most areas the soil is subject to ponding by runoff from adjacent higher soils. The slope is 0 to 2 percent. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface soil is black, friable and firm silty clay loam about 11 inches thick. The subsoil is very dark gray, dark gray, and gray, mottled, firm silty clay loam about 23 inches thick. The substratum to a depth of about 62 inches is yellowish brown, mottled, firm silty clay loam and gray, mottled, friable, stratified silt loam and very fine sandy loam. In a few areas a thin layer of light-colored alluvium is on the surface. In places the surface layer is mucky silt loam or silt loam. In a few areas thin sandy or gravelly layers are below a depth of 48 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils on slight rises. Also included are some small areas where the surface layer is muck and is as much as 16 inches thick. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Luray soil is near or above the surface during wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high, and tilth is fair. This soil can be tilled only within a narrow range in moisture content. Runoff is very slow or is ponded. The content of organic matter is high.

Most drained areas of this soil are used for crops. Some areas are used as pasture. Other areas are wooded.

This soil, if drained, is well suited to corn, small grains, and hay. Undrained areas generally are too wet to be cultivated. Ponding and a saturated root zone are the main concerns in management. Planting and harvesting are sometimes delayed because of wetness and ponding. In some areas, ponding damages small grains and hay. Surface and subsurface drains are used to remove excess water. In some areas, especially in depressions, drains are difficult to install because outlets are inadequate. Also, correct timing of tillage is very important because this soil becomes compacted and cloddy if worked when wet and sticky.

If drained, this soil is well suited to water-tolerant grasses and legumes as pasture. However, pastures should not be grazed early in spring. Grazing when the soil is wet and soft causes surface compaction and poor tilth and damages the plants.

This soil is well suited to trees adapted to wet sites. It is well suited to habitat for wetland wildlife. Seasonal wetness and low strength limit the use of equipment for planting and harvesting trees. Trees are subject to windthrow. Seedlings have a severe mortality rate. Plant competition is severe. Site preparation and planting can be done during dry periods. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Logging can be done when the soil is frozen or during the drier parts of the year.

Because of ponding and moderately slow permeability, this soil is generally unsuited as a site for buildings and septic tank absorption fields. Many areas afford good sites for ponds. Artificial drainage and the use of suitable base material for local roads can reduce damage resulting from ponding, frost action, and low strength.

The land capability classification is IIw. The woodland ordination symbol is 5W. The pasture and hayland suitability group is C-1.

McC—Mechanicsburg silt loam, 6 to 12 percent slopes

This deep, moderately sloping, well drained soil is on ridgetops and the upper parts of side slopes on the glaciated uplands. Most areas lie below gently sloping hilltops and above the steeper part of hillsides. Areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 49 inches thick. The upper part is yellowish brown, friable silt loam; the middle part is yellowish brown and dark yellowish brown, firm and friable loam; and the lower part is light olive brown, friable, channery loam. The substratum, about 6 inches thick, is light olive brown, friable, extremely channery loam. Light olive brown, fractured, fine grained sandstone bedrock is at a depth of about 64 inches. In places the substratum is extremely channery clay loam. Areas in cropland generally are eroded.

Included with this soil in mapping are small areas of Wooster soils on ridgetops or the upper parts of side slopes. Wooster soils have a fragipan. Also included are somewhat poorly drained soils around seep spots. Included soils make up about 10 percent of most areas.

Permeability in this Mechanicsburg soil is moderate.

The root zone is deep. Available water capacity is moderate or high. Tilth is good, and runoff is rapid. The content of organic matter is moderate.

Some areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. The good natural drainage is favorable to alfalfa. A severe hazard of erosion and surface crusting are the main concerns of management. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Crop residue or other organic material returned to the soil increases the rate of water infiltration, improves tilth and fertility, and reduces crusting.

On pasture, this soil is well suited to grasses and legumes. This soil can be grazed early in spring. If this soil is plowed for seedbed preparation or if the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Plant competition is severe, and low strength and slope are management concerns during harvest for haul roads and log landings. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope.

Because of slope and shrinking and swelling of the soil, this soil is moderately well suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

This soil is moderately well suited as a site for septic tank absorption fields. The main limitations are slope, depth to bedrock, and moderate permeability. If the distribution lines are placed too deep, effluent in septic tank absorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply. Effluent can also seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system with the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IIIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-1.

McD—Mechanicsburg silt loam, 12 to 18 percent slopes

This deep, strongly sloping, well drained soil is on side slopes on the glaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, friable silt loam; the middle part is yellowish brown, firm loam; and the lower part is dark yellowish brown, friable channery loam. The substratum is light olive brown, friable extremely channery loam. Light olive brown, fractured, fine grained sandstone bedrock is at a depth of about 60 inches. In places the substratum is extremely channery clay loam. Areas in cropland generally are eroded.

Included with this soil in mapping are small areas of Wooster soils on ridgetops or the upper parts of side slopes. Wooster soils have a fragipan. Also included are somewhat poorly drained soils around seep spots. Included soils make up about 10 percent of most areas.

Permeability in this Mechanicsburg soil is moderate. The root zone is deep. Available water capacity is moderate or high. Tilth is good, and runoff is rapid. The content of organic matter is moderate.

Most areas of this soil are wooded. Some areas are used as pasture. A few areas are used as cropland.

This soil is poorly suited to corn and small grains and moderately well suited to hay. The good natural drainage favors alfalfa. Slope and the severe hazard of erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. Row crops can be grown occasionally in this soil if erosion is controlled. No-till or other conservation tillage systems that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes.

Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates.

On pasture, this soil is moderately well suited to grasses and legumes. If the soil is plowed for seedbed preparation or if the pasture is overgrazed, the hazard of erosion is severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Plant competition is severe. Low strength and slope are management concerns during harvest for haul roads and log landings. Slope limits the use of equipment. Runoff can cause erosion. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope.

Because of slope and the shrinking and swelling of the soil, this soil is poorly suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Diversions carry away runoff from higher adjacent soils and help to control erosion. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling of the soil. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. Locating roads and streets on the contour will reduce the steepness of grade. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

This soil is poorly suited as a site for septic tank absorption fields. The main limitations are slope, depth to bedrock, and moderate permeability. If the distribution lines are placed too deep, effluent in septic tank absorption fields can seep rapidly through cracks in the underlying bedrock and pollute the underground water supply. Effluent can also seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system and placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IVe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is A-1.

Md—Melvin silt loam, frequently flooded

This deep, nearly level, poorly drained soil is on the low parts of the flood plains. It is subject to flooding in winter and spring. The slope is 0 to 2 percent. Most areas are long and narrow and range from 5 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. The upper part is dark gray, mottled, friable silt loam; the lower part is grayish brown, mottled, firm silty clay loam. The substratum to a depth of about 76 inches is dark grayish brown, friable very fine sandy loam and dark gray, very friable loamy very fine sand. In places the subsoil has more sand and less silt. Some areas have a buried, dark-colored surface layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville and Orrville soils on slight rises. Also included are small areas of the very poorly drained Luray soils in slight depressions. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Melvin soil is near the surface during extended wet periods. Permeability is moderate. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is very slow. The content of organic matter is moderate.

A few areas of this soil are drained and used for crops. Some areas are used as pasture. Other areas are wooded and used for wildlife.

If drained, this soil is moderately well suited to corn and poorly suited to hay. It is generally not suited to small grains because they are subject to damage by flooding. Undrained areas are too wet for the commonly grown crops. Flooding and wetness are the main concerns in management. They often delay spring planting. Flooding is less common during the growing season, and such crops as corn generally tolerate brief flooding; however, hay crops can be damaged. Floodwater leaves sediments on grasses and legumes, often making the crop unfit for hay. Surface and subsurface drains are used to improve drainage. In many areas outlets for drainage systems are difficult to install because the soil is in low landscape positions. The surface layer crusts after hard rains. Returning crop residue to the soil reduces crusting.

Most of the pastured areas are undrained. The undrained areas of this soil are poorly suited to pasture. This soil is well suited to water-tolerant grasses and legumes. Grazing when the soil is wet and soft causes surface compaction and poor tilth and damages the plants.

This soil is well suited to trees adapted to wet sites, and well suited to natural habitat for wetland wildlife. Seasonal wetness, flooding, and low strength limit the use of equipment for planting and harvesting trees. Also, trees are subject to windthrow. Seedlings have a moderate mortality rate. Plant competition is severe. Woodland harvesting and planting can be performed when the soil is not flooded. Site preparation and planting can be done during dry periods. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Logging can be done during dry periods or when the soil is frozen.

Because of flooding, this soil is generally unsuited as a site for buildings and septic tank absorption fields. Fill can be used to elevate roads above the normal flood level.

The land capability classification is IIIw. The woodland ordination symbol is 7W. The pasture and hayland suitability group is C-3.

Mg—Melvin silt loam, ponded

This deep, nearly level, poorly drained soil is in swampy areas on flood plains. It is subject to flooding and to ponding by surface runoff from surrounding areas. The slope is 0 to 2 percent. Areas are irregularly shaped and range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 40 inches thick. The upper part is dark gray, mottled, friable silt loam; the lower part is grayish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark grayish brown, friable very fine sandy loam and dark gray, very friable loamy very fine sand. In places the subsoil has more sand and less silt. Other areas have a buried, dark-colored surface layer.

Included with this soil in mapping are small areas of Carlisle and Luray soils on the same ponded landscape. Carlisle is an organic soil; Luray is very poorly drained soil. Also included are a few areas in which the surface layer is organic material. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Melvin soil is near or above the surface most of the year, and the soil is ponded. Permeability is moderate. The root zone is deep. Available water capacity is high. Tilth is good. The content of organic matter is moderate.

This soil is in its natural state and is used as habitat for wetland wildlife (fig. 12).

This soil is well suited to habitat for wetland wildlife. It is generally unsuited to cultivated crops, hay, pasture, woodland, building sites, and septic tank absorption fields because of ponding and flooding. Areas of this soil support water-tolerant trees, cattails, reeds, and sedges. The fluctuating water level limits the survival of most tree species. The soil provides good habitat for ducks, muskrats, beaver, and other wetland wildlife.

The land capability classification is Vw. The woodland ordination symbol is 6W. This map unit is not assigned to a pasture and hayland suitability group.

Or—Orrville silt loam, occasionally flooded

This deep, nearly level, somewhat poorly drained soil is on flood plains along small streams and in long, narrow strips along larger streams in wide valleys. This soil is subject to flooding for brief periods in winter and spring. The slope is 0 to 2 percent. Most areas range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 19 inches thick. The upper part is yellowish brown, mottled, friable silt loam; the middle part is grayish brown, mottled, friable silt loam; and the lower part is light brownish gray, mottled, friable loam. The substratum to a depth of about 80 inches is light brownish gray and grayish brown, mottled, friable loam. In places the surface layer is loam, fine sandy loam, or sandy loam. Some areas contain more silt and less sand in the subsoil. In a few areas bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping are small areas of the poorly drained Melvin soils, the moderately well drained Lobdell soils, and the well drained Tioga soils. Melvin soils are in slight depressions. Lobdell and Tioga soils are on slight rises adjacent to the stream channel. Also included are small areas of the well drained Chili soils and the moderately well drained Bogart soils on alluvial fans. Included soils make up about 10 to 15 percent of most areas.

A seasonal high water table in this Orrville soil is at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate. The root zone is deep. Available water capacity is moderate or high. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

If drained, this soil is well suited to corn and hay. However, it generally is unsuited to small grains because they are subject to damage by flooding. Flooding and seasonal wetness are the main concerns of management. Surface and subsurface drains are used to improve drainage. In some areas drainage outlets are difficult to install because this soil is in low landscape positions. Controlling flooding is difficult. Preparing a seedbed and planting can be done after the floodwater recedes. Flooding is less common during the growing season, and such crops as corn generally tolerate brief flooding; however, hay crops can be damaged. Floodwater leaves sediments on grasses and legumes, often making the crop unfit for hay. Tilling this soil when it is wet compacts the soil and causes poor tilth.

On pasture, this soil is well suited to water-tolerant grasses and legumes. However, pastures on this soil should not be grazed early in spring. Artificial drainage is needed for deep-rooted legumes, such as alfalfa. Timing of grazing is important, for grazing when the soil is wet and soft causes surface compaction and poor tilth and damages the plants.

This soil is well suited to trees. Seasonal wetness limits site preparation, planting, and harvesting of trees. Also, plant competition is severe and can be controlled by removing vines and the less desirable trees and shrubs. Woodland harvesting and planting can be performed when the soil is not flooded. Site preparation and planting can be done during dry periods. Logging can be done during dry periods or when the soil is frozen.

Because of flooding, this soil is generally unsuited as a site for buildings and septic tank absorption fields. Diking to control flooding is difficult. Elevating roads on fill above the normal flood level reduces damage.

The land capability classification is IIw. The woodland ordination symbol is 5A. The pasture and hayland suitability group is C-3.

Pg—Pits, gravel

This map unit consists of areas from which sand and gravel have been removed for use in construction. The areas are on outwash plains, stream terraces, and kames, mainly adjacent to Bogart, Chili, Fitchville, and Glenford soils. Most gravel pits are irregularly shaped and range from 5 to 50 acres in size. Actively mined gravel pits are continually being enlarged.

Typically, the pits have nearly vertical sides and gently sloping bottoms. The sides consist of layers of gravel and sand that vary in fragment size, orientation, thickness, and mixture. The bottom of the pits is either loamy material or sand and gravel. Some pits contain water.

The areas are generally not suited to good plant growth. Extensive reclamation is necessary before seeding. Cutting back sidewalls, covering with topsoil, and properly controlling excess runoff help in establishing plants. Blanketing the area with a layer of good soil material improves the available water capacity. Fertilization may be needed. Establishing a stand of drought-resistant grasses is important in controlling erosion.

Abandoned gravel pits have potential for recreation uses. The pits can be graded and seeded for use as parks, playgrounds, or picnic areas. Pits that have been excavated to or below the level of the water table can be developed as habitat for wetland wildlife.

This map unit was not assigned to a capability subclass. It was not given a woodland ordination symbol. It was not assigned to a pasture and hayland suitability group.

Pu—Pits, quarry

This map unit consists of inactive surfaced mined areas from which sandstone has been removed for use in construction. The unit is on unglaciated uplands. Most quarries are irregularly shaped and range from 5 to 20 acres in size. Most quarries have a highwall on one or more sides.

Before the sandstone was quarried, the overburden generally was scalped and stockpiled. This material commonly is acid and is poorly suited to plants. Most of these abandoned quarries are overgrown and have fair or poor potential as habitat for wildlife.

For a better vegetative cover, extensive reclamation is needed before seeding. Both the overburden and the mined areas are generally unsuited or poorly suited to plants. The hard rock sidewalls are difficult to cut back. Some sidewalls can be covered if enough spoil material is available. Plant growth can be improved by leveling the spoil material, blanketing the spoil with topsoil and subsoil material, and applying lime and fertilizer. Planting grasses or legumes helps to control erosion. Some areas can be developed for recreation uses and habitat for wildlife.

This map unit was not assigned to a capability subclass. It was not given a woodland ordination symbol. It was not assigned to a pasture and hayland suitability group.

ReA—Ravenna silt loam, 0 to 2 percent slopes

This deep, nearly level, somewhat poorly drained soil is on flat till plains and in small depressions and drainageways on glaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 44 inches thick. The upper part is dark yellowish brown, mottled, firm loam; the middle part is yellowish brown, mottled, very firm and brittle loam that is a fragipan; the lower part is yellowish brown, mottled, friable loam. The substratum to a depth of about 80 inches is light olive brown, mottled, friable loam glacial till. In places the surface layer is loam.

Included with this soil in mapping are small areas of the moderately well drained Canfield soils on the crest of

Figure 12.—Melvin silt loam, ponded, is well suited to habitat for wetland wildlife.

some knolls and ridges and on side slopes along some drainageways. Also included are small areas of the somewhat poorly drained Fitchville soils and the poorly drained Sebring soils in depressions and in some drainageways. Included soils make up about 10 to 15 percent of most areas.

A perched, seasonal high water table in this Ravenna soil is at a depth of 6 to 18 inches during extended wet periods. A fragipan is at a depth of 14 to 30 inches. Permeability is moderate above the fragipan and slow in the fragipan. The root zone mainly is restricted to the 14- to 30-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Seasonal wetness, surface crusting, and the restricted rooting depth are the main concerns of management. Wetness delays planting in spring. The surface layer crusts after hard rains. Subsurface drains are used to lower the seasonal high water table and permit more timely field operations. Surface drainage also is needed in some areas. Returning crop residue to the soil, planting winter cover crops, and regularly adding other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting. If drained, this soil is moderately well suited to no-till.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to a variety of pasture plants. Undrained areas are better suited to grasses than to deep-rooted legumes. Subsurface drainage is needed for deep-rooted legumes, such as alfalfa. Timely deferment of grazing when the soil is wet and soft helps to prevent surface compaction.

This soil is well suited to trees. Seasonal wetness limits site preparation, planting, and harvesting of trees. Seedlings have a moderate mortality rate. Plant competition is moderate. Trees are subject to windthrow. Site preparation and planting can be done during dry periods. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Logging can be done during dry periods or when the soil is frozen.

This soil is poorly suited as a site for buildings. Seasonal wetness is the main limitation. Open ditches and subsurface drains are used to lower the seasonal high water table. Diversions divert runoff from higher adjacent soils. Drains at the base of footings remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. In constructing local roads and streets, artificial drainage and the use of suitable base material reduce damage resulting from frost action and seasonal wetness.

Because of seasonal wetness and slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIw. The woodland ordination symbol is 5D. The pasture and hayland suitability group is C-2.

ReB—Ravenna silt loam, 2 to 6 percent slopes

This deep, gently sloping, somewhat poorly drained soil is on till plains, at the base of steeper slopes, in small drainageways, and at the heads of drainageways on glaciated uplands. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 3 inches thick. The subsurface layer is brown, mottled, friable loam about 4 inches thick. The subsoil is about 48 inches thick. The upper part is brown, mottled, firm loam and gravelly loam. The middle part is yellowish brown, mottled, very firm and brittle, gravelly loam (fragipan). The lower part is yellowish brown, mottled, friable fine sandy loam. The substratum to a depth of about 80 inches is light olive brown, mottled, friable loam glacial till. In places the surface layer is loam.

Included with this soil in mapping are small areas of the moderately well drained Canfield soils on the crests of some knolls and ridges and on side slopes along some drainageways. Also included are small areas of the somewhat poorly drained Fitchville soils and the poorly drained Sebring soils in depressions and in some drainageways. Included soils make up about 10 to 15 percent of most areas.

A perched, seasonal high water table in this Ravenna soil is at a depth of 6 to 18 inches during extended wet periods. A fragipan is at a depth of 14 to 30 inches. Permeability is moderate above the fragipan and slow in the fragipan. The root zone mainly is restricted to the 14- to 30-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. Seasonal wetness, a moderate hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns of management. Wetness delays planting in spring. The surface layer crusts after hard rains. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion; these practices are easily adapted to most areas. If drained, this soil is moderately well suited to no-till. Subsurface drains are used to lower the seasonal high water table and permit more timely field operations. Suitable drainage outlets are in most areas. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to a variety of pasture plants. If the pasture is overgrazed or if the soil is plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding help to control erosion. Timely deferment of grazing when the soil is wet and soft helps to prevent surface compaction. Subsurface drains are used where deep-rooted legumes, such as alfalfa, are grown. Undrained areas are better suited to grasses than to deep-rooted legumes.

This soil is well suited to trees. Seasonal wetness limits site preparation, planting, and harvesting of trees. Seedlings have a moderate mortality rate. Plant competition is moderate. Trees are subject to windthrow. Site preparation and planting can be done during dry periods. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Logging can be done during dry periods or when the soil is frozen.

This soil is poorly suited as a site for buildings. Seasonal wetness is the main limitation. Building sites should be landscaped to provide good surface drainage away from foundations. Open ditches and subsurface drains are used to lower the seasonal high water table. Diversions and drainage ditches divert runoff from higher adjacent soils. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings are used to remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Maintaining a plant cover on a construction site and using other water control practices help to control erosion. In constructing local roads and streets, artificial drainage and the use of suitable base material reduce damage resulting from frost action and seasonal wetness.

Because of seasonal wetness and slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIe. The woodland ordination symbol is 5D. The pasture and hayland suitability group is C-2.

RgB—Rigley sandy loam, 3 to 8 percent slopes

This deep, gently sloping, well drained soil is on ridgetops on the unglaciated uplands. Most areas are long and narrow and range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable sandy loam about 8 inches thick. The subsoil, about 40 inches thick, is yellowish brown, friable and firm sandy loam and channery sandy loam. The substratum is yellowish brown, friable channery sandy loam. Dark yellowish brown, fractured, soft, sandstone bedrock is at a depth of about 62 inches. In places the subsoil contains more clay. In places the surface layer is fine sandy loam, loam, channery sandy loam, channery fine sandy loam, or channery loam. In places soft, sandstone bedrock is between a depth of 30 and 60 inches.

Included with this soil in mapping are small areas of Coshocton, Hazleton, and Westmoreland soils. The deep, moderately well drained Coshocton soils and the deep, well drained Westmoreland soils have more clay and less sand in the solum than the Rigley soil. The deep, well drained Hazleton soils have a higher content of coarse fragments in the subsoil than the Rigley soil. These three soils are on landscapes similar to those of the Rigley soil and are scattered throughout the unit. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Rigley soil is moderately rapid. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Many areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is well suited to corn, small grains, and hay (fig. 13). Controlling erosion and conserving moisture are the main concerns of management. Erosion is a moderate hazard. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent, timely applications of fertilizer than to one large application.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa. The natural drainage permits grazing early in spring. Erosion is a moderate hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs.

It also is well suited as a site for buildings and septic tank absorption fields. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures.

The land capability classification is IIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-1.

RgC—Rigley sandy loam, 8 to 15 percent slopes

This deep, strongly sloping, well drained soil is on ridgetops and side slopes on the unglaciated uplands. Areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, very friable sandy loam about 3 inches thick. The subsurface layer is yellowish brown, friable sandy loam about 7 inches thick. The subsoil, about 40 inches thick, is yellowish brown, friable and firm sandy loam and channery sandy loam. The substratum is yellowish brown, friable channery sandy loam about 15 inches thick. Gray, thin-bedded shale bedrock is at a depth of about 65 inches. In places the subsoil contains more clay. In places the surface layer is fine sandy loam, loam, channery sandy loam, channery fine sandy loam, or channery loam. In some areas on ridgetops slopes are 5 to 8 percent. In a few places on ridgetops, soft sandstone bedrock is between a depth of 30 and 60 inches. Areas in cropland generally are eroded.

Included with this soil in mapping are small areas of Coshocton, Hazleton, and Westmoreland soils. The deep, moderately well drained Coshocton soils and the deep, well drained Westmoreland soils have more clay and less sand in the solum than the Rigley soil. The deep, well drained Hazleton soils have a higher content of coarse fragments in the subsoil than the Rigley soil. These three soils are on landscapes similar to those of the Rigley soil and are scattered throughout the unit. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Rigley soil is moderately rapid. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Many areas are used as woodland. Some areas are used as cropland. Other areas are used as pasture.

This soil is moderately well suited to corn and small grains and well suited to hay (fig. 14). Controlling erosion and conserving moisture are the main concerns of management. Erosion is a severe hazard. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent, timely applications of fertilizer than to one large application.

On pasture, this soil is well suited to grasses and legumes, especially deep-rooted plants, such as alfalfa. The natural drainage permits grazing early in spring. Erosion is a severe hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate and can be controlled by removing vines and the less desirable trees and shrubs. Also, slope is a concern during harvest for log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope.

Because of slope, this soil is moderately well suited as a site for buildings. Building sites should be located in the less sloping areas of this unit. Diversions carry away runoff from higher adjacent soils and help to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures.

This soil is moderately well suited as a site for septic tank absorption fields. Slope is the main limitation. Effluent can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface.

The land capability classification is IIIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-1.

RgD—Rigley sandy loam, 15 to 25 percent slopes

This deep, moderately steep, well drained soil is on side slopes on the unglaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, very friable sandy loam about 3 inches thick. The subsurface layer is yellowish brown, friable sandy loam about 5 inches thick. The subsoil, about 48 inches thick, is brown and strong brown, friable and firm sandy loam and channery sandy loam. The substratum is yellowish brown, friable channery sandy loam about 22 inches thick. Gray, thin-bedded shale bedrock is at a depth of about 78 inches. In places the subsoil contains more clay. In places the surface layer is fine sandy loam, loam,

Figure 13.—Rigley sandy loam, 3 to 8 percent slopes, is well suited to hay.

channery sandy loam, channery fine sandy loam, or channery loam. In a few places soft bedrock is above a depth of 60 inches. Areas in cropland generally are eroded.

Included with this soil in mapping are small areas of Coshocton, Hazleton, and Westmoreland soils. The deep, moderately well drained Coshocton soils and the deep, well drained Westmoreland soils have more clay and less sand in the solum than the Rigley soil. The deep, well drained Hazleton soils have a higher content of coarse fragments in the subsoil than the Rigley soil. These three soils are on landscapes similar to those of the Rigley soil and are scattered throughout the unit. Included soils make up about 10 to 15 percent of the unit.

Permeability is moderately rapid. The root zone is deep. Available water capacity is low or moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Many areas of this soil are used as woodland. Some areas are used as pasture. A few areas are in cropland.

This soil is poorly suited to corn and small grains and moderately well suited to hay. The good natural drainage is favorable to alfalfa. Slope and the severe hazard of erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion control practices. Row crops can be grown occasionally if erosion is controlled. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and planting cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates. Because nutrients are moderately rapidly leached, crops generally respond better to small, frequent, timely applications of fertilizer than to one large application.

On pasture, this soil is moderately well suited to grasses and legumes. The natural drainage permits grazing early in spring. Erosion is a severe hazard if the soil is plowed to prepare a seedbed or if the pasture is overgrazed. Reseeding with a cover or companion crop, mulching, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Slope limits the use of equipment and runoff can cause erosion. Plant competition is moderate and the seedling mortality rate is moderate on south- and west-facing slopes. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover are also used to control erosion. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

Because of slope, this soil is moderately well suited as a site for buildings. Building sites should be located in the less sloping areas of this unit. Diversions carry away runoff from higher adjacent soils and help to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures.

This soil is poorly suited as a site for septic tank absorption fields. Slope is the main limitation. Effluent can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Also, if the distribution lines are placed too deep, effluent from the septic tank absorption fields can pollute the underground water supply because of the moderately rapid permeability. Enlarging the field or installing a double absorption field system and placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IVe. The woodland ordination symbol is 4R on north aspects and 3R on south aspects. The pasture and hayland suitability group is A-2.

ScD—Schaffenaker loamy sand, 12 to 25 percent slopes

This moderately deep, moderately steep, well drained soil is on side slopes on the unglaciated uplands. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy sand about 3 inches thick. The subsurface layer is brown, very friable loamy sand about 4 inches thick. The subsoil is about 14 inches thick. The upper part is light yellowish brown, very friable loamy sand; the lower part is yellowish brown, very friable channery loamy sand. The substratum is brown, loose channery sand. Yellowish brown sandstone bedrock is at a depth of 33 inches. In the upper 5 inches it is soft and fractured; below that, it is hard. In places the surface layer is loamy fine sand or sand.

Included with this soil in mapping are small, scattered areas of Rigley soils. Rigley soils are deep and have more clay in the subsoil than the Schaffenaker soil. Included soils make up about 10 percent of most areas.

Permeability in this Schaffenaker soil is rapid or very rapid. The root zone is moderately deep. Available water capacity is very low. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Most areas are used as woodland. A few areas are used as pasture.

Because of the very low available water capacity, the moderately steep slope, and the very severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to grasses and legumes used as pasture. The good natural drainage permits early spring grazing, but little forage is produced during the dry part of summer. If the pasture is overgrazed, the hazard of erosion is severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is moderately well suited to trees. Slope limits the use of equipment. Seedlings have a moderate or severe mortality rate. Depth to bedrock is a management concern in constructing haul roads and log landings. Placing logging roads and skid trails on the contour facilitates the use of equipment. Also, log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. The moderately deep bedrock is rippable with construction equipment. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

Because of slope, depth to bedrock, and the hazard of sloughing or cave-ins during excavations, this soil is poorly suited as a site for buildings. This soil is better suited to houses without basements than houses with basements. Building sites should be located in the less sloping areas of this unit. Special safety precautions are needed in digging basements or trenches. Diversions carry away runoff from higher adjacent soils and help to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action.

This soil is generally unsuited as a site for septic tank absorption fields because of slope, depth to rock, and the possibility of ground water contamination by the effluent.

The land capability classification is VIs. The woodland ordination symbol is 3S on north aspects and 2S on south aspects. The pasture and hayland suitability group is F-1.

Figure 14.—Stripcropping of corn, hay, and oats on Rigley sandy loam, 8 to 15 percent slopes.

Se—Sebring silt loam

This deep, nearly level, poorly drained soil is in depressions on small, local lake basins and in a few areas in depressions on stream terraces. The soil is subject to ponding by runoff from surrounding higher soils. The slope is 0 to 2 percent. Areas are irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 12 inches thick. The subsoil is gray and dark gray, mottled, firm silt loam and silty clay loam about 36 inches thick. The substratum to a depth of about 80 inches is gray and yellowish brown, very firm and firm silty clay loam. Some areas have a silty clay loam surface layer. In a few places glacial till is at a depth of 50 to 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils on slight rises and the very poorly drained Luray soils in small depressions. Included soils make up about 10 to 15 percent of most areas.

An apparent seasonal high water table in this Sebring soil is near or above the surface during extended wet periods. Permeability is moderately slow. The root zone is deep. Available water capacity is high. Tilth is good. Runoff is very slow or ponded. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

If adequately drained, this soil is moderately well suited to corn and well suited to hay. It is poorly suited to small grains because these crops are easily damaged by ponding. Surface and subsurface drains are used in most areas to improve drainage. However, in many areas, good natural outlets for subsurface drains are not available because the soil is in very low landscape positions. In places diversions and waterways are used to intercept surface runoff from adjacent higher soils and thus reduce ponding.

On pasture, this soil is well suited to water-tolerant grasses and legumes. However, pastures on this soil should not be grazed early in spring. Grazing when the soil is wet and soft causes surface compaction and poor tilth and damages the plants. Artificial drainage is needed for deep-rooted legumes, such as alfalfa, to grow well.

This soil is well suited to trees adapted to wet sites and well suited to habitat for wetland wildlife. Seasonal wetness and low strength limit the use of equipment for planting and harvesting trees. Also, seedlings have a severe mortality rate and plant competition is severe. Site preparation and planting can be done during dry periods. Planting seedlings that have been transplanted once will reduce the seedling mortality rate. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Logging can be done during dry periods or when the soil is frozen.

Because of ponding and slow permeability, this soil is generally unsuited as a site for buildings and septic tank absorption fields. Artificial drainage and the use of suitable base material for local roads can reduce damage resulting from ponding, frost action, and low strength. Some areas are suited to aquifer-fed, excavated ponds.

The land capability classification is IIIw. The woodland ordination symbol is 5W. The pasture and hayland suitability group is C-2.

Tg—Tioga loam, occasionally flooded

This deep, nearly level, well drained soil is on the highest parts of the flood plains adjacent to the stream channel. It is subject to flooding for brief periods in winter and spring. The slope is 0 to 2 percent. Areas are long and narrow or irregularly shaped and range from 5 to 200 acres in size.

Typically, the surface layer is brown, friable loam about 8 inches thick. The subsoil is brown and dark yellowish brown, friable loam and sandy loam about 28 inches thick. The substratum to a depth of about 80 inches is dark yellowish brown, friable, stratified silt loam and loam. In some areas the surface layer is silt loam or fine sandy loam. In a few places the surface layer is gravelly loam. In a few areas the subsoil has more clay. Also in places the soil is moderately well drained.

Included with this soil in mapping are small areas of the somewhat poorly drained Orrville soils in the slightly lower areas. Included soils make up about 10 percent of most areas.

A seasonal high water table in this Tioga soil is at a depth of 36 to 72 inches during extended wet periods. Permeability is moderate or moderately rapid. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is slow. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn and hay and poorly suited to small grains. Flooding is the main concern of management. Winter and spring floods damage small grains. Flooding is less common during the growing season, and corn generally tolerates brief flooding; however, hay crops can be damaged. Floodwater leaves sediments on grasses and legumes, often making the crop unfit for hay. This soil drains faster after a flood and can be tilled earlier than other soils on bottom land.

On pasture, this soil is well suited to grasses and legumes. Areas that are dissected by meander channels or are covered by flood debris are used as pasture. These areas can be grazed early in spring.

Areas in narrow stream valleys or areas irregularly shaped are used as woodland. This soil is well suited to woodland. Flooding limits the harvesting and planting of trees. Plant competition is moderate. Woodland harvesting and planting can be performed when the soil is not flooded. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of flooding, this soil is generally unsuited as a site for buildings and septic tank absorption fields. Diking to control flooding is difficult. Elevating roads on fill above the normal flood level reduces damage. Fill for roads should not block the flow of floodwater. This soil is a good source of topsoil.

The land capability classification is IIw. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-5.

Ud—Udorthents, loamy

These soils are in areas that have been altered by cutting or filling. They are mainly in construction areas and small pits from which material other than coal or bedrock has been removed, but they also include fill or disposal areas. The slopes range from 0 to 12 percent. The areas are irregularly shaped and range from 5 to 30 acres in size.

In areas where soil material has been removed, the remaining material typically is similar to the subsoil or substratum of adjacent soils. In fill or disposal areas, the characteristics of the soil material are more varied; this soil material generally originated as the subsoil and substratum of nearby soils.

Typically, the upper 60 inches is silty clay loam, clay loam, silt loam, or loam. The available water capacity varies, but it is dominantly low or very low in the root zone. Permeability generally is slow. Tilth is poor. If the soil has little or no plant cover, hard rains tend to seal the surface. Sealing or crusting slows the infiltration of water and inhibits the emergence and growth of seedlings. A seasonal high water table is evident in some areas, particularly in graded areas that are depressed or bowl-shaped.

Erosion on cut slopes and filled banks is the major problem in soil management in most areas of this map unit. Crownvetch and grass commonly are planted to control erosion. In some areas surface and subsurface drains and sediment basins are needed to control runoff.

The suitability of these soils for building site development and sanitary facilities varies considerably. Onsite investigation is needed to determine hazards or limitations for any proposed use.

This map unit was not assigned to a capability subclass. It was not given a woodland ordination symbol. It was not assigned to a pasture and hayland suitability group.

Up—Udorthents-Pits complex

This map unit consists mainly of areas that are actively being surface mined primarily for coal (fig. 15) but also for clay and limestone and the adjacent mined areas that are in reclamation. These areas are about 70 percent Udorthents and 20 percent Pits. Udorthents are gently sloping to steep soils around pits or near the edge of the unit. Pits are the nearly level areas between vertical highwalls or between vertical highwalls and Udorthents. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, Udorthents are mixed rock fragments and partly weathered fines. They also include stockpiles of topsoil and other soil material used in the later reclamation of the area. The mixture of rock fragments and partly weathered fines are in cone-shaped piles 10 to 70 feet high or have been leveled in partially reclaimed mined areas. These partially reclaimed mined areas are adjacent to the active mines. They have been filled and leveled, but do not have part or all of the 2 to 3 feet of reconstructed natural soil material and topsoil that will later be applied in the final reclamation of the area.

Included in mapping and making up about 10 percent of most areas are moderately deep and deep soils in areas around the edges of pits or in small, scattered areas within pits.

In areas of Udorthents where the surface is bare, the erosion hazard is severe. Suitable plant cover is needed to control erosion. These areas will later be reclaimed by filling, landleveling, and the replacement of the topsoil on the surface. However, at present, the available water capacity is quite variable, but is dominantly low or very low in the root zone.

The suitability of areas as sites for temporary buildings and sanitary facilities during the mining and reclamation process is highly variable. Onsite investigation is needed to determine the potential and limitation for any proposed use. These sites are subject to constant change. Upon completion of the mining and reclamation process, these areas will be a reclaimed soil, such as Fairpoint or Farmerstown soils.

This map unit was not assigned to a capability subclass. It was not given a woodland ordination symbol. It was not assigned to a pasture and hayland suitability group.

WeC2—Westmoreland silt loam, 8 to 15 percent slopes, eroded

This deep, strongly sloping, well drained soil is on ridgetops and the upper parts of side slopes on the unglaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Areas are irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The yellowish brown subsoil is about 47 inches thick. It is firm silty clay loam and clay loam in the upper part and firm silt loam and channery silt loam in the lower part. Light olive brown, soft siltstone bedrock is at a depth of about 54 inches; light olive brown, thin-bedded, fractured siltstone bedrock is at a depth of about 70 inches. Wooded areas are not eroded. Some areas have a surface layer of loam. In places on ridgetops slopes are 5 to 8 percent. A few places have bedrock at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Coshocton and Rigley soils. The moderately well drained Coshocton soils are on landscapes similar to those of the Westmoreland soil. Rigley soils have less clay and more sand in the solum than the Westmoreland soil. They are on narrow ridgetops or on upper side slopes. Also included are areas of somewhat poorly drained soils near seeps. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Westmoreland soil is moderate. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Many areas of this soil are used as cropland. Some areas are used as pasture. Other areas are wooded.

This soil is moderately well suited to corn and small grains and well suited to hay. The good natural drainage favors alfalfa. A severe hazard of erosion and surface crusting are the main concerns of management. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Crop residue or other organic material returned to the soil increases the rate of water infiltration, improves tilth and fertility, and reduces crusting.

On pasture, this soil is well suited to grasses and legumes. This soil can be grazed early in spring. If this soil is plowed for seedbed preparation or if the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. However, seedlings are subject to severe plant competition; management concerns during harvest include slope for log landings and low strength for haul roads and log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope and depth to bedrock, this soil is moderately well suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. During construction, erosion and sedimentation can be reduced by using plant cover and other water-control measures. This soil is better suited to buildings without basements than buildings with basements. Artificial drainage and the use of suitable base material help to prevent the damage caused by frost action to local roads and streets.

This soil is moderately well suited as a site for septic tank absorption fields. The main limitations are slope, depth to bedrock, and moderate permeability. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent. Effluent from septic tank absorption fields can seep through cracks in the underlying bedrock and pollute the underground water supply. Placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IIIe. The woodland ordination symbol is 4A. The pasture and hayland suitability group is A-1.

Figure 15.—Vertical highwalls in the foreground and stockpiles of soil material in the background on Udorthents-Pits complex.

WeD2—Westmoreland silt loam, 15 to 25 percent slopes, eroded

This deep, moderately steep, well drained soil is on side slopes on the unglaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Areas are irregularly shaped and range from 5 to 75 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil, about 38 inches thick, is yellowish brown, friable and firm silt loam, clay loam, and loam. The substratum is yellowish brown, friable very channery loam. Light olive brown, soft siltstone bedrock is at a depth of about 52 inches; light olive brown, thin-bedded, fractured siltstone bedrock is at a depth of about 70 inches. Some areas have a surface layer of loam. Wooded areas are not eroded. In places the substratum is channery loam. A few places have bedrock at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Coshocton and Rigley soils. The moderately well drained Coshocton soils are on landscapes similar to those of the Westmoreland soil. Rigley soils have less clay and more sand in the solum than the Westmoreland soil. Rigley soils are on narrow ridgetops or on the upper side slopes. Also included are areas of somewhat poorly drained soils near seeps. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Westmoreland soil is moderate. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Some areas of this soil are used as cropland. Many areas are used as pasture. Other areas are wooded.

This soil is poorly suited to corn and small grains and moderately well suited to hay. Slope and the severe hazard of erosion are the main concerns of management.

Slope hinders the use of machinery and the installation of erosion-control measures. Row crops can be grown occasionally if erosion is controlled. No-till or other forms of conservation tillage that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates.

On pasture, this soil is moderately well suited to grasses and legumes. If the soil is plowed for seedbed preparation or if the pasture is overgrazed, the hazard of erosion is severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, timely grazing, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Slope limits the use of equipment. Plant competition is severe. Management concerns during harvest include slope and low strength for haul roads and log landings. Runoff can cause erosion. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

Because of slope, this soil is poorly suited as a site for buildings. Buildings should be designed so that they conform to the natural slope of the land; sites should be landscaped so surface runoff drains away from foundations. Diversions carry away runoff from higher, adjacent soils and help to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and the use of suitable base material help to reduce damage from frost action.

This soil is poorly suited as a site for septic tank absorption fields. Slope is the main limitation. Effluent from a septic tank absorption field can seep horizontally and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IVe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is A-2.

WeE—Westmoreland silt loam, 25 to 40 percent slopes

This deep, steep, well drained soil is on side slopes on the unglaciated uplands. Areas are irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 2 inches thick. The subsurface layer, about 3 inches thick, is brown, friable loam. The subsoil is yellowish brown, friable and firm loam and clay loam about 36 inches thick. The substratum is yellowish brown and brown, friable very channery loam. Light olive brown, soft siltstone bedrock is at a depth of about 53 inches; light olive brown, thin-bedded, fractured siltstone bedrock is at a depth of about 70 inches. In some areas the surface layer is loam and in small, eroded spots the subsoil has been mixed into the surface layer. In places the substratum is channery loam. A few places have bedrock at a depth of 20 to 40 inches.

Included with this soil in mapping are small areas of Coshocton and Hazleton soils. The moderately well drained Coshocton soils and the well drained Hazleton soils are on landscapes similar to those of the Westmoreland soil. Hazleton soils have a higher content of coarse fragments in the subsoil than the Westmoreland soil. Also included are areas of somewhat poorly drained soils near seeps. Included soils make up about 10 to 15 percent of most areas.

Permeability in this Westmoreland soil is moderate. The root zone is deep. Available water capacity is moderate. Tilth is good. Runoff is very rapid. The content of organic matter is moderate.

Most areas of this soil are wooded. Some areas are used as pasture.

Because of the steep slope and the severe erosion hazard, this soil is generally unsuited to cropland.

This soil is poorly suited to grasses and legumes used as pasture. The good natural drainage permits early spring grazing. If the pasture is overgrazed, the hazard of erosion is severe. Timely grazing, proper stocking rates, and pasture rotation help to keep the soil and plants in good condition.

This soil is well suited to trees. Slope limits the use of equipment. Plant competition is severe. Management concerns during harvest include slope and low strength for haul roads and log landings. Runoff can cause erosion. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

This soil is generally unsuited as a site for buildings and septic tank absorption fields. The steep slope is the main limitation.

The land capability classification is VIe. The woodland ordination symbol is 4R. The pasture and hayland suitability group is A-3.

WgC2—Westmoreland-Coshocton complex, 8 to 15 percent slopes, eroded

These deep, strongly sloping soils are on side slopes and ridgetops on the unglaciated uplands. Most areas are about 50 percent Westmoreland silt loam and 40 percent Coshocton silt loam. The well drained Westmoreland soil and the moderately well drained Coshocton soil are very intermingled on the landscape. In both soils erosion has removed part of the original surface layer. The present surface layer of both soils is a mixture of the original surface layer and the subsoil material. These soils occur as areas so intricately mixed or in areas so small that mapping them separately was not practical. Most areas are elongated and range from 5 to 75 acres in size.

Typically, the Westmoreland soil has a brown, friable silt loam surface layer about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The yellowish brown subsoil is about 45 inches thick. It is firm silty clay loam and clay loam in the upper part and firm silt loam and channery silt loam in the lower part. Yellowish brown, soft siltstone bedrock is at a depth of about 53 inches; light olive brown, thin-bedded, fractured siltstone bedrock is at about 70 inches. Some areas have a surface layer of loam. Wooded areas are not eroded. In places on ridgetops slopes are 5 to 8 percent. A few places have bedrock at a depth of 20 to 40 inches.

Typically, the Coshocton soil has a brown, friable silt loam surface layer about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The yellowish brown subsoil is about 32 inches thick. It is friable and firm silt loam in the upper part and mottled, firm clay loam and silty clay loam in the lower part. The substratum is light yellowish brown and yellowish brown, mottled, firm silty clay loam. Thin-bedded, soft shale bedrock is at a depth of about 52 inches. In places on ridgetops slopes are 5 to 8 percent. In some areas the subsoil contains less sand and fewer siltstone fragments. Wooded areas are not eroded. Also, in places the substratum overlies sandstone bedrock.

Included with this unit in mapping are small areas of the deep, well drained Rigley soils that contain less clay and more sand in the solum than Westmoreland and Coshocton soils. Rigley soils are on narrow ridgetops or on the steeper side slopes. Also included are deep, moderately well drained soils that contain more clay in the subsoil than the Westmoreland and Coshocton soils, that are on landscapes similar to those of the Westmoreland and Coshocton soils, and that are scattered throughout the unit. Also included are areas of somewhat poorly drained soils near seeps. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 18 to 42 inches during extended wet periods in the Coshocton soil. Permeability is moderate in the Westmoreland soil and moderately slow or slow in the Coshocton soil. The root zone is deep, the available water capacity is moderate, and tilth is good in both soils. Runoff is rapid. The content of organic matter is moderately low in both soils.

Many areas of these soils are used as cropland. Some areas are used as pasture. Other areas are wooded.

These soils are moderately well suited to corn and small grains and well suited to hay. Controlling erosion and maintaining tilth are the main concerns of management. Erosion is a severe hazard. A system of conservation tillage that leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. These soils are moderately well suited to no-till because of the seasonal wetness of the Coshocton soil. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces surface crusting. Subsurface drains are used to drain areas of the included wetter soils.

On pasture, these soils are well suited to grasses and legumes. If the soils are plowed to prepare a seedbed or if the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Grazing when the soils are wet causes surface compaction, increased runoff, and reduced yields. Proper stocking rates, timely grazing, and pasture rotation help to keep the soils and plants in good condition.

These soils are well suited to trees. However, in both soils, plant competition is severe. Management concerns during harvest include slope for log landings and low strength for haul roads and log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

These soils are moderately well suited as a site for buildings. The main limitations are slope on both soils, seasonal wetness and shrinking and swelling on the Coshocton soil, and depth to bedrock on the Westmoreland soil. Building sites should be landscaped so surface runoff drains away from foundations. Subsurface drains also reduce wetness. Drains at the base of footings are used to remove excess water from around foundations and basement walls. Exterior basement wall coatings help to prevent wet basements. Backfilling along basement walls with a low shrink-swell material minimizes the damage caused by shrinking and swelling. Diversions carry away runoff from higher adjacent soils and help to reduce seasonal wetness and to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. The Westmoreland soil is better suited to buildings without basements than buildings with basements. In constructing local roads and streets, artificial drainage and the use of suitable base material help to reduce damage from frost action.

The Westmoreland soil is moderately well suited as a site for septic tank absorption fields because of slope, depth to bedrock, and moderate permeability. The Coshocton soil is poorly suited as a site for septic tank absorption fields because of seasonal wetness and moderately slow or slow permeability. Interceptor drains placed upslope from absorption fields help to lower the seasonal high water table on the Coshocton soil. Effluent from a septic tank absorption field can seep horizontally in both soils and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent. If the distribution lines are placed too deep, effluent from the septic tank absorption fields can pollute the underground water supply. Placing the absorption field in suitable fill material will increase the absorption of effluent and reduce the pollution hazard.

The land capability classification is IIIe. The woodland ordination symbol is 4A. The pasture and hayland suitability groups are A-1 on the Westmoreland soil and A-6 on the Coshocton soil.

WgD2—Westmoreland-Coshocton complex, 15 to 25 percent slopes, eroded

These deep, moderately steep soils are on side slopes on the unglaciated uplands. Most areas are about 50 percent Westmoreland silt loam and 40 percent Coshocton silt loam. The well drained Westmoreland soil and the moderately well drained Coshocton soil are very intermingled on the landscape. On both soils, erosion has removed part of the original surface layer. The present surface layer of both soils is a mixture of the original surface layer and the subsoil material. These soils occur as areas so intricately mixed or in areas so small that mapping them separately was not practical. Most areas are elongated and range from 5 to 60 acres in size.

Typically, the Westmoreland soil has a brown, friable silt loam surface layer about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The yellowish brown subsoil is about 43 inches thick. It is firm silty clay loam and clay loam in the upper part and firm silt loam and channery silt loam in the lower part. Yellowish brown, soft siltstone bedrock is at a depth of about 50 inches; light olive brown, thin-bedded, fractured siltstone bedrock is at a depth of about 70 inches. Some areas have a surface layer of loam. Wooded areas are not eroded. A few places have bedrock at a depth of 20 to 40 inches.

Typically, the Coshocton soil has a brown, friable silt loam surface layer about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The yellowish brown subsoil is about 33 inches thick. It is friable and firm silt loam in the upper part and mottled, firm clay loam and silty clay loam in the lower part. The substratum is light yellowish brown and yellowish brown, mottled, firm silty clay loam. Thin-bedded soft shale bedrock is at a depth of about 54 inches. In some areas the subsoil contains less sand and fewer siltstone fragments. Wooded areas are not eroded. Also, in places the substratum overlies sandstone bedrock.

Included with this unit in mapping are small areas of the deep, well drained Rigley soils that have less clay and more sand in the solum than the Coshocton and Westmoreland soils. Also included are deep, moderately well drained soils that have more clay in the subsoil than the Coshocton and Westmoreland soils. These included soils are on landscapes similar to those of the Coshocton and Westmoreland soils and are scattered throughout the unit. Also included are areas of somewhat poorly drained soils near seeps. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 18 to 42 inches during extended wet periods in the Coshocton soil. Permeability is moderate in the Westmoreland soil and moderately slow or slow in the Coshocton soil. The root zone is deep, the available water capacity is moderate, and tilth is good in both soils. Runoff is rapid. The content of organic matter is moderately low in both soils.

Some areas of these soils are used as cropland. Many areas are used as pasture. Other areas are wooded.

These soils are poorly suited to corn and small grains and moderately well suited to hay. Slope and the very severe hazard of erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. Row crops can be grown occasionally if erosion is controlled. No-till or other forms of conservation tillage that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates.

On pasture, these soils are moderately well suited to grasses and legumes. If the soils are plowed for seedbed preparation or if the pasture is overgrazed, the hazard of erosion is very severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, timely grazing, and pasture rotation help to keep the soils and plants in good condition.

These soils are well suited to trees. Slope, low strength, and the moderate hazard of erosion are the main concerns of management for both soils. However, seedling mortality is a management concern on the Coshocton soil and plant competition is severe on both soils. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Applying gravel or crushed stone on haul roads and log landings can improve soil strength. Because of slope, special equipment is needed for site preparation and planting. Planting seedlings that have been transplanted once will reduce the seedling mortality rate on south- and west-facing slopes of the Coshocton soil. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Coves and north- and east-facing slopes are the best woodland sites. These sites have cooler temperatures and less evapotranspiration because of less exposure to the prevailing wind and sun.

Because of slope, these soils are poorly suited as a site for buildings. Seasonal wetness is a limitation on the Coshocton soil. Buildings should be designed so that they conform to the natural shape of the land and sites should be landscaped to permit surface runoff to drain away from foundations. Diversions carry away runoff from higher adjacent soils and help to reduce seasonal wetness and to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and the use of suitable base material help to reduce damage from frost action.

The Westmoreland soil is poorly suited as a site for septic tank absorption fields because of the slope; the Coshocton soil is poorly suited as a site for septic tank absorption fields because of the slope, seasonal wetness, and the moderately slow or slow permeability. Interceptor drains placed upslope from absorption fields help to lower the seasonal high water table on the Coshocton soil. Effluent from a septic tank absorption field can seep horizontally in both soils and surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the field or installing a double absorption field system will increase the absorption of effluent.

The land capability classification is IVe. The woodland ordination symbol is 4R on north aspects of both soils, 4R on the south aspect of the Westmoreland soil, and 3R on the south aspect of the Coshocton soil. The pasture and hayland suitability group is A-2 for both soils.

WsB—Wooster silt loam, 2 to 6 percent slopes

This deep, gently sloping, well drained soil is on slightly convex areas on the glaciated uplands. Areas are irregularly shaped and range from 5 to 150 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The yellowish brown subsoil is about 48 inches thick. The upper part is firm silt loam and loam; the middle part is mottled, very firm and brittle, loam (fragipan); the lower part is firm loam. The substratum to a depth of about 80 inches is yellowish brown, friable gravelly loam glacial till. Some areas have a surface layer of loam. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained.

Included with this soil in mapping are small areas of the well drained Amanda soils on landscapes similar to those of the Wooster soil. Also included are the somewhat poorly drained Ravenna soils in small drainageways. Amanda soils do not have a fragipan. Also included are a few small areas of severely eroded soils that have fair tilth on knolls. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table in this Wooster soil is at a depth of 30 to 48 inches during extended wet periods. A fragipan is at a depth of 20 to 36 inches. Permeability is moderately slow. The root zone mainly is restricted to the 20- to 36-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is medium. The content of organic matter is moderate.

Most areas of this soil are used as cropland. Some areas are used as pasture. A few areas are wooded.

This soil is well suited to corn, small grains, and hay. The good natural drainage favors alfalfa. A moderate hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns of management. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. Deferring plowing until spring, after leaving crop residue on the surface over winter, also helps to control erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. This soil is well suited to a variety of pasture plants. It can be grazed early in spring. If the pasture is overgrazed or if the soil is plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding help to control erosion.

This soil is well suited to woodland. Most wooded areas are small. Trees are subject to windthrow, and plant competition is severe. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is well suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings are used to remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In the construction of local roads and streets, artificial drainage and the use of suitable base material minimize the damage caused by frost action.

Because of seasonal wetness and moderately slow permeability, this soil is poorly suited as a site for septic tank absorption fields. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIe. The woodland ordination symbol is 5D. The pasture and hayland suitability group is F-3.

WsC—Wooster silt loam, 6 to 12 percent slopes

This deep, moderately sloping, well drained soil is on the sides of ridges and small, natural drainageways and on complex slopes on the glaciated uplands. Areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is dark yellowish brown and dark grayish brown, firm silt loam about 3 inches thick. The subsoil is about 45 inches thick. The upper part is yellowish brown, friable and firm silt loam and clay loam, and the lower part is dark yellowish brown, mottled, very firm and brittle, clay loam and gravelly loam (fragipan). The substratum to a depth of about 72 inches is dark yellowish brown, mottled, very firm silt loam and gravelly sandy loam glacial till. Some areas have a surface layer of loam. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained.

Included with this soil in mapping are small areas of the well drained Amanda soils on landscapes similar to those of the Wooster soil and the somewhat poorly drained Ravenna soils in small drainageways. Amanda soils do not have a fragipan. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table in this Wooster soil is at a depth of 30 to 48 inches during extended wet periods. A fragipan is at a depth of 20 to 36 inches. Permeability is moderately slow. The root zone mainly is restricted to the 20- to 36-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is rapid. The content of organic matter is moderate.

Most areas are used as woodland. Some areas are used as pasture. A few areas are used as cropland.

This soil is moderately well suited to corn and small grains and well suited to hay (fig. 16). The good natural drainage favors alfalfa. The severe hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns of management. Erosion reduces the thickness of the root zone above the fragipan, thus reducing the volume of soil from which crops can extract moisture and plant nutrients. No-till and other forms of conservation tillage that leave crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. This soil is well suited to no-till. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Crop residue or other organic material returned to the soil increases the rate of water infiltration, improves tilth and fertility, and reduces crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

On pasture, this soil is well suited to grasses and legumes. It can be grazed early in spring. If the soil is plowed for seedbed preparation or if the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Most wooded areas are small. Trees are subject to windthrow. Plant competition is severe. Slope is a concern during harvest for log landings. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, this soil is moderately well suited as

Figure 16.—Wooster silt loam, 6 to 12 percent slopes, is well suited to hay.

a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Subsurface drains are used to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings and exterior coatings on basement walls help to prevent wet basements. Diversions carry away runoff from higher adjacent soils and help to reduce seasonal wetness and to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In the construction of local roads and streets, artificial drainage and the use of suitable base material reduce damage caused by frost action.

This soil is poorly suited as a site for septic tank absorption fields. Seasonal wetness and moderately slow permeability are the main limitations. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIIe. The woodland ordination symbol is 5D. The pasture and hayland suitability group is F-3.

WsC2—Wooster silt loam, 6 to 12 percent slopes, eroded

This deep, moderately sloping, well drained soil is on the sides of ridges and small natural drainageways and on complex slopes on the glaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Most areas are long and narrow and range from 5 to 75 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm silt loam and loam, and the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm loam glacial till. Some areas have a loam or gravelly loam surface layer. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained.

Included with this soil in mapping are small areas of the well drained Amanda soils on landscapes similar to those of the Wooster soil and the somewhat poorly drained Ravenna soils in small drainageways. Amanda soils do not have a fragipan. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table in this Wooster soil is at a depth of 30 to 48 inches during extended wet periods. A fragipan is at a depth of 20 to 36 inches. Permeability is moderately slow. The root zone mainly is restricted to the 20- to 36-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Most areas of this soil are used as cropland. Other areas are used as pasture.

This soil is moderately well suited to corn and small grains and well suited to hay. The good natural drainage favors alfalfa. Controlling the severe hazard of further erosion and reducing crusting are the main concerns of management. Continued erosion further reduces the thickness of the root zone above the fragipan, thus further reducing the volume of soil from which crops can extract moisture and plant nutrients. Conservation tillage, which leaves crop residue on the surface, contour stripcropping, winter cover crops, and grassed waterways help to control erosion. This soil is well suited to no-till. Crop rotations that include a high percentage of hay and pasture and regular applications of barnyard manure and other organic material also help to control erosion and surface crusting. In areas that have smooth, uniform slopes, this soil is well suited to such erosion-control measures as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in fall and not plowing until spring also protect the soil against erosion. Returning crop residue or other organic material to the soil and planting cover crops increase the rate of water infiltration, improve tilth and fertility, and reduce crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

On pasture, this soil is well suited to grasses and legumes. It can be grazed early in spring. If the soil is plowed to prepare a seedbed or if the pasture is overgrazed, continued erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. However, trees are subject to windthrow. Plant competition is severe. Management concerns during harvest include slope for log landings. Log landings should be located on less sloping soils nearby, or landing sites could be improved on this soil by cutting and filling to a more desirable slope. Frequent, light thinning and harvesting increases stand vigor and reduces the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated also reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, this soil is moderately well suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Subsurface drains are used to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings and exterior coatings on basement walls help to prevent wet basements. Diversions carry away runoff from higher adjacent soils and help to reduce seasonal wetness and to control erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, artificial drainage and use of suitable base material reduce damage caused by frost action.

This soil is poorly suited as a site for septic tank absorption fields. Seasonal wetness and moderately slow permeability are the main limitations. Interceptor drains placed upslope from the septic tank absorption field or perimeter drains around the absorption field help to lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IIIe. The woodland ordination symbol is 5D. The pasture and hayland suitability group is F-3.

WsD2—Wooster silt loam, 12 to 18 percent slopes, eroded

This deep, strongly sloping, well drained soil is on side slopes of natural drainageways and ridges on the glaciated uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. Most areas are long and narrow and range from 5 to 80 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 35 inches thick. The upper part is yellowish brown, firm silt loam and loam, and the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm loam glacial till. Some areas have a loam or gravelly loam surface layer. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained. Wooded areas are not eroded.

Included with this soil in mapping are small areas of the well drained Amanda soils on landscapes similar to those of the Wooster soil and the somewhat poorly drained Ravenna soils in small drainageways. Amanda soils do not have a fragipan. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table in this Wooster soil is at a depth of 30 to 48 inches during extended wet periods. A fragipan is at a depth of 20 to 36 inches. Permeability is moderately slow. The root zone mainly is restricted to the 20- to 36-inch zone above the fragipan. Available water capacity is low in the zone above the fragipan. Tilth is good. Runoff is rapid. The content of organic matter is moderately low.

Many areas of this soil are used as pasture. Some areas are in native hardwoods. Other areas are used as cropland.

This soil is poorly suited to corn and small grains and moderately well suited to hay. The good natural drainage favors alfalfa. Slope and the severe hazard of further erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. Continued erosion further reduces the thickness of the root zone above the fragipan, thus further reducing the volume of soil from which crops can extract moisture and plant nutrients. Row crops can be grown occasionally if erosion is controlled. No-till or other forms of conservation tillage that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates.

On pasture, this soil is moderately well suited to grasses and legumes. If the soil is plowed for seedbed preparation or if the pasture is overgrazed, the hazard of continued erosion is severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soil in good condition.

This soil is well suited to trees. Slope limits the use of equipment. Runoff can cause erosion. Also, trees are subject to windthrow. Plant competition is severe. Slope is a concern during harvest for haul roads and log landings. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of slope, this soil is poorly suited as a site for buildings. Building sites should be landscaped to provide good surface drainage away from foundations. Subsurface drains are used to lower the seasonal high water table. Diversions carry away runoff from higher adjacent soils and help to reduce seasonal wetness and further erosion. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. Locating roads and streets on the contour will reduce the steepness of grade. In the construction of local roads and streets, artificial drainage and the use of suitable base material reduce damage caused by frost action.

This soil is poorly suited as a site for septic tank absorption fields. Slope, seasonal wetness, and moderately slow permeability are the main limitations. Interceptor drains placed upslope from the septic tank absorption field help lower the seasonal high water table. Effluent from absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption.

The land capability classification is IVe. The woodland ordination symbol is 5R. The pasture and hayland suitability group is F-3.

WtB—Wooster-Chili complex, 2 to 6 percent slopes

These deep, gently sloping, well drained soils are on complex slopes on glaciated uplands adjacent to stream valleys and on moraines on the glaciated uplands. Most areas are about 60 percent Wooster silt loam and 30 percent Chili loam. The Wooster and Chili soils are intermingled on the landscape. They are so intricately mixed or in areas so small that mapping them separately was not practical. Areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the Wooster soil has a dark grayish brown, friable silt loam surface layer about 9 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown, friable and firm silt loam and loam, and the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm loam glacial till. Some areas have a surface layer of loam. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained.

Typically, the Chili soil has a brown, friable loam surface layer about 9 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown, firm loam and strong brown, firm gravelly clay loam; the lower part is strong brown, friable gravelly sandy loam. The substratum to a depth of about 60 inches is brown, loose very gravelly loamy sand. In places the surface layer is silt loam or gravelly loam. In some small eroded spots subsoil material is mixed into the surface layer. In some areas the soil is moderately well drained.

Included with this unit in mapping are small areas of the well drained Amanda soils on landscapes similar to those of the Wooster soil and the somewhat poorly drained Ravenna soils in depressions and small drainageways. Amanda soils do not have a fragipan. Also included are a few small areas of severely eroded soils that have fair tilth on knolls. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 30 to 48 inches during extended wet periods in the Wooster soil. A fragipan is at a depth of 20 to 36 inches in the Wooster soil. Permeability is moderately slow in the Wooster soil. It is moderately rapid in the subsoil and rapid in the substratum of the Chili soil. The root zone mainly is restricted to the 20- to 36-inch zone above the fragipan in the Wooster soil. The root zone is deep in the

Chili soil. Available water capacity is low in the zone above the fragipan in the Wooster soil. It is low or moderate in the Chili soil. Tilth is good in both soils. Runoff is medium. The content of organic matter is moderate in both soils.

Most areas of these soils are used as cropland. Some areas are used as pasture. A few areas are wooded.

These soils are well suited to corn, small grains, and hay. The good natural drainage of this unit favors alfalfa. A moderate hazard of erosion and surface crusting are the main concerns of management. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help to reduce runoff and to control erosion. These soils are well suited to no-till. Deferring plowing until spring, after leaving crop residue on the surface over winter, also protects these soils against erosion. Returning crop residue or other organic material to the soil increases water intake, improves tilth and fertility, and reduces crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

Most of the pastured areas are in rotation with cultivated crops. These soils are well suited to a variety of pasture plants. They can be grazed early in spring. If the pasture is overgrazed or if the soils are plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding help to control erosion.

These soils are well suited to trees, but most wooded areas are small. Plant competition is moderate on the Chili soil and severe on the Wooster soil. Trees are subject to windthrow on the Wooster soil. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard.

These soils are well suited as a site for buildings. For buildings with basements, the main limitation on the Wooster soil is seasonal wetness. The Chili soil has a hazard of sloughing and cave-ins during excavations. On both soils, building sites should be landscaped to provide good surface drainage away from foundations. On the Wooster soil, water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings are used to remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Special safety precautions are needed in digging basements or trenches on the Chili soil. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. In constructing local roads and streets, providing suitable base material minimizes the damage caused by frost action in both soils, and artificial drainage on the Wooster soil also helps to prevent the damage caused by frost action to local roads and streets.

The Wooster soil is poorly suited as a site for septic tank absorption fields, and the Chili soil is well suited. The main limitations on the Wooster soil are seasonal wetness and the moderately slow permeability. On the Chili soil, if the distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply because of the rapid permeability in the substratum. On the Wooster soil, perimeter drains around a septic tank absorption field help to lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption. On the Chili soil, placing septic tank absorption fields in suitable fill material reduces the ground water pollution hazard.

The land capability classification is IIe. The woodland ordination symbol is 5D on the Wooster soil and 4A on the Chili soil. The pasture and hayland suitability groups are F-3 on the Wooster soil and A-1 on the Chili soil.

WtC2—Wooster-Chili complex, 6 to 12 percent slopes, eroded

These deep, moderately sloping, well drained soils are on complex slopes on glaciated uplands adjacent to stream valleys and on moraines on the glaciated uplands. Most areas are about 60 percent Wooster silt loam and 30 percent Chili loam. In both soils erosion has removed part of the original surface layer. The present surface layer of both soils is a mixture of the original surface layer and the subsoil material. The Wooster and Chili soils are intermingled on the landscape. They are so intricately mixed or in areas so small that mapping them separately was not practical. Areas are irregularly shaped and range from 5 to 50 acres in size.

Typically, the Wooster soil has a brown, friable silt loam surface layer about 7 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 38 inches thick. The upper part is yellowish brown, firm silt loam and loam, and the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm loam glacial till. Some areas have a loam or gravelly loam surface layer. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained. Wooded areas are not eroded.

Typically, the Chili soil has a brown, friable loam surface layer about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm loam and strong brown, firm gravelly clay loam; the lower part is strong brown, friable gravelly sandy clay loam. The substratum to a depth of about 60 inches is brown, loose very gravelly loamy sand. Some areas have a gravelly loam surface layer. In places the soil is moderately well drained. Wooded areas are not eroded.

Included with this unit in mapping are small areas of the well drained Amanda soils on landscapes similar to those of the Wooster soil and the somewhat poorly drained Ravenna soils at the heads of drainageways. Amanda soils do not have a fragipan. Also included are a few small areas of severely eroded soils that have fair tilth on knolls. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 30 to 48 inches during extended wet periods in the Wooster soil. In the Wooster soil, a fragipan is at a depth of 20 to 36 inches. Permeability is moderately slow in the Wooster soil and moderately rapid in the subsoil and rapid in the substratum of the Chili soil. The root zone mainly is restricted to the 20- to 36-inch zone above the fragipan in the Wooster soil. The root zone is deep in the Chili soil. Available water capacity is low in the zone above the fragipan in the Wooster soil. It is low or moderate in the Chili soil. Tilth is good in both soils. Runoff is rapid. The content of organic matter is moderately low in both soils.

Most areas of these soils are used as cropland. Some areas are used as pasture. A few areas are wooded.

These soils are moderately well suited to corn and small grains and well suited to hay. The good natural drainage of this unit favors alfalfa. Controlling the severe hazard of further erosion and reducing crusting are the main concerns of management. On the Wooster soil continued erosion further reduces the thickness of the root zone above the fragipan, thus further reducing the volume of soil from which crops can extract moisture and plant nutrients. On both soils, conservation tillage, which leaves crop residue on the surface, contour stripcropping, winter cover crops, and grassed waterways help to control erosion. These soils are well suited to no-till. Crop rotations that include a high percentage of hay and pasture and regular applications of barnyard manure and other organic material also help to control erosion and surface crusting. Leaving crop residue on the surface in fall and not plowing until spring also protect these soils against erosion. Crop residue and other organic material returned to the soil increase the rate of water infiltration, improve tilth and fertility, and reduce crusting. Random subsurface drains are used to lower the seasonal high water table in the included wetter soils.

On pasture, these soils are well suited to grasses and legumes. Pastures on these soils can be grazed early in spring. If these soils are plowed to prepare a seedbed or if the pasture is overgrazed, continued erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soils in good condition.

These soils are well suited to trees, but most wooded areas are small. Plant competition is moderate on the Chili soil and severe on the Wooster soil. Harvest concerns include slope for log landings on both soils. On the Wooster soil, trees are subject to windthrow. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard.

Both soils are moderately well suited as a site for buildings. Slope is the main limitation for both soils. Seasonal wetness is a also a limitation on the Wooster soil. The Chili soil has a hazard of sloughing and cave-ins during excavations. On both soils, building sites should be landscaped to provide good surface drainage away from foundations. Diversions carry away runoff from higher adjacent soils and help to reduce seasonal wetness on the Wooster soil and to control erosion in both soils. Further erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. On the Wooster soil, water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings are used to remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. Special safety precautions are needed in digging basements or trenches on the Chili soils. In constructing local roads and streets, providing suitable base material on both soils minimizes the damage caused by frost action and artificial drainage on the Wooster soil also helps to prevent the damage caused by frost action to local roads and streets.

The Wooster soil is poorly suited and the Chili soil is moderately well suited as a site for septic tank absorption fields. The main limitations on the Wooster soil are slope, seasonal wetness, and the moderately slow permeability. The main limitation on the Chili soil is slope. Also, on the Chili soil, if the distribution lines are placed too deep, effluent in septic tank absorption fields can pollute the underground water supply because of the rapid permeability in the substratum. On the Wooster soil, interceptor drains placed upslope from the septic tank absorption field help to lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption. On the Chili soil, placing septic tank absorption fields in suitable fill material reduces the ground water pollution hazard.

The land capability classification is IIIe. The woodland ordination symbol is 5D on the Wooster soil and 4A on the Chili soil. The pasture and hayland suitability groups are F-3 on the Wooster soil and A-1 on the Chili soil.

WtD2—Wooster-Chili complex, 12 to 18 percent slopes, eroded

These deep, strongly sloping, well drained soils are on complex slopes on the glaciated uplands adjacent to stream valleys. Most areas are about 60 percent Wooster silt loam and 30 percent Chili loam. On both soils, erosion has removed part of the original surface layer. The present surface layer of both soils is a mixture of the original surface layer and the subsoil material. The Wooster soil typically is on the upper part of slopes and the Chili soil is on the lower parts. They are so intricately mixed or in areas so small that mapping them separately was not practical. Most areas are long and narrow and range from 5 to 30 acres in size.

Typically, the Wooster soil has a brown, friable silt loam surface layer about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm silt loam and loam, and the lower part is dark yellowish brown, mottled, very firm and brittle, loam (fragipan). The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm loam glacial till. Some areas have a loam or gravelly loam surface layer. A few areas have more sand in the subsoil and substratum. A few places have bedrock at a depth of 40 to 60 inches. In some areas the soil is moderately well drained. Wooded areas are not eroded.

Typically, the Chili soil has a brown, friable loam surface layer about 8 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil is about 38 inches thick. The upper part is yellowish brown, firm loam and strong brown, firm gravelly clay loam, and the lower part is strong brown, friable gravelly sandy clay loam. The substratum to a depth of about 60 inches is brown, loose, very gravelly loamy sand. Some areas have a gravelly loam surface layer. In places the soil is moderately well drained.

Included with this unit in mapping are small areas of the well drained Amanda soils on landscapes similar to those of the Wooster soil and the somewhat poorly drained Ravenna soils at the heads of drainageways. Amanda soils do not have a fragipan. Seep spots are in a few areas. Included soils make up about 10 percent of most areas.

A perched, seasonal high water table is at a depth of 30 to 48 inches during extended wet periods in the Wooster soil. A fragipan in the Wooster soil is at a depth of 20 to 36 inches. Permeability is moderately slow in the Wooster soil and moderately rapid in the subsoil and rapid in the substratum of the Chili soil. The root zone mainly is restricted to the 20- to 36-inch zone above the fragipan in the Wooster soil. The root zone is deep in the Chili soil. Available water capacity is low in the zone above the fragipan in the Wooster soil. It is low or moderate in the Chili soil. Tilth is good in both soils. Runoff is rapid. The content of organic matter is moderately low in both soils.

Most areas are used as pasture. Some areas are used as cropland. Other areas are wooded.

These soils are poorly suited to corn and small grains and moderately well suited to hay. The good natural drainage of this unit favors alfalfa. Slope and the severe hazard of further erosion are the main concerns of management. Slope hinders the use of machinery and the installation of erosion-control measures. On the Wooster soil, continued erosion further reduces the thickness of the root zone above the fragipan, thus further reducing the volume of soil from which crops can extract moisture and plant nutrients. Row crops can be grown occasionally on both soils if erosion is controlled. No-till or other forms of conservation tillage that leave crop residue on the surface, rotations with grasses and legumes, and cover crops help to reduce runoff and to control erosion. Some areas are suited to contour stripcropping, but most areas are not adapted to this practice because of short, complex slopes. Grassed waterways are used to reduce gullying in natural waterways where runoff water concentrates.

On pasture, these soils are moderately well suited to grasses and legumes. If the soils are plowed for seedbed preparation or if the pasture is overgrazed, the hazard of continued erosion is severe. Reseeding with a cover or companion crop, using a mulch, and no-till seeding help to to control erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help to keep the plants and the soils in good condition.

These soils are well suited to trees. Slope limits the use of equipment. Plant competition is moderate on the Chili soil and severe on the Wooster soil. Runoff can cause erosion on both soils. On the Wooster soil, trees are subject to windthrow. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and vegetative cover also help to control erosion. Log landings should be located on less sloping soils nearby, or landing sites on this soil can be improved by cutting and filling to a more desirable slope. Because of slope, special equipment is needed for site preparation and planting. Plant competition can be controlled by removing vines and the less desirable trees and shrubs. Frequent, light thinning and harvesting will increase stand vigor and reduce the windthrow hazard. Harvesting procedures that do not leave the remaining trees widely spaced or isolated will also reduce the windthrow hazard.

These soils are poorly suited as a site for buildings. Slope is the main limitation for buildings. Sloughing and cave-ins are hazards during excavations on the Chili soil. On both soils, building sites should be landscaped to provide good surface drainage away from foundations. Diversions carry away runoff from higher adjacent soils and help to reduce seasonal wetness on the Wooster soil and further erosion in both soils. Further erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. On the Wooster soil, water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings are used to remove excess water around foundations and basement walls. Also, exterior basement wall coatings help to prevent wet basements. On the Chili soil, special safety precautions are needed in digging basements or trenches. In constructing local roads and streets, providing suitable base material on both soils and artificial drainage on the Wooster soil helps to prevent the damage caused by frost action to local roads and streets.

These soils are poorly suited as a site for septic tank absorption fields. The main limitations on the Wooster soil are slope, seasonal wetness, and the moderately slow permeability. The main limitation on the Chili soil is slope. Also, if distribution lines are placed too deep on the Chili soil, effluent in septic tank absorption fields can pollute the underground water supply because of the rapid permeability in the substratum. On the Wooster soil, interceptor drains placed upslope from the septic tank absorption field help to lower the seasonal high water table. Effluent from septic tank absorption fields may seep along the top of the fragipan and surface downslope. Placing the distribution lines of the septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Enlarging the absorption field or installing a double absorption field system increases effluent absorption. On the Chili soil, placing septic tank absorption fields in suitable fill material reduces the ground water pollution hazard.

The land capability classification is IVe. The woodland ordination symbol is 5R on the Wooster soil and 4R on the Chili soil. The pasture and hayland suitability groups are F-3 on the Wooster soil and A-1 on the Chili soil.

Prime Farmland

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. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses (*23*). It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 53,200 acres, 20 percent of Holmes County, is classified as prime farmland. Also, parts of another 27,800 acres, or 10 percent of the county, is prime farmland because it has been drained or drained and protected from flooding. The undrained parts of this survey area are potential prime farmland if they are later drained or drained and protected from flooding. The northern part of the county contains the most areas of prime farmland. Although the southern part of the county is generally more sloping than the northern part, some fairly large areas of prime farmland are on flood plains and terraces. Most areas of prime farmland are on nearly level and gently sloping uplands, terraces, and flood plains. About 74 percent of all prime farmland is in crops, including corn, hay, and small grains (*27*).

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive, and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. On some soils included on the list, measures that overcome a hazard or limitation, such as flooding and wetness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent 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 behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

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

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

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

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

The soils in the survey area are assigned to various interpretative groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops and Pasture

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General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

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

New farming methods and management practices are likely to be introduced during the useful life of this survey. Information about the latest methods and practices is available in the "Agronomy Guide," published regularly by the Agronomy Department of Ohio State University, the Ohio Agricultural Research and Development Center, and the Cooperative Extension Service.

Trends in Land Use

Farming is the main land use in Holmes County. About 63 percent of the county is used as cropland and pasture; only 1 percent is urban land (*27*). In recent years, the amount of cropland has decreased and the amount of pasture has increased. In 1980, 112,200 acres was used as cropland and 59,700 acres was used as pasture (*27*). In 1967, a total of 116,778 acres was used as cropland and 42,287 acres was used as pasture (*20*).

In the future, some cropland and pasture can be expected to be converted to residential, industrial, or recreation areas. The extent to which this conversion reduces the food-producing potential of the county depends to a large extent on the soils in the converted area.

Most of the cropland supports dairy and livestock enterprises; however, the number of cash grain farms is increasing. Crops produced are corn for grain or silage, forage, small grains, and soybeans. A few specialized crops make up a small percentage of cropland. Stripcropping and crop rotations are used extensively throughout the county. Conservation tillage, which leaves crop residue on the surface, is practiced on a significant acreage throughout the county. No-till is growing in popularity for erosion control for crop production.

Cropping patterns have changed in recent years. In the past, the cropping sequence on most cropland included 4 or more years of hay. This sequence has changed somewhat because of an increase in corn production. Although a system of conservation tillage that leaves crop residue on the surface has been applied in the areas used for corn, excessive erosion has resulted in areas where the protective cover of crop residue has not been adequate.

The Agronomy Guide keeps current on the latest varieties, fertilizer recommendations, and tillage methods (*19*).

Soil Management Problems

The management concerns on cropland in the county are erosion, natural drainage, soil moisture, fertility, water quality of local springs and shallow ground water aquifers, and tilth. They are described in the following paragraphs.

Erosion is a major soil management problem on about 56 percent of the cropland and about 50 percent of the pasture in Holmes County (*20*). Erosion is a hazard on all soils that have slopes of more than 2 percent. On some soils, such as Wooster silt loam, 6 to 12 percent slopes, eroded, it is the most serious problem. On other soils, such as Ravenna silt loam, 2 to 6 percent slopes, both erosion and wetness are problems.

Erosion reduces soil productivity and can result in the sedimentation of lakes and streams. Soil productivity is reduced because the surface layer is lost and part of the subsoil is incorporated into the plow layer.

Erosion results in the removal of the surface layer of the soil. The surface layer, over the years, has received most of the residue from plants, both native and cultivated, which have grown in the soil. For this reason, the surface layer contains more organic matter than other parts of the soil. In most soils in Holmes County, the surface layer is darker colored than the subsoil and substratum. Because of this added organic matter, the surface layer is capable of storing and releasing more available water and plant nutrients per unit volume than other layers in the soil. Thus, its loss reduces considerably the nutrient supplying power of the soil.

The subsoil in Coshocton and many other soils is higher in content of clay than the surface layer. As erosion removes soil from the surface, the plow layer extends deeper into the subsoil. The result is a plow layer with a higher content of clay than the original plow layer. Plow layers with a higher content of clay have poorer tilth, are harder to work, and are not as good a seedbed.

The rooting depth is restricted in many soils in Holmes County. In soils such as Canfield soils, the restriction is caused by a dense layer in the subsoil called a fragipan. In other soils, such as Gilpin or Loudonville soils, bedrock is the restriction. Erosion at the surface reduces the depth to these restrictive layers, thus reducing the volume of soil available for root system development.

For these reasons, controlling erosion is important in sustaining high crop yields. Several means of erosion control can be used. Measures that control erosion provide a protective cover of crops or crop residue, reduce the runoff rate, and increase the rate of water intake.

A simple erosion-control measure is cross-slope cultivation. This measure is effective on soils that have slopes of 2 to 6 percent. On such soils as Canfield silt loam, which typically has long, uniform slopes, tillage across the slope is easy. On soils such as Centerburg silt loam, which has short, irregular slopes, tillage in any particular direction is unlikely to eliminate completely upslope and downslope cultivation.

Contour stripcropping has been in extensive use as an erosion control practice in the county for many years. It is used most widely on soils that have rather uniform slopes of 6 to 25 percent (fig. 17). This practice is not practical in areas that have short, irregular slopes, such as many areas of the sloping Chili soils.

Erosion control practices equally applicable to smooth and irregular slopes are the return of crop residue and the use of hay crops in the rotation. Residues reduce raindrop impact against the soil, preventing particles from being dislodged. The close-growing hay crops help to reduce the rate of runoff, thus reducing the amount of lost soil. The applicability of the use of hay as an erosion-control practice depends largely on the type of farming operation.

Terraces and diversions help to control runoff, erosion, and the length of slope. They are most practical on deep, well drained soils that have smooth slopes. Some areas of Chili soils have long, uniform slopes that are suitable for terraces. Most soils in the county are less suitable for terracing and diversions because of irregular slopes, excessive wetness in the terrace channels, the clayey subsoil, a fragipan exposed in terrace channels, or bedrock between depths of 20 and 40 inches.

Grassed waterways are natural or constructed outlets that remove surface water at a nonerosive velocity. Gullies can form in such areas if water flows rapidly across a bare surface. Subsurface drains can carry off the normal flow of water in these areas. Any excess surface water can be carried off by grassed waterways. Natural drainageways are the best sites for waterways, mainly because a good channel commonly can be established with a minimum of

Figure 17.—Contour stripcropping is a common practice on the Westmoreland-Coshocton complex, 8 to 15 percent slopes, eroded, and the Westmoreland-Coshocton complex, 15 to 25 percent slopes, eroded.

shaping. The waterway can be designed to accomodate farm machinery crossing it.

Water and sediment control basins that have underground outlets can be constructed in the drainageways as an alternative to grassed waterways. These basins can be effective in areas where the accumulation of sediments is high or where a herbicide might damage the sod in grassed waterways.

No-till or reduced tillage methods of crop production are growing in popularity. These methods control erosion by preventing the exposure of bare soil to raindrop impact and runoff. No-till methods are best adapted on well drained, medium or moderately coarse textured soils, such as Amanda, Chili, and Wooster soils. In such soils, the surface layer is sufficiently friable to make good contact with planted seeds, even when the soil has not been loosened artificially. Moderately well drained soils, such as Canfield and Glenford soils, also are suited to no-till methods (fig. 18). Seasonal wetness during the planting season affects soil temperature, seed germination, and seed-soil contact. Good artificial drainage in soils limited by seasonal wetness, such as Ravenna and Luray soils, improve the suitability for no-till planting.

Modified tillage methods in which other implements are used instead of the moldboard plow are also popular. These methods are varied and their description is beyond the scope of this report. Any tillage method that reduces the amount of soil exposed to rainfall and runoff helps to control erosion.

Soil blowing is a hazard on Carlisle soils, which have a muck surface. Maintaining a vegetative cover, mulching, or keeping the surface rough through proper tillage minimizes soil blowing on these soils. Also, windbreaks of suitable shrubs are effective in reducing the risk of soil blowing.

Some pastures are subject to erosion. Many permanent pastures are on moderately steep or steep land on which runoff rates are rapid. Erosion control on pasture requires the maintenance of a thick sod cover. Poor management practices, such as overgrazing, which reduce this cover, will cause soil loss; practices that increase the cover, such as applying fertilizer and liming, help to reduce soil loss.

Many of the pastures in Holmes County are in gently sloping areas that are occasionally used for cultivated crops. Special care to avoid soil loss is needed during periods when pastures are used for cultivated crops. No-till methods of pasture seeding permit reseeding of pastures with a minimum of soil loss.

When pastures are plowed for seedbed preparation, erosion is a hazard. Reseeding with cover or companion crops or using a mulch helps to control erosion.

Information on the design of erosion-control measures for each kind of soil is available in local offices of the Natural Resources Conservation Service. Information on current agronomic practices utilized in no-till crop management is available in local offices of the Cooperative Extension Service.

Soil drainage is an important soil management problem in Holmes County. Most plant roots do not grow without free oxygen. Very little free oxygen is available in saturated soils. Wet soils remain cold in spring. Wetness delays the use of farm machinery; grazing when the soils are wet damages plants.

The soils in Holmes County have been classified into natural drainage classes by soil series. For example, Wooster soils are well drained, Ravenna soils are somewhat poorly drained, and Luray soils are very poorly drained. Drainage classes are based on the depth to the seasonal high water table during the wettest periods of the year, usually late winter or early spring. The level of the seasonal high water table is reflected by colors in the soil; an experienced soil scientist can accurately predict these levels regardless of the time of year examining the soil. The drainage classes refer to the water table level under natural conditions and are not related to the adequacy of artificial drainage.

About 51 percent, or 138,900 acres, of Holmes County is well drained soils. Wooster soils are the most extensive in the county. Well drained soils have adequate natural drainage for crop production. However, about 52 percent, or 72,300 acres, of these well drained soils are on slopes steeper than 15 percent. Most of these steeper soils are Berks, Brownsville, and Wooster soils.

About 37 percent, or 99,300 acres, of Holmes County consists of moderately well drained soils. These soils generally have adequate natural drainage for most crops, but they contain included wetter soils in low spots, springs, and seep areas in which artificial drainage is helpful. Canfield and Coshocton soils are the most extensive moderately well drained soils in the county.

About 8 percent, or 22,500 acres, of Holmes County consists of somewhat poorly drained soils. These soils have a seasonal high water table mostly between depths of 6 and 30 inches in the wettest parts of the year. A complete drainage system is needed to produce good yields of most crops. Fitchville and Orrville soils are the most extensive somewhat poorly drained soils in the county.

The rest of the county consists of poorly drained and very poorly drained soils. In these soils, the water table is above or within 12 inches of the surface for extended periods under natural conditions. Artificial drainage is essential if these soils are used as cropland. Melvin soils are the most extensive poorly drained soils. Luray soils are the most extensive very poorly drained soils.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface and subsurface drainage is needed in most areas of poorly drained and very poorly drained soils used for intensive row cropping. Drains have to be more closely spaced in soils that have slow or very slow permeability than in more permeable soils. Developing adequate outlets for subsurface drainage systems is difficult in many areas of Luray and Melvin soils.

Organic soils are subject to oxidation and subsidence when drained. Special drainage systems are needed to control the depth and the period of drainage. Lowering the water table to a level required by crops during the growing season and raising it to the surface during other parts of the year minimizes the oxidation and subsidence of organic soils.

On wet soils, crops such as alfalfa and winter wheat require better surface and subsurface drainage than crops such as corn and soybeans. Late-planted soybeans are grown successfully in areas that are not drained adequately for most other crops.

Many naturally wet soils are highly productive when adequately drained. Their natural wetness has reduced the oxidation of organic matter and the leaching of lime; thus, the soils are higher in natural fertility than nearby soils with better natural drainage.

Information on drainage design for each kind of soil is given in the Technical Guide, which is available in local offices of the Natural Resources Conservation Service.

Soil moisture is a critical management concern in Chili, Hazleton, and other soils that have a high content of sand in the subsoil; in Canfield, Gilpin, and other soils that have a restricted root zone; and in Farmerstown soils. Available water capacity is low or very low in these soils. Measures that help to reduce runoff and evaporation rates will improve productivity. Some of these measures include a system of conservation tillage that leaves crop residue on the surface, winter cover crops, contour stripcropping, and a cropping sequence that includes grasses and legumes. Some of these soils are potentially irrigable.

The effects of drought are more evident in pastures than in cultivated fields. Grass pastures on most moderately steep or steep soils grow little during the dry part of summer. Overcoming this problem practically requires renovating pastures to the extent that drought-tolerant legumes, such as alfalfa, can be included in the pasture seeding. Although these legumes are more drought tolerant, a high level of pasture management is required to maintain them in the stand. Alfalfa and other legumes cannot tolerate overgrazing. Generally, plants grown in soil having high fertility are more efficient in using available water.

Soil fertility is naturally low in some soils in Holmes County, especially Bethesda, Hazleton, and Rigley soils. It is medium or high, however, in soils that commonly are adjacent to outcrops of limestone bedrock and in the somewhat poorly drained Euclid, Fitchville, and Orrville soils, the poorly drained Melvin and Sebring soils, and the very poorly drained Luray soils.

Sustained high yields of crops and pasture require adequate levels of fertilizer, lime, and organic matter. The maintenance of such levels is a management concern on all soils in the county, regardless of other soil problems.

Soil fertility depends on past use, management, and long-term fertility history. These factors differ widely from farm to farm, even among similar soils. Therefore, fertility differences are not used in mapping soils. A regular program of soil testing can determine the amount and kind of fertilizer needed on a given field at a given time to produce a certain crop.

The amount and kind of fertilizer needed for soil fertility buildup differs widely within soil types. The ability of the soil to store and release plant nutrients is a property of the soil itself, and can be related to soil types. Soils that are high in clay and organic matter content have a high capacity to store and release plant nutrients. An example is Luray silty clay loam. Soils that are low in clay and organic matter content, such as Hazleton loam, have a low capacity to store and release nutrients. The plow layer of eroded soils is lower in organic matter content than uneroded soils of the same type; thus, eroded soils have lower capacities to store and release plant nutrients.

Much of the fertilizer and lime applied in large amounts to steep or very porous soils is likely lost through runoff or leaching before being held by the soil in a form that can be used by plants. Hence, frequent, light applications of fertilizer and lime are preferable to infrequent, heavy applications on steep or very porous soils.

Most soils in Holmes County are naturally acid in the root zone of most crops. Centerburg soils, for example,

Figure 18.—Glenford silt loam, 2 to 6 percent slopes, is well suited to no-till.

have natural lime deep in the soil profile. But where unlimed, they have a surface pH of 4.5 to 6.0. Wooster soils, for example, formed dominantly in acid soils material. But where unlimed, they have a surface pH of 4.5 to 5.5.

Most commonly grown crops in the area require a pH in the root zone of at least 5.5 for optimum growth. An exception is alfalfa, which does not grow as well below a pH of 6.5.

Phosphorous availability is closely dependent on pH. Much of the phosphate fertilizer applied to very acid soils combines with iron and aluminum and is not available to plants. Earthworms, which incorporate plant residue into the soils, are more active at pH values near neutral. Their activity improves soil structure.

Additions of organic matter are beneficial on most soils in Holmes County. Organic matter is a good source of nitrogen. Organic matter improves soil structure and makes the soil easier to work. Organic materials also have a capacity to store and release plant nutrients; thus, as they accumulate in the soil, they increase the potential of the soil to provide nutrients to crops. Additions of organic matter are especially beneficial in restoring the productivity of severely eroded areas.

The water quality of local springs and wells from shallow ground water aquifers supplies water to much of the rural population of Holmes County. In recent years, in places fertilizers and farm chemicals apparently have leached down into these shallow ground water aquifers in the county. More permeable soil and ground water at a shallower depth increase the liklihood of this kind of pollution. Thus, applying high rates of certain fertilizers and farm chemicals on soils that have a fairly low content of clay and that are moderately deep to fractured bedrock, such as the Berks soils, increases the potential of polluting the ground water of shallow aquifers. In contrast, applying fertilizer and farm chemicals on soils that have more clay and that are deeper over bedrock, such as the Coshocton soils, is less likely to pollute the ground water of shallow aquifers.

Soils that have relatively low permeability or that are relatively shallow to the ground water in Holmes County have a higher potential of leaching certain fertilizers and farm chemicals into the ground water of shallow aquifers. These include Berks, Brownsville, Gilpin, Hazleton, Rigley, and Schaffenaker soils on uplands; Bogart, Chili, and Cidermill soils on outwash plains and stream terraces; and Lobdell, Melvin, Orrville, and Tioga soils on flood plains.

Caution is needed in applying fertilizer and farm chemicals on soils having a higher leaching potential. Apply only as much as needed or as much as the crop can assimilate. On some soils, frequent, light applications of fertilizer are preferred to less frequent, heavier applications.

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

Most soils used for crops in Holmes County have a silt loam surface layer that is light in color and moderate or moderately low in content of organic matter. Generally, the structure of such soils is weak or moderate and intensive rainfall causes the formation of a surface crust. When dry, the crust is hard and nearly impervious to water. The crust reduces the rate of water infiltration and thus increases the runoff rate. Seed germination is retarded.

Measures that increase the content of organic matter can improve the soil structure. Examples are a cropping sequence that includes grasses and legumes, a system of conservation tillage that leaves crop residue on the surface, winter cover crops, and contour stripcropping. Regular additions of manure or other organic material also improves soil structure.

Fall plowing on light-colored soils that have a silt loam surface layer results in surface crusting and excessive soil loss. If plowed in fall, many soils are nearly as dense and hard at planting time as they were before they were plowed. About 86 percent of cropland, or about 96,800 acres, consists of sloping soils that are subject to damaging erosion if plowed in fall (*27*).

Luray soils have a dark surface layer. They often stay wet until late in spring. If plowed when wet, they tend to be very cloddy when dry, thus making good seedbeds difficult to prepare. Fall plowing generally results in good tilth in spring.

A common practice in Holmes County is to allow animals to graze residue left on crop fields after harvest. Grazing crop fields or pastures when the soils are wet and soft causes surface compaction and poor tilth, damages plants, and reduces air and water movement in the soil.

Field crops suited to the soils and climate of Holmes County include many that are not now commonly grown. Corn is the most common row crop. Soybeans are less commonly grown, but are increasing in acreage. Grain sorghum, sunflowers, and similar crops can be grown if economic conditions are favorable.

Wheat, oats, barley, and spelts are common close-growing crops. Rye is less common. Buckwheat and flax could be grown. Alfalfa and red clover are common legumes grown for hay. Grass seed could be produced from bluegrass, bromegrass, fescue, orchardgrass, and timothy.

Special crops grown commercially in the county are vegetables, small fruits, tree fruits, and Christmas trees. Melons, strawberries, raspberries, and other vegetables and small fruits are grown on small acreages scattered throughout the county. Apples are the most important tree fruits grown in the county.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. These are Chili, Amanda, and Wooster soils on slopes of less than 6 percent. Crops generally can be planted and harvested earlier on all these soils than on other soils in the county.

When adequately drained, muck soils are well suited to a wide range of vegetable crops. Carlisle soils take in about 620 acres in the county.

Most of the well drained soils are suitable for orchards and nursery plants. Soils in low positions where frost is frequent and air drainage is poor, however, generally are not as well suited to early vegetables, small fruits, and orchards. If nursery crops are grown, however, irrigation is needed on some of these soils in low positions.

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

Pasture and Hayland Management

Approximately 22 percent of Holmes County is used as pastureland (*27*). Much of the cropland is farmed using a rotation that includes hayland as part of the crop sequence. Some areas of potential pasture and hayland are idle and are reverting to brush and young tree growth.

Most of the pasture and hayland is on hillsides adjacent to cultivated areas. In these areas erosion is a hazard. The most common pasture grasses are bluegrass, orchardgrass, and timothy. Alfalfa and red clover are the most common legumes grown for hay.

Some pastures and meadows show the result of abuse and neglect from overgrazing. Overgrazing has resulted in weedy, low-production forage and the hazard of increased erosion because of the sparse, short vegetative cover. Soils in these fields frequently are acid and have low phosphorus and potassium levels. Good management can in time restore these soils to much higher productivity. To maintain a stand of legumes in the forage mixture of a pasture, a system of controlled grazing is needed.

Successful establishment of forage crops requires the selection of quality seed of species adapted to the area and the soils. Reseeding requires proper seedbed preparation, proper seeding methods at the proper time, and the use of recommended applications of lime and fertilizer.

Forage renovation requires that the existing grass and weeds be killed or suppressed before reseeding the desired species. The object is to kill the existing sod and leave it on or near the surface as a dead mulch to reduce the erosion hazard. Nearly level pastures can be plowed. Vegetation on gently sloping, moderately sloping, and strongly sloping soils should be killed or suppressed. On sloping soils, tillage and seeding on the contour is needed. An herbicide can be used with the trash mulch method to reduce the amount of tillage needed to kill existing vegetation.

No-till seeding can be effective on most soils in Holmes County except the more poorly drained soils. When no-till is used, vegetation should be suppressed or killed by grazing or herbicides.

April or August are usually the best months to make forage seedings. Forages can be seeded with small grains, but frequently the stands are reduced because of plant competition for light, moisture, and nutrients.

Seeding mixtures should be based on soil type and the desired pasture management system. Legumes increase the nutrient value of the forage and provide nitrogen for grass growth. Alfalfa and red clover should be seeded on soils with good drainage. Ladino and alsike clovers are better adapted to wetter soils. Birdsfoot trefoil, bromegrass, lespedeza, warm-season grasses, and vetches are generally not grown as forages in Holmes County.

Maintenance application of lime and fertilizer according to soil tests will insure good productivity and lengthen the life of the stand. Weed control by mowing, clipping, and spraying is important for continued high production. Weeds should be mowed before going to seed. Control of such insects as alfalfa weevil and leaf hopper may be necessary. When pesticides are used, all label restrictions should be observed.

Hay, silage, or pasture should be harvested at the proper stage of maturity to obtain the maximum quality feed for animals. Refer to the current Agronomy Guide for proper management of forage species (*19*).

Rotational grazing of pasture is necessary to maintain stands of productive forage species, especially alfalfa, and to control grazing. Rotational grazing improves use of pasture plants by reducing selective grazing, animal tramping, and waste.

Pasture and Hayland Suitability and Production

Table 6 can be used by farmers, farm managers, conservationists, and extension agents in planning the use of soil for pasture and hay crops. Soils on slopes of more than 25 percent generally are not recommended for pasture or hayland.

The table lists the pasture and hayland suitability group symbol for each soil. Soils assigned the same suitability group symbol require the same general management and have about the same potential productivity. The pasture and hayland suitability groups organize the soils by soil characteristics and limitations. Only the soil characteristics and limitations found in Holmes County are listed in the suitability groups discussions.

Group A soils have few limitations for the management and growth of climatically adapted plants. Group A-1 consists of deep, well drained soils. The surface texture is loam, silt loam, or sandy loam. Available water capacity is low to high. Some of these soils are droughty. These soils will respond favorably to additions of lime. Frequent applications may be needed to maintain an adequate pH level. The low pH of the subsoil will shorten the life of some deep-rooted legumes in a stand. Average slopes range from 0 to 18 percent.

Group A-2 consists of deep, well drained or moderately well drained soil. Surface textures are loam, silt loam, or sandy loam. Available water capacity is low to high. Some of these soils are droughty. These soils will respond favorably to additions of lime. Frequent applications may be needed to maintain an adequate pH level. The low pH of the subsoil will shorten the life of some deep-rooted legumes in a stand. The slope of these soils will interfere with mechanical application of lime and fertilizer and with clipping, mowing, or spraying for weed control. The slope will increase the risk of erosion if overgrazed or cultivated for reseeding. These soils are suited to no-till seedings. Average slopes range from 15 to 25 percent.

Group A-3 consists of deep, well drained or moderately well drained soils. The surface texture is silt loam. Available water capacity is moderate. Average slopes range from 25 to 40 percent. This group generally is not recommended for pasture or hayland.

Group A-4 consists of deep or moderately deep, well drained or moderately well drained soils that have stones on the surface. These stones are extensive enough to preclude the use of haymaking equipment. Surface texture is silt loam. Available water capacity ranges from moderate to very low. Some of these soils are droughty. Average slopes range from 12 to 35 percent.

Group A-5 consists of deep, well drained or moderately well drained soils on flood plains. They are subject to occasional flooding. Flooding limits these soils for pasture during periods of stream overflow and sediments lowers the quality of forage. Surface textures are loam or silt loam. Available water capacity is moderate or high. Average slopes are 0 to 2 percent.

Group A-6 consists of deep, moderately well drained soils that are subject to frost action. Surface texture is silt loam. Available water capacity is moderate or high. Frost action may damage legumes. Including grasses in a seeding mixture will help to protect the legumes from frost heave. Average slopes range from 0 to 15 percent.

Group B soils have limited growth and production because of droughtiness. Group B-1 consists of deep, well drained soils. The surface texture is channery silt loam and loam. Available water capacity is low. These soils are droughty. They will respond favorably to additions of lime. Frequent applications may be needed to maintain an adequate pH level. The low pH of the subsoil will shorten the life of some deep-rooted legumes in a stand. A high percentage of rock fragments are in the subsoil. Average slopes range from 8 to 25 percent.

Group B-2 consists of deep, well drained soils. The surface texture is channery silt loam and loam. Available water capacity is low. These soils are droughty. The soils are skeletal in the subsoil. Average slopes range from 25 to 40 percent. This group generally is not recommended for hayland and is poorly suited to pasture.

Group B-4 consists of deep, well drained, surface mined soils that have been reconstructed by adding a layer of topsoil. The surface texture is silt loam. Available water capacity is low. These soils are droughty. They will respond favorably to additions of lime. Frequent applications may be needed to maintain an adequate pH level. The substratum of these soils contain a high percentage of rock fragments. The root zone generally is 20 to 30 inches deep. Average slope ranges from 0 to 20 percent.

Group C soils are normally wet because of a seasonal high water table or are saturated during the growing season. Group C-1 consists of deep, somewhat poorly drained or very poorly drained soils. The surface texture is silt loam or silty clay loam. Available water capacity is high. Frost action may damage legumes. Including grasses in a seeding mixture will help to protect the legumes from frost heave. A seasonal high water table limits the rooting depth of deep-rooted forage plants. Shallow-rooted species do best on these soils. Subsurface drains are used to lower the seasonal high water table. These soils will respond favorably to additions of lime. Frequent applications may be needed to maintain an adequate pH level. The low pH of the subsoil will shorten the life of some deep-rooted legumes in a stand. Average slopes range from 0 to 6 percent.

Group C-2 consists of deep, somewhat poorly drained and poorly drained soils. The surface texture is silt loam. Available water capacity is low to high. Some of these soils are droughty. A seasonal high water table limits the rooting depth of deep-rooted forage plants. Shallow-rooted species do best on these soils. Subsurface drains are used to lower the seasonal high water table. Effectiveness of subsurface drainage is usually limited by permeability in the subsoil or the landscape position of the soil. These soils will respond better to forages that do not have a tap root because of the moderately deep root zone. Average slopes range from 0 to 6 percent.

Group C-3 consists of deep, somewhat poorly drained and poorly drained soils on flood plains. They are subject to frequent or occasional flooding. Flooding limits these soils for pasture during periods of stream overflow and sediment lowers the quality of the forage. Surface texture is silt loam. Available water capacity is moderate or high. Frost action may damage legumes. Including grasses in a seeding mixture will help to protect the legumes from frost heave. A seasonal high water table limits the rooting depth of deep-rooted forage plants. Shallow-rooted species grow best on these soils. Subsurface drains are used to lower the seasonal high water table. Effectiveness of subsurface drainage is limited by landscape position of the soil. Average slopes are 0 to 2 percent.

Group D consists of classified organic soils. Group D-1 consists of deep, very poorly drained soils formed entirely or partly in organic material. Available water capacity is very high. Average slopes are 0 to 2 percent. Normally this group is used for other, higher value crops and is not used for forage production. Undrained areas are too wet to be used for forage production.

Group E consists of shallow soils that restrict root growth to less than 20 inches. These soils will respond better to forages with a fibrous root system rather than deep-rooted species because of the shallow root zone. Group E-3 consists of shallow, well drained soils. The surface texture is very channery clay loam. Available water capacity is low. These soils are droughty. Average slopes range from 0 to 20 percent.

Group F soils have restricted root growth of climatically adapted plants to less than 40 inches but more than 20 inches. These soils will respond better to forages that do not have a tap root because of the moderately deep root zone. Group F-1 consists of moderately deep, well drained soils. Surface textures are loamy sand or silt loam. Available water capacity is moderate to very low. Some of these soils are droughty. These soils will respond favorably to additions of lime. Frequent applications may be needed to maintain an adequate pH level. The low pH of the subsoil will shorten the life of some deep-rooted legumes in a stand. Average slopes range from 3 to 25 percent.

Group F-3 consists of deep, well drained and moderately well drained soils that are moderately deep to a fragipan. These soils will respond favorably to additions of lime. Frequent applications may be needed to maintain an adequate pH level. The low pH of the subsoil will shorten the life of some deep-rooted legumes in a stand. Surface texture is silt loam. Available water capacity is low in the root zone. These soils are droughty. Average slopes range from 2 to 18 percent.

Group H soils are not adapted to forage species. Group H-1 consists of soils that are on slopes of more than 40 percent. Also included is surface-mined land that have soil characteristics that prohibit use as pasture. This group generally is not recommended for pasture or hayland.

Miscellaneous land types are not assigned a rating. Also not assigned a rating are ponded soils. These soils generally are not used for forage production.

Recommended species or forage mixtures for seeding are shown in Table 6. They should be productive with good management. Yields given are what can be expected under a high level of management. Yields may vary in any given year because of seasonal rainfall and other climatic factors. Grass yields depend on the amount of actual nitrogen applied. These yields cannot be achieved without nitrogen fertilization.

Animal unit months (AUM) is the forage requirements for a mature cow with calf for 1 month. Thus, 6 AUM means that 1 acre can provide 6 months or 180 days of pasture for a mature cow with calf. An animal unit month also is equal to 1,200 pounds of hay equivalent forage. Consult a pasture calendar guide to find the relative distribution of animal unit days on a per month basis; these animal unit days are not evenly distributed throughout the growing season.

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 7. 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 land capability classification of each map unit also is shown in the table.

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 ensures 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 7 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 Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The 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 and for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (*24*). Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

The acreage of soils in each capability class and subclass is shown in table 8. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Charles A. Reynolds, district conservationist, Natural Resources Conservation Service, and Koral Clum, service forester, Ohio Department of Natural Resources, Division of Forestry, helped to prepare this section.

Nearly all Holmes County was forested at the time of settlement (*9*). Most of the county was covered by a mixed oak forest. Killbuck Valley supported an elm-ash swamp. In smaller areas of the county, the cover consisted of oak-sugar maple, beech, and mixed mesophytic forest (*8*).

As a result of clearing, the acreage in woodland has been reduced to about 74,900 acres, or 28 percent of the county (*27*). Most of the wooded areas occur on privately owned land in the southern part of the county. The remaining areas are in small woodlots in the northern and eastern parts of the county. Most of the woodland has been cut over and much of it has been grazed. Only the steepest, wettest, and less accessible parts of the county have remained in woodland. However, income from the sale of wood products is an important source of income.

The woodland consists mainly of areas of mixed hardwoods (fig. 19). The major forest type is oak-hickory. The dominant species are oak, hickory, ash, yellow-poplar, black cherry, and red maple. Most of the wooded areas occur on moderately steep soils that formed in material weathered from sandstone, shale, siltstone, and limestone. Brownsville, Coshocton, Hazleton, Rigley, and Westmoreland soils commonly are in these areas. Much of the woodland follows the slopes along streams and drainageways. Scattered areas of somewhat poorly drained and poorly drained soils, such as Ravenna, Melvin, and Orrville soils, are used as woodland. The principal species in these areas are swamp white oak, blackgum, and pin oak.

Some of the woodland shows the results of poor management. The best trees are selected for cutting, and the diseased or damaged trees are left to occupy valuable growing space on excellent woodland soils. In many woodland areas grapevines have not been controlled. Grazing cattle have damaged some woodland by destroying leaf litter and desirable seedlings, damaging roots, and compacting the soil. Good management can restore this woodland to a high level of production.

Woodland productivity varies widely from soil to soil. The factors influencing tree growth are almost the same as those influencing annual crops and pasture. The major difference is that tree roots penetrate the soil to a greater depth, especially around rock fragments in the lower part of the profile. Aspect and the position on the landscape also are important.

Aspect is the compass direction toward which the slope faces. Trees grow better on north and east aspects because of less exposure to the prevailing winds and the sun and because of more soil moisture. Some of the factors that make south and west aspects less suitable are a higher soil temperature, the result of more direct sun rays; a high evaporation rate, which is caused by prevailing winds; earlier snow-melt; and a greater degree of freezing and thawing (*4*).

The position of the soil on the landscape is important in determining the amount of moisture available for tree growth. The amount increases as elevation decreases, partly because of seepage downslope. On the lower part

Figure 19.—This 35-year old stand of tulip, ash, and cherry on Canfield silt loam, 2 to 6 percent slopes, is typical of small woodlots in Holmes County.

of slopes, the soils generally are deeper than on the upper part, less soil moisture is lost through evaporation, and soil temperature is somewhat lower.

The steepness of the slope is an important factor in woodland management. Steep and very steep slopes result in serious equipment limitations. As the percent of slope increases, the rate of water infiltration decreases and the rate of runoff and the hazard of erosion increases.

Erosion reduces the volume of soil available for water storage. In severely eroded areas, the surface layer is removed and the subsoil is exposed. Because the subsoil commonly is less porous than the surface layer, the runoff rate is increased and the water intake rate is decreased. Tree growth and natural reseeding are adversely affected.

Reaction and fertility affect the growth of different kinds of trees. For example, black walnut grows well on Tioga, Glenford, and other soils that have natural lime content in the subsoil, which favors tree growth. Growth is slow on soils that are low in fertility.

Christmas trees are grown in some areas of the county. They can grow well on many of the soils but are adversely affected by various soil properties (*25*). Drainage and texture affect the species that can be successfully grown. For example, blue spruce and Fraser fir do not grow well on poorly drained and somewhat poorly drained soils, such as Fitchville and Orrville soils. Fraser fir cannot grow well on soils that have a moderately fine and fine textured subsoil. Other factors are fertility, available water capacity, the potential for frost action, and the depth to bedrock. Westmoreland soils are better suited to spruce and fir than Brownsville soils because they are naturally more fertile and have higher available water capacity.

Additional information and assistance concerning woodland management is available from the Ohio Department of Natural Resources, Division of Forestry; the Cooperative Extension Service; and the local office of the Natural Resources Conservation Service.

Table 9 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 for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 9, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

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

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Woodland Harvesting and Regeneration Activities

Table 10 gives the degree and kinds of limitations that affect the operations where equipment is used for harvesting and regeneration of woodlands. These operations are haul roads, log landings, skid trails and logging areas, and site preparation and planting. The limitations are considered slight if the physical site characteristics impose little or no limitations on kind of equipment or time of operation; moderate if physical site characteristics impose some limitations on kind of equipment, time of operation, or both; and severe if physical site conditions are such that special equipment or techniques are needed, that time of efficient operation is very limited, or both.

Haul roads are access roads leading from log landings to primary or surface roads. Generally, these are unpaved roads and not graveled. The ratings are based on soil properties, site features, and observed performance of the soils. Wetness, depth to hard bedrock, stoniness, soil strength, slope, soil texture, and flooding are soil properties and hazards that should be considered in selecting routes for haul roads. Wetness and flooding affect the duration of use. Rock outcrops, stones, and boulders that are difficult to move hinder construction when cutting and filling is needed. The soil strength, as inferred from the AASHTO group index and AASHTO group, is a measure of the traffic support capacity of the soil. Slope affects equipment use and cutting and filling requirements.

Log landings refers to areas where logs are assembled for transportation. Areas that require little or no surface preparation of cutting and filling are desired. Considerable surface compaction on these areas is expected. The ratings are based on the soil properties, site features, and observed performance of the soils. Wetness, flooding, rockiness, stoniness, slope, depth to hard bedrock, soil strength, and coarse fragments are soil properties and hazards that should be considered in selecting sites for log landings. Wetness and flooding affect the duration of use. Rock outcrops, stones, and boulders that are difficult to move affect equipment operability, configuration, and location of landings. Shallowness to hard bedrock is a problem for cutting and filling. Slope affects equipment use and cutting and filling on the site. Soil texture affects trafficability. The soil strength, as inferred from the AASHTO group index and AASHTO group, is a measure of the traffic supporting capacity of the soil.

Skid trails and logging areas refer to areas being partly or completely logged. It includes the logging activities with rubber-tired equipment from stump to log landing areas. Other types of log-moving equipment can sometimes be utilized to reduce or overcome the site limitations. The ratings are based on soil properties, site features, and observed performance of the soils. Wetness, flooding, rockiness, stoniness, texture, and slope are soil and topographic features that affect equipment use in logging activities. Periods when the soil is saturated at or near the surface should be avoided to minimize environmental damage. Also, special equipment is usually required for these periods. Soils on which flooding of a long duration is a hazard should be avoided to prevent damage to equipment, the environment, or both. Surface stones and boulders and rock outcrops are problems for efficient and safe equipment operation. As slope gradients increase, traction problems increase. Clayey and sandy textures have special traction problems. Clayey soils have reduced traction when wet, and sandy soils have reduced traction when dry. Rubber-tired or track-type equipment severely damages organic soils.

Site preparation and planting are the mechanized operations for site preparation, planting, row seeding, or all three. The ratings are based on both limitations to efficient equipment operation and on hazards to the site from operation of the equipment. It is assumed that operating techniques are used that do not displace or remove topsoil from the site or create channels to concentrate storm runoff. Wetness, flooding, rockiness, stoniness, coarse fragments, depth to hard bedrock, texture, and slope are soil and topographic features that affect equipment use and site preparation and planting operations. Periods when the soil is saturated at or near the surface should be avoided to minimize environmental damage. Also, special equipment is usually required in these periods. Soils on which flooding of a long duration is hazard should be avoided to prevent damage to equipment, the environment, or both. Surface stones and boulders and rock outcrops are problems for efficient and safe equipment operation. Coarse fragments and hard bedrock at very shallow depths can interfere with equipment used for site preparation and planting. As slope gradients increase, traction problems increase. Clayey and sandy soils have special traction problems. Clayey soils have reduced traction when wet; sandy soils have reduced traction when dry.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 11 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 11 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local offices of the Natural Resources Conservation Service; the Ohio Department of Natural Resources, Division of Forestry; the Cooperative Extension Service; or from a commercial nursery.

Recreation

Charles A. Reynolds, district conservationist, Natural Resources Conservation Service, helped to prepare this section.

Holmes County is scenic. It has potential for recreation uses in the nearly level to gently rolling areas in the northern part of the county and in the hilly to very steep areas in the southern part (fig. 20). The scenery, the large Amish population, and the geologic and historic attractions bring many tourists to Holmes County.

The Mohican River is located in the western part of the county. It provides recreation for campers, fishermen, canoeists, and picnickers. The southern part of the county is predominantly wooded. It is an excellent source of wildlife for hunters. Also, the state-owned Killbuck Marsh Wildlife Area, located north of Holmesville, provides an area for public hunting and fishing.

The county has several other outdoor recreation areas and summer campgrounds. Most are owned by private individuals, service organizations, churches, or sportsmen's clubs. The Holmes County Park District also maintains recreation areas. Residents of other counties have constructed summer residences in the western part of the county.

The soils in the county vary greatly. Many soils are moderately well suited to recreation use. Areas on bottom land tend to be excessively wet and are subject to flooding. The best suited areas are in the northern part of the county on nearly level and gently sloping uplands. However, this type of land makes up only a small part of Holmes County. In most of the county, slope affects certain types of recreation development. Because of the rolling topography, measures that control erosion and reduce wetness are needed both in intensive recreation areas, such as playgrounds and developed campsites, and in extensive recreation areas, such as trails and primitive campsites. Examples of these measures are access roads, critical area planting, diversions, waterways, subsurface drains, and heavy use area protection. More information about these conservation measures can be obtained from the local office of the Natural Resources Conservation Service.

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size

Figure 20.—Some of the scenic areas in the county have been developed for recreation uses. This golf course is on Coshocton silt loam, 25 to 40 percent slopes.

and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. 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 uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 12, 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 a combination of these measures.

The information in table 12 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 14.

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

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

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

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

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

Wildlife Habitat

Charles A. Reynolds, district conservationist, Natural Resources Conservation Service, and William G. Hlavin, game protector, Ohio Department of Natural Resources, Division of Wildlife, helped to prepare this section.

Holmes County has a wide variety of wildlife. Some birds inhabiting the county are pheasant, turkey, mourning dove, ruffed grouse, quail, hawks, crows, and various songbirds. Some mammals include rabbit, squirrel, beaver, opossum, muskrat, woodchuck, raccoon, skunk, fox, and white-tail. This wide variety of wildlife is supported by diverse habitats, including cropland, openland, woodland, swamps, and ponds.

Large areas of wetland are along Killbuck Creek (fig. 21). Smaller areas are scattered throughout the county. Carlisle, Luray, Melvin, and Orrville soils commonly are in these areas. Near Holmesville, Killbuck Marsh, the largest inland marsh in Ohio, has been protected by the Ohio Department of Natural Resources, Division of Wildlife, because of its unique vegetation and wildlife.

With proper treatment, most of the soils in Holmes County are well suited to plants used as food and cover for wildlife (*1*). Nesting areas are needed, and can be created by planting grasses. Also, shrubs can be planted in hedgerows and fence rows. Planting nut-producing trees and leaving hollow den trees improves woodlots as habitat for wildlife. Cropland, if managed properly, is an invaluable source of food for wildlife. Ponds can be constructed in some areas. Landscaping the area around a newly constructed pond helps to provide habitat for wildlife. Additional information about improving wildlife habitat can be obtained from the Cooperative Extension Service; the Ohio Department of Natural Resources, Division of Wildlife; and the local office of the Natural Resources Conservation Service.

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

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

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, 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 flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are foxtail, goldenrod, smartweed, ragweed, and milkweed.

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, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, beech, maple, hawthorn, dogwood, hickory, blackberry, and black walnut. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are shrub-honeysuckle, autumn-olive, and crabapple.

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

Figure 21.—Areas along Killbuck Creek on Melvin silt loam, ponded, have been developed as habitat for wetland wildlife.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, chickweed, reed canarygrass, 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. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

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

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

Engineering

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

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

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

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

Some areas in Holmes County are subject to controlled inundation. These areas are behind flood storage dams where water is held and slowly released to reduce downstream flooding. The approximate flood pool lines are shown on the soils map. The Mohawk Dam flood pool is located in Knox and Richland Townships. The Beach City Lake flood pool is located in Paint and Walnut Creek Townships.

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 or 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 kinds 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 14 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, 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 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, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 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, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials 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 15 shows the degree and 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 15 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

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

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

Table 15 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 resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

The ratings in table 15 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, highly organic layers, and soil reaction affect trench 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 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 wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the 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 16 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 to 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, a 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 a 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 have a water table at a depth of 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. They are used in many kinds of construction. Specifications for each use vary widely. In table 16, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

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

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

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

Soil Material for Reconstruction of Strip Mined Land

Table 17 gives information about the soils as a source of material for reclaiming areas drastically disturbed by surface mining.

The surface layer, subsoil, and substratum of the soils are rated good, fair, or poor, according to their erodibility and stability as a medium for plant growth. The ratings only apply to that part of the soil within a depth of 5 feet.

The interpretations in Table 17 cannot be used for quarry, pit, and surface mine operations that require an offsite source of soil reconstruction material. The interpretations for daily cover for sanitary landfill in Table 15 should be used to evaluate the material used in restoration of these operations.

A rating of good in Table 17 means vegetation is relatively easy to establish and maintain, the surface is stable and resists erosion, and the reconstructed soil has good potential productivity. Material rated fair can be vegetated and stabilized by modifying one or more properties. Topdressing with better material or application of soil amendments may be necessary for satisfactory performance. Material rated poor has such severe problems that revegetation and stabilization are very difficult and costly. Topdressing with better material is necessary to establish and maintain vegetation.

Soil texture and coarse fragments influence soil structure and consistence, water intake rate, runoff, fertility, workability, and trafficability. They also influence available water capacity and wind and water erosion. Loamy and silty soils that are free of coarse fragments are the best reconstruction material. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are droughty and subject to soil blowing.

Rock fragments influence the ease of excavation, stockpiling, respreading, and suitability for the final use of the land. A certain amount of rock fragments can be tolerated, depending on the size of rock fragments and the intended use of the reclaimed area. Rock fragments longer than 10 inches cause severe problems.

Vegetation is difficult to establish on soils that are extremely acid or alkaline. Materials that are extremely acid or are potentially extremely acid upon oxidation are difficult and expensive to vegetate. They also contribute to poor water quality both of runoff and of ground water. Materials high in pyrite and marcasite without offsetting bases are potentially highly acid. Laboratory tests may be needed to properly identify those materials.

Excessive amounts of such substances as sodium, salt, sulfur, copper, and nickel restrict plant growth and limit establishing vegetation. These substances thereby influence erosion and surface stability. Other substances, such as selenium, boron, and arsenic, enter the food chain. They are toxic to grazing animals. Of all these substances, only sodium and salt were considered in the ratings. Soil layers relatively high in toxic substances are rated poor. Laboratory tests are needed to properly identify toxic substances.

The interpretations in Table 17 do not cover all the soil features required in planning soil reconstruction, for example, slope, thickness of material, ease of excavation, potential slippage hazard, and moisture regime. Slope of the original soil may influence the method of stripping and stockpiling of reconstruction material. But slope but may have little effect on the final contour and on the stability and productivity of the reconstructed soil. Therefore, slope was not a criterion in making the interpretations.

The thickness of material suitable for reconstruction and the ease of excavation are important criteria in planning soil reconstruction operations. However, they depend on the method of mining activities and so were not used as a criteria in developing interpretations. Potential slippage hazard is related to soil texture, slope, differential permeability between layers, rainfall, and other factors that were not considered. Soil moisture regime, climate, and weather influence the kind of vegetation to plant and the rate of revegetative growth. They were not used as criteria because the relative ratings do not change with variable moisture regimes; that is, the best soil in a moist environment is the best soil in a dry environment. Furthermore, the soil may be irrigated to establish vegetation.

Water Management

Table 18 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; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding;

slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. 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 control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

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

Soil Properties

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

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

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

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

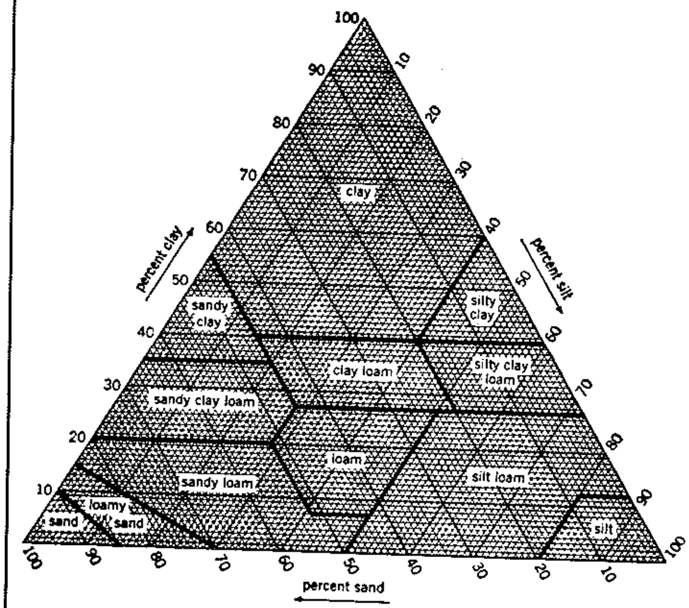

Figure 22.—Percent of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 19 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 the heading "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 (fig. 22). "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 about 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 (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

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

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

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

Rock fragments larger than 10 inches in diameter and 3 to 10 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 generally 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 20 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place.

Laboratory measurements of swelling of undisturbed clods were made for many soils (*12*). 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 classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

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

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 20, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in 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 21 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a 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.

If a soil is assigned to two hydrologic groups in table 21, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 21 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is 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.

Some areas in Holmes County are subject to controlled inundation. These areas are behind flood storage dams where water is held and slowly released to reduce downstream flooding. The approximate flood pool lines are shown on the soils map. The Mohawk Dam flood pool is located in Knox and Richland Townships. The Beach City Lake flood pool is located in Paint and Walnut Creek Townships.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 21 are the depth to the seasonal high water table; the kind of water table—that is, perched, apparent, or artesian; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 21.

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. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Two numbers in the column showing depth to the water table 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. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet 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 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.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

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 results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

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

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

Physical and Chemical Analyses of Selected Soils

Some of the soils in Holmes County were sampled by the Soil Characterization Laboratory, Department of Agronomy, Ohio State University, Columbus, Ohio. The physical and chemical data obtained from the samples include particle-size distribution, reaction, organic matter content, calcium carbonate equivalent, and extractable cations.

These data were used in classifying and correlating the soils and in evaluating their behavior under various land uses. Three pedons were selected as representative of their respective series and are described in the section "Soil Series and Their Morphology." These series and their laboratory identification numbers, respectively, are Cidermill Series (HL-9), Farmerstown Series (HL-8), and Keene Series (HL-5).

In addition to the data from Holmes County, laboratory data also are available from nearby counties that comprise many of the same soils. These data and the data from Holmes County are on file at the Department of Agronomy, Ohio State University, Columbus, Ohio; the Department of Natural Resources, Division of Soil and Water Conservation, Columbus, Ohio; and the Natural Resources Conservation Service, State Office, Columbus, Ohio. Some of the data have been published in special studies of soils in nearby counties (*12,14,15*).

Engineering Index Test Data

Table 22 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Ohio Department of Trasportation, Division of Highways, Bureau of Testing, Soils and Foundation Section.

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

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); Moisture density—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*26*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 23 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

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

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup 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 taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

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

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The Chili Series is an example of the fine-loamy, mixed, mesic family of Typic Hapludalfs.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each 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" (*29*). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (*26*) and in "Keys to Soil Taxonomy" (*28*). Unless otherwise indicated, 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."

Amanda Series

The Amanda series consists of deep, well drained soils on glaciated uplands. These soils formed in loamy glacial till. Permeability is moderately slow. Slopes range from 2 to 25 percent.

Amanda soils are similar to Centerburg soils and commonly are adjacent to Centerburg and Wooster soils. Centerburg soils are moderately well drained and are on the concave or less convex parts of the landscape. Wooster soils have a fragipan and are on landscape positions similar to those of the Amanda soils.

Typical pedon of Amanda silt loam, in an area of Amanda-Wooster complex, 6 to 12 percent slopes, eroded, about 3.0 miles west-northwest of Holmesville, in

Prairie Township, about 2,215 feet north and 1,415 feet west of the southeast corner of sec. 31, T. 14 N., R. 13 W. (Pedon 142):

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine and medium roots; mixed with some streaks and pockets of dark yellowish brown (10YR 4/4) subsoil material; 5 percent rock fragments; slightly acid; abrupt smooth boundary.

BA—8 to 12 inches; dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; friable; common fine and medium roots; 10 percent rock fragments; medium acid; clear smooth boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; common fine and few medium roots; common distinct brown (10YR 5/3) clay films on faces of peds; 10 percent coarse fragments; strongly acid; clear smooth boundary.

Bt2—17 to 25 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; common fine and few medium roots; common distinct brown (10YR 5/3) clay films on faces of peds; 5 percent rock fragments; strongly acid; clear wavy boundary.

Bt3—25 to 29 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; common fine and few medium roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine very dark brown (10YR 2/2) stains (iron and manganese oxides); 10 percent rock fragments; strongly acid; clear wavy boundary.

Bt4—29 to 45 inches; yellowish brown (10YR 5/4) clay loam; few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; many coarse very dark brown (10YR 2/2) stains (iron and manganese oxides); 5 percent rock fragments; strongly acid; clear wavy boundary.

BC—45 to 66 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; few distinct light yellowish brown (2.5Y 6/4) clay films on faces of peds in upper part; common medium very dark brown (10YR 2/2) stains (iron and manganese oxides) in upper part; 5 percent rock fragments; medium acid; clear wavy boundary.

C—66 to 80 inches; light olive brown (2.5Y 5/4) loam; few medium prominent light brownish gray (10YR 6/2) mottles; massive; firm; 10 percent rock fragments; neutral.

The solum ranges from 40 to 70 inches in thickness. Rock fragments range from 0 to 10 percent in the upper part of the solum, 2 to 15 percent in the lower part, and 5 to 15 percent in the C horizon.

The Ap horizon has color value of 4 or 5 and chroma of 2 to 4. It is silt loam or loam. The Bt horizon has color value of 4 or 5 and chroma of 4 to 6. It is clay loam, loam, or silty clay loam. The C horizon has hue of 2.5Y or 10YR, value of 4 or 5, and chroma of 2 to 4. It is loam or silt loam.

Berks Series

The Berks consists of moderately deep, well drained soils on the unglaciated uplands. These soils formed in material weathered from shale, siltstone, and fine grained sandstone. Permeability is moderate or moderately rapid. Slopes range from 15 to 70 percent.

Berks soils are similar to Brownsville and Hazleton soils and commonly are adjacent to Coshocton, Rigley, and Westmoreland soils. Brownsville, Coshocton, Hazleton, Rigley, and Westmoreland soils are deep. Coshocton, Rigley, and Westmoreland soils have an argillic horizon. Hazleton soils have a higher content of medium and coarse sand and a lower content of clay, fine sand, and silt. Coshocton, Rigley, and Westmoreland soils are on ridgetops and the upper side slopes above the Berks soils. Brownsville and Hazleton soils are in landscape positions similar to the Berks soils. In places Coshocton and Westmoreland soils also are in landscape positions similar to those of the Berks soils.

Typical pedon of Berks silt loam, 15 to 25 percent slopes, very stony, about 3.3 miles northeast of Clark, in Mechanic Township, about 885 feet south of the intersection of C-58 and T-128 along C-58 and then 170 feet east in Lot 10, 3rd Quarter Township, T. 8 N., R. 6 W. (Pedon 150):

Oi—1 inch to 0; deciduous leaf litter.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine and medium roots; about 10 percent rock fragments; very strongly acid; clear smooth boundary.

Bw1—3 to 7 inches; yellowish brown (10YR 5/4) channery silt loam; few distinct dark yellowish brown (10YR 3/4) and brown (10YR 5/3) silt coatings on faces of peds; weak fine subangular blocky structure; friable; many fine and medium roots; about 20 percent rock fragments; very strongly acid; clear smooth boundary.

Bw2—7 to 17 inches; yellowish brown (10YR 5/4) very channery silt loam; few distinct dark yellowish brown (10YR 4/4) silt coatings on faces of peds; moderate medium subangular blocky structure; friable; many fine and medium roots; about 45 percent rock fragments; very strongly acid; gradual wavy boundary.

Bw3—17 to 23 inches; yellowish brown (10YR 5/4) extremely channery loam; weak fine subangular blocky structure; friable; common fine and few medium roots; about 65 percent rock fragments; very strongly acid; abrupt wavy boundary.

R—23 to 26 inches; light olive brown (2.5Y 5/4) siltstone and fine grained sandstone.

The solum ranges from 18 to 40 inches in thickness. The depth to bedrock ranges from 20 to 40 inches. Rock fragments range from 10 to 50 percent in the A horizon, 15 to 75 percent in the Bw horizon, and 35 to 90 percent in the C horizon, where present.

The A horizon has value of 3 to 5 and chroma of 2 to 4. It is dominantly silt loam, but ranges to loam in the fine-earth fraction. The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. It is silt loam or loam in the fine-earth fraction. Some pedons have a C horizon.

Bethesda Series

The Bethesda series consists of deep, well drained soils in surfaced mined areas on uplands. These soils formed in acid, unconsolidated regolith from coal surface mine operations. Permeability is moderately slow. Slopes range from 0 to 70 percent.

Bethesda soils commonly are adjacent to Coshocton, Gilpin, and Westmoreland soils. Coshocton, Gilpin, and Westmoreland soils have an argillic horizon and are in unmined areas.

Typical pedon of Bethesda very channery clay loam, 20 to 70 percent slopes, about 2.75 miles east of Walnut Creek, in Walnut Creek Township; about 1,280 feet south and 1,885 feet west of the northeast corner of sec. 17, T. 9 N., R. 4 W. (Pedon 117):

A—0 to 3 inches; dark grayish brown (10YR 4/2) very channery clay loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine and common coarse roots; about 35 percent rock fragments; extremely acid; clear smooth boundary.

C1—3 to 17 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) very channery silty clay loam; massive; firm; common fine and coarse roots; about 40 percent rock fragments; extremely acid; clear smooth boundary.

C2—17 to 29 inches; light olive brown (2.5Y 5/4), brown (10YR 4/3), and yellowish brown (10YR 5/6) very channery clay loam; massive; firm; few fine and medium roots; about 35 percent rock fragments; extremely acid; clear smooth boundary.

C3—29 to 48 inches; dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) extremely channery silty clay loam; massive; firm; few fine and medium roots; about 70 percent rock fragments; extremely acid; clear smooth boundary.

C4—48 to 68 inches; dark grayish brown (10YR 4/2) and strong brown (7.5YR 5/6) very channery clay loam; massive; firm; few fine and medium roots; about 50 percent rock fragments; extremely acid; clear smooth boundary.

C5—68 to 80 inches; very dark grayish brown (10YR 3/2) and dark yellowish brown (10YR 4/4) very channery silty clay loam; massive; firm; about 50 percent rock fragments; extremely acid.

Rock fragments make up 35 to 80 percent of the volume below the A horizon. They are dominantly less than 10 inches in diameter, but include some stones and boulders. These rock fragments include shale, sandstone, siltstone, and coal.

The A horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 1 to 6. It is dominantly very channery clay loam, but in some pedons the A horizon is channery clay loam or channery or very channery silty clay loam, silt loam, or loam. The C horizon has hue of 7.5YR to 2.5Y or is neutral; value of 3 to 5 and chroma of 0 to 6. It is very channery or extremely channery silty clay loam, clay loam, silt loam, or loam.

Bogart Series

The Bogart series consists of deep, moderately well drained soils on outwash plains and stream terraces. These soils formed in stratified glacial outwash deposits. Permeability is moderate or moderately rapid in the solum and rapid in the substratum. Slopes range from 0 to 6 percent.

Bogart soils are similar to and commonly adjacent to Chili soils. Chili soils are well drained and are on the higher or more sloping parts of the landscape.

Typical pedon of Bogart silt loam, 2 to 6 percent slopes, about 2.1 miles northwest of Mt. Hope, in Salt Creek Township, about 555 feet south and 370 feet east of the northwest corner of sec. 35, T. 15 N., R. 12 W. (Pedon 161):

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; moderate fine and medium granular structure; friable; many fine and medium roots; trace gravel; slightly acid; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; common distinct brown (10YR 5/3) silt coatings on faces of peds; trace gravel; medium acid; clear smooth boundary.

Bt1—13 to 18 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; common distinct brown (10YR 5/3) clay films on faces of peds; trace gravel; very strongly acid; gradual smooth boundary.

Bt2—18 to 23 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) and common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct light brownish gray (10YR 6/2) clay films on faces of peds; about 5 percent gravel; very strongly acid; abrupt wavy boundary.

Bt3—23 to 30 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam; common medium distinct light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on gravel; 30 percent gravel; strongly acid; gradual wavy boundary.

BC—30 to 42 inches; dark yellowish brown (10YR 4/4) very gravelly coarse sandy loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; about 40 percent gravel; medium acid; gradual wavy boundary.

C—42 to 80 inches; dark grayish brown (10YR 4/2) very gravelly loamy sand; single grained; loose; about 55 percent coarse gravel; neutral.

The solum ranges in thickness from 30 to 50 inches. The amount of gravel is variable in most pedons because of stratification. It ranges from 0 to 30 percent in the A and B horizons above a depth of 20 inches, from 15 to 50 percent as an average in the B and C horizons from a depth of 20 to 40 inches, and from 15 to 60 percent in the B and C horizons below a depth of 40 inches.

The Ap horizon has chroma of 2 or 3. It is dominantly silt loam, but it is loam or gravelly loam in some pedons. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam, loam, sandy loam, clay loam, sandy clay loam, or their gravelly or very gravelly analogs. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It is gravelly or very gravelly analogs of loam, sandy loam, or loamy sand.

Brownsville Series

The Brownsville series consists of deep, well drained soils on unglaciated uplands. These soils formed in colluvium and material weathered from siltstone and fine grained sandstone. Permeability is moderate or moderately rapid. Slopes range from 15 to 70 percent.

Brownsville soils are similar to Berks and Hazleton soils and commonly are adjacent to Coshocton, Gilpin, Hazleton, and Westmoreland soils. Berks soils are moderately deep. Coshocton, Gilpin, and Westmoreland soils have an argillic horizon. Also, Coshocton soils are moderately well drained and Gilpin soils are moderately deep. Hazleton soils have a higher content of medium and coarse sand and a lower content of clay, fine sand, and silt. Coshocton, Gilpin, and Westmoreland soils are on ridgetops and the upper side slopes above the Brownsville soils. Berks and Hazleton soils are in landscape positions similar to the Brownsville soils.

Typical pedon of Brownsville channery silt loam, 35 to 70 percent slopes, about 4.1 miles southeast of Loudonville, in Knox Township, about 400 feet north and 925 feet east of the southwest corner of sec. 20, T. 19 N., R. 15 W. (Pedon 093):

Oi—1 inch to 0; deciduous leaf litter.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) channery silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; many fine, medium, and coarse roots; about 25 percent rock fragments; extremely acid; abrupt smooth boundary.

Bw1—2 to 10 inches; light yellowish brown (10YR 6/4) very channery silt loam; few faint pale brown (10YR 6/3) silt coatings on faces of peds; weak medium subangular blocky structure; friable; common fine and medium roots; about 50 percent rock fragments; strongly acid; clear smooth boundary.

Bw2—10 to 22 inches; yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 45 percent rock fragments; strongly acid; clear wavy boundary.

Bw3—22 to 30 inches; yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; firm; few fine and medium roots; few distinct strong brown (7.5YR 5/6) clay films on coarse fragments; about 40 percent rock fragments; strongly acid; clear wavy boundary.

Bw4—30 to 42 inches; yellowish brown (10YR 5/4) extremely channery silt loam; weak fine subangular blocky structure; friable; few fine and medium roots; few distinct strong brown (7.5YR 5/6) clay films on coarse fragments; about 75 percent rock fragments; strongly acid; clear wavy boundary.

R—42 to 45 inches; yellowish brown (10YR 5/4) fractured, fine grained siltstone bedrock.

The solum ranges in thickness from 24 to 55 inches and the depth to bedrock is 40 to 72 inches. Rock fragments mainly are thin, flat fragments of siltstone or very fine grained sandstone. They range from 15 to 80 percent in the Bw horizon and 30 to 90 percent in the C horizon, where present.

The A horizon has value of 2 to 5 and chroma of 1 to 4. It is dominantly channery silt loam, but ranges to very channery silt loam. The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. It is dominantly very channery or extremely channery silt loam or loam, but includes channery loam and thin subhorizons of channery or flaggy analogs. Some pedons have a C horizon.

Canfield Series

The Canfield series consists of deep, moderately well drained soils on glaciated uplands. These soils formed in a thin mantle of loess and in the underlying, low-lime glacial till. Canfield soils have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 2 to 12 percent.

Canfield soils are similar to Wooster soils and commonly are adjacent to Ravenna and Wooster soils. Ravenna soils are somewhat poorly drained and are in lower areas and slight depressions. Wooster soils are well drained and are on the more convex parts of the landscape.

Typical pedon of Canfield silt loam, 2 to 6 percent slopes, about 2.8 miles north of Mt. Hope, in Salt Creek Township, about 1,055 feet south and 2,375 feet west of the northeast corner of sec. 26, T. 15 N., R. 12 W. (Pedon 081):

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine roots; few rock fragments; slightly acid; abrupt smooth boundary.

BE—6 to 9 inches; brown (10YR 4/3) silt loam; common faint yellowish brown (10YR 5/4) silt coatings on faces of peds; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium prismatic structure parting to moderate fine and medium subangular blocky; friable; common fine roots; few rock fragments; slightly acid; clear smooth boundary.

Bt1—9 to 15 inches; strong brown (7.5YR 5/6) silt loam; few distinct brown (7.5YR 5/4) silt coatings on faces of peds; moderate medium subangular blocky structure; firm; few fine roots; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few rock fragments; medium acid; clear smooth boundary.

2Bt2—15 to 21 inches; yellowish brown (10YR 5/6) loam; few fine prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; few distinct brown (7.5YR 5/4) clay films on faces of peds; about 5 percent rock fragments; strongly acid; clear smooth boundary.

2Bt3—21 to 26 inches; dark yellowish brown (10YR 4/4) loam; common fine distinct grayish brown (10YR 5/2) and few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent rock fragments; strongly acid; clear smooth boundary.

2Btx1—26 to 38 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; weak very coarse prismatic structure parting to weak thick platy; very firm, brittle; common distinct grayish brown (10YR 5/2) clay films on vertical faces of peds and common faint brown (10YR 4/3) clay films on horizontal faces of peds; common medium black (10YR 2/1) stains (iron and manganese oxide); about 10 percent rock fragments; medium acid; clear wavy boundary.

2Btx2—38 to 45 inches; dark yellowish brown (10YR 4/4) loam; few fine distinct grayish brown (10YR 5/2) mottles; weak very coarse prismatic structure parting to weak thick platy; very firm, brittle; common distinct grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds; common fine and medium very dark brown (10YR 2/2) stains (iron and manganese oxide); about 10 percent rock fragments; slightly acid; gradual wavy boundary.

2C1—45 to 62 inches; olive brown (2.5Y 4/4) loam; massive; friable; about 5 percent rock fragments; slightly acid; gradual wavy boundary.

2C2—62 to 80 inches; light olive brown (2.5Y 5/4) loam; massive; friable; about 10 percent rock fragments; neutral.

The solum ranges from 40 to 60 inches in thickness. The depth to the top of the fragipan ranges from 15 to 30 inches. Rock fragments range from 0 to 14 percent above the fragipan, 2 to 25 percent in the fragipan, and 2 to 30 percent below the fragipan.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly silt loam, but it is loam in some pedons. The Bt and 2Bt horizons have hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 4 to 6. Mottles that have chroma of 2 or less are within the upper 10 inches of the Bt horizon. They are dominantly loam or silt loam, but include subhorizons of clay loam or silty clay loam. The 2Btx horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. They are loam, silt loam, or their gravelly analog. The 2C horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. They are loam, silt loam, sandy loam, or their gravelly analog.

Carlisle Series

The Carlisle series consists of deep, very poorly drained soils in bogs and depressions within lake plains and outwash plains. These soils formed in organic materials more than 51 inches thick. Permeability is moderately slow to moderately rapid. Slopes are less than 2 percent.

Carlisle soils commonly are adjacent to Luray, Melvin, and Sebring soils. These soils formed in mineral material. Melvin soils are on flood plains. Luray and Sebring soils are in landscape positions similar to those of Carlisle soils.

Typical pedon of Carlisle muck, about 2.1 miles northwest of Berlin, in Berlin Township, about 50 feet north and 190 feet east of the southwest corner of sec. 2, 1st quarter township, T. 9 N., R. 6 W. (Pedon 134):

Oa1—0 to 10 inches; black (10YR 2/1) broken face; black (10YR 2/1) rubbed sapric material; about 5 percent fiber, trace rubbed; moderate medium granular structure; friable; many fine and common medium roots; few woody fragments; estimated mineral content 25 percent; medium acid; clear smooth boundary.

Oa2—10 to 30 inches; black (10YR 2/1) broken face; black (10YR 2/1) rubbed sapric material; about 15 percent fiber, 5 percent rubbed; moderate coarse subangular blocky structure; friable; common fine roots; few woody fragments; mineral content 20 percent; medium acid; clear smooth boundary.

Oa3—30 to 40 inches; very dark brown (10YR 2/2) broken face; black (10YR 2/1) rubbed sapric material; about 25 percent fiber, 10 percent rubbed; moderate coarse subangular blocky structure; friable; common fine roots; few woody fragments; mineral content 10 percent; slightly acid; clear smooth boundary.

Oa4—40 to 50 inches; dark reddish brown (5YR 3/2) broken face; dark reddish brown (5YR 2/2) rubbed sapric material; about 25 percent fiber, 10 percent rubbed; massive; friable; about 10 percent woody fragments; mineral content 10 percent; slightly acid; clear smooth boundary.

Oa5—50 to 60 inches; very dark grayish brown (10YR 3/2) broken face; very dark brown (10YR 2/2) rubbed sapric material; about 70 percent fiber, 15 percent rubbed; massive; friable; about 5 percent woody fragments; mineral content 10 percent; slightly acid.

Organic deposits are more than 51 inches thick. The subsurface and bottom tiers have hue of 5YR, 7.5YR, 10YR, or are neutral; value of 2 or 3 and chroma of 0 to 3. Broken faces commonly become darker upon brief exposure to air. The subsurface tier is dominantly sapric material with a rubbed fiber content of less than 16 percent of the organic volume. The bottom tier has variable amounts of woody and herbaceous layers; however, herbaceous fibers generally constitute the greater proportion. It is dominantly sapric material but some pedons have thin layers of hemic material.

Centerburg Series

The Centerburg series consists of deep, moderately well drained soils on glaciated uplands. These soils formed in loamy glacial till. Most places have a thin loess mantle. Permeability is moderately slow. Slopes range from 2 to 12 percent.

Centerburg soils are similar to Amanda soils and commonly are adjacent to Amanda and Wooster soils. Amanda soils are well drained and are on the higher and more convex parts of the landscape or on the steeper slopes. Wooster soils are well drained, have a fragipan, and are on the higher and more convex parts of the landscape.

Typical pedon of Centerburg silt loam, 2 to 6 percent slopes, about 5 miles northwest of Holmesville, in Ripley Township, about 2,510 feet south and 2,375 feet west of the northeast corner of sec. 25, T. 18 N., R. 14 W. (Pedon 133):

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine and common medium roots; few rock fragments; medium acid; abrupt smooth boundary.

Bt1—9 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct brown (10YR 5/3) mottles below 14 inches; moderate medium subangular blocky structure; firm; common fine and few medium roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; few rock fragments; strongly acid; gradual smooth boundary.

Bt2—18 to 27 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure; firm; few fine roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine black (10YR 2/1) stains (iron and manganese oxide); about 8 percent rock fragments; very strongly acid; gradual smooth boundary.

Btx—27 to 36 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure; firm, slightly brittle; many distinct grayish brown (10YR 5/2) clay films on faces of peds; common medium black (10YR 2/1) stains (iron and manganese oxide); about 10 percent rock fragments; slightly acid; gradual smooth boundary.

BC—36 to 45 inches; light olive brown (2.5Y 5/4) clay loam; common medium distinct grayish brown (2.5Y 5/2) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; common fine black (10YR 2/1) stains (iron and manganese oxide); about 5 percent rock fragments; neutral; gradual smooth boundary.

C—45 to 80 inches; light olive brown (2.5Y 5/4) loam; common medium distinct grayish brown (2.5Y 5/2) mottles; massive; firm; about 10 percent rock fragments; slight effervescence; mildly alkaline.

The solum ranges from 40 to 54 inches in thickness. Rock fragments range from 0 to 10 percent in the upper part of the B horizon; 2 to 15 percent in the lower part of the B horizon; and 3 to 15 percent in the C horizon.

The Ap horizon has chroma of 2 or 3. Some pedons have an E horizon. The Bt and Btx horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam, silt loam, clay loam, or loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is loam or silt loam.

Chili Series

The Chili series consists of deep, well drained soils on outwash plains, stream terraces, and kames. These soils formed in stratified glacial outwash deposits. Permeability is moderately rapid in the subsoil and rapid in the substratum. Slopes range from 0 to 70 percent.

Chili soils are similar to Bogart soils and commonly are adjacent to Bogart and Wooster soils. Bogart soils are moderately well drained and are on flats and slight rises. Wooster soils have less sand and gravel in the subsoil and have a fragipan. Wooster soils are on nearby till plains.

Typical pedon of Chili loam, 2 to 6 percent slopes, about 2.0 miles east-northeast of Mt. Hope, in Paint Township, about 1,850 feet north and 355 feet east of the southwest corner of sec. 5, T. 14 N., R. 11 W. (Pedon 129):

A—0 to 4 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; moderate medium granular structure; friable; many fine and common medium roots; trace of gravel; strongly acid; abrupt smooth boundary.

E—4 to 8 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; many fine and common medium roots; trace of gravel; strongly acid; clear smooth boundary.

Bt1—8 to 11 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular blocky structure; friable; common fine and few medium roots; trace of gravel; strongly acid; gradual smooth boundary.

Bt2—11 to 18 inches; yellowish brown (10YR 5/4) loam; moderate and medium coarse subangular blocky structure; firm; common fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent gravel; strongly acid; gradual wavy boundary.

Bt3—18 to 24 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; moderate coarse subangular blocky structure; firm; few fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; about 35 percent gravel; strongly acid; gradual wavy boundary.

Bt4—24 to 32 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; moderate medium subangular blocky structure; friable; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; about 40 percent gravel fragments; strongly acid; gradual wavy boundary.

Bt5—32 to 44 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; weak coarse subangular blocky structure; friable; common distinct brown (10YR 4/3) clay films on faces of peds; about 40 percent gravel; strongly acid; gradual wavy boundary.

BC—44 to 56 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; weak medium subangular blocky structure; very friable; common distinct brown (10YR 4/3) clay films on gravel; about 50 percent coarse gravel; medium acid; gradual wavy boundary.

C1—56 to 68 inches; dark yellowish brown (10YR 4/4) very gravelly loamy sand; massive; very friable; about 45 percent gravel; medium acid; gradual wavy boundary.

C2—68 to 80 inches; dark yellowish brown (10YR 4/4) very gravelly sand; single grained; loose; about 35 percent gravel; medium acid.

The solum ranges in thickness from 40 to 70 inches. The amount of gravel is variable in most pedons because of stratification. It ranges from 0 to 30 percent in the A and E horizons and in the Bt horizons above a depth of 15 inches, 15 to 50 percent in the Bt horizon between a depth of 15 and 40 inches, and 25 to 60 percent in the Bt and C horizons below a depth of 40 inches.

The A horizon has value of 3 and chroma of 2 or 3. The Ap horizon has value of 4 and chroma of 3 or 4. They are dominantly loam but are silt loam or gravelly loam in some pedons. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It commonly is loam, sandy loam, clay loam, sandy clay loam, or their gravelly or very gravelly analogs. Less commonly, the range includes silt loam to a depth of 24 inches. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It typically is stratified, gravelly or very gravelly loamy sand or sand.

Cidermill Series

The Cidermill series consists of deep, well drained soils on stream terraces. These soils formed in a mantle of silty materials and in stratified glacial outwash deposits. Permeability is moderate or moderately rapid in the solum and rapid in the substratum. Slopes range from 0 to 6 percent.

Cidermill soils commonly are adjacent to Chili, Fitchville, and Glenford soils. Chili soils do not have the 24- to 36-inch mantle of silty materials and are in landscape positions similar to those of the Cidermill soils. Fitchville and Glenford soils are silty throughout the solum and commonly are in the slightly lower areas. Fitchville soils are somewhat poorly drained and Glenford soils are moderately well drained.

Typical pedon of Cidermill silt loam, 2 to 6 percent slopes, about 2.8 miles west-southwest of Nashville, in Knox Township, about 1,715 feet south and 1,385 feet west of the northeast corner of sec. 21, T. 19 N., R. 15 W. (Pedon 136):

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and common medium roots; trace of gravel; slightly acid; abrupt smooth boundary.

Bt1—9 to 12 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common fine and few medium roots; common faint yellowish brown (10YR 5/4) silt coatings on faces of peds; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; trace of gravel; slightly acid; gradual smooth boundary.

Bt2—12 to 17 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse and medium subangular blocky structure; friable; common fine roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; trace of gravel; slightly acid; gradual smooth boundary.

Bt3—17 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse and medium subangular blocky structure; friable; common fine roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; trace of gravel; slightly acid; gradual smooth boundary.

Bt4—21 to 28 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse and medium subangular blocky structure; friable; few fine roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent gravel; slightly acid; clear wavy boundary.

2Bt5—28 to 34 inches; brown (7.5YR 4/4) gravelly loam; moderate medium subangular blocky structure; firm; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 30 percent gravel; medium acid; gradual wavy boundary.

2Bt6—34 to 42 inches; brown (7.5YR 4/4) very gravelly loam; moderate medium subangular blocky structure; firm; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 55 percent gravel; medium acid; gradual wavy boundary.

2BC—42 to 50 inches; dark yellowish brown (10YR 4/4) very gravelly coarse sandy loam; weak medium subangular blocky structure; friable; common faint brown (10YR 4/3) clay films on gravel; about 45 percent gravel; strongly acid; gradual wavy boundary.

2C—50 to 80 inches; dark yellowish brown (10YR 4/4) very gravelly coarse sandy loam; massive; very friable; about 45 percent gravel; strongly acid.

The solum ranges in thickness from 40 to 70 inches. Thickness of the silty mantle ranges from 24 to 40 inches. The amount of gravel is variable in most pedons because of stratification. It ranges from 0 to 5 percent in the Ap and Bt horizons, 10 to 60 percent in the 2Bt horizon, and 15 to 60 percent in the 2C horizon, except for a few, thin lenses that range to as much as 80 percent.

The Ap horizon has chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It commonly is clay loam, loam, fine sandy loam, sandy loam, sandy clay loam, or their gravelly or very gravelly analogs. The 2C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It typically is stratified with dominant textures of gravelly or very gravelly analogs of sandy loam, coarse sandy loam, loamy sand, loamy coarse sand, or sand; the upper part and some minor strata range to gravelly or very gravelly loam or its extremely gravelly analog.

Coshocton Series

The Coshocton series consists of deep, moderately well drained soils on unglaciated uplands. These soils formed in loamy colluvium and material weathered from thin-bedded shale, sandstone, and siltstone. Permeability is moderately slow or slow. Slopes range from 2 to 40 percent.

Coshocton soils are similar to Keene soils and commonly are adjacent to Gilpin, Keene, Rigley, and Westmoreland soils. Gilpin soils are well drained and moderately deep, and are on ridgetops and the upper side slopes. Keene soils contain less sand in the subsoil and are on broad ridgetops. Rigley soils are well drained, contain less clay in the solum, and are on ridgetops and the upper side slopes. Westmoreland soils are well drained and are in similar landscape positions.

Typical pedon of Coshocton silt loam, 2 to 6 percent slopes, about 2.5 miles southwest of Nashville, in Knox Township, about 1,960 feet west of intersection of TR 213 and TR 446 along TR 213, then 1,915 feet north. Lot 7, 2nd quarter township, T. 9 N., R. 9 W. (Pedon 164):

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; many fine and medium roots; about 5 percent rock fragments; slightly acid; abrupt smooth boundary.

Bt1—8 to 16 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; firm; common fine and common medium roots; common faint yellowish brown (10YR 5/6) clay films on faces of peds; about 12 percent rock fragments; very strongly acid; clear wavy boundary.

Bt2—16 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common moderate prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many distinct to prominent gray (10YR 6/1) clay films on faces of peds; about 10 percent rock fragments; very strongly acid; gradual smooth boundary.

Bt3—22 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct to prominent gray (10YR 6/1) clay films on faces of peds; about 7 percent rock fragments; very strongly acid; gradual smooth boundary.

BC—33 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; common distinct light yellowish brown (10YR 6/4) clay films on faces of peds; about 5 percent rock fragments; very strongly acid; gradual wavy boundary.

C1—42 to 48 inches; dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common medium distinct strong brown (7.5YR 5/6) mottles; massive; firm; about 10 percent rock fragments; very strongly acid; gradual wavy boundary.

C2—48 to 65 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; about 10 percent rock fragments; very strongly acid; gradual wavy boundary.

Cr—65 to 70 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/6), soft, thin-bedded shale.

The solum ranges in thickness from 24 to 50 inches. The depth to bedrock ranges from 40 to 84 inches. Fragments of shale, siltstone, or sandstone range from 2 to 15 percent in the upper part of the Bt horizon, 2 to 35 percent in the lower part of the Bt and in BC horizons, and 2 to 60 percent in the C horizon.

The Ap horizon has chroma of 2 to 4. Some undisturbed pedons have A and E horizons. In the upper part the Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam, clay loam, silt loam, or loam. In the lower part the Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. It is silty clay loam, silty clay, clay loam, loam, or their channery analog. The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is silty clay loam, clay loam, silty clay, or their channery or very channery analogs.

Euclid Series

The Euclid series consists of deep, somewhat poorly drained soils on low stream terraces. These soils formed in stratified silty deposits. Permeability is moderately slow. Slopes range from 0 to 2 percent.

Euclid soils are similar to Fitchville soils and commonly are adjacent to Fitchville, Lobdell, Melvin, and Orrville soils. Fitchville soils have an argillic horizon and are in the slightly higher landscape positions. Unlike Euclid soils, Lobdell, Melvin, and Orrville soils do not have a steady decrease in organic matter content with increasing depth. Lobdell, Melvin, and Orrville soils are on flood plains. Lobdell soils are moderately well drained and Melvin soils are poorly drained.

Typical pedon of Euclid silt loam, occasionally flooded, about 2.65 miles northeast of Walnut Creek, in Walnut Creek Township, about 660 feet north and 1,450 feet east of the southwest corner of sec. 7, T. 9 N., R. 4 W. (Pedon 140):

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

Bw1—9 to 18 inches; yellowish brown (10YR 5/4) silt loam; many light brownish gray (10YR 6/2) coatings on faces of peds; common medium distinct light brownish gray (10YR 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few medium and common fine roots; common faint brown (10YR 5/3) silt coatings on faces of peds in the upper part; few fine strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) stains (iron and manganese oxide); medium acid; gradual smooth boundary.

Bw2—18 to 25 inches; yellowish brown (10YR 5/6) silt loam; many light brownish gray (10YR 6/2) coatings on faces of peds; common medium prominent grayish brown (10YR 5/2) and few fine distinct brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; common medium strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) stains (iron and manganese oxide); medium acid; gradual smooth boundary.

Bw3—25 to 33 inches; yellowish brown (10YR 5/4) silt loam; many light brownish gray (10YR 6/2) silt coatings on faces of peds; many medium and coarse distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; few fine roots; common medium strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) stains (iron and manganese oxide); few thin lenses of loam; medium acid; gradual smooth boundary.

BC—33 to 42 inches; grayish brown (10YR 5/2) silt loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; friable; few fine roots; common medium strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) stains (iron and manganese oxide); medium acid; gradual smooth boundary.

C1—42 to 67 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) and few fine prominent strong brown (7.5YR 5/6) mottles; massive; firm; slightly acid; gradual smooth boundary.

C2—67 to 80 inches; dark yellowish brown (10YR 4/4) silty clay loam; many coarse distinct grayish brown (10YR 5/2) mottles; massive; firm; slightly acid.

The solum ranges in thickness from 35 to 55 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. The C horizon has hue of 10YR, 7.5YR, 2.5Y, or is neutral, value of 4 to 6, and chroma of 0 to 6. It is dominantly silt loam, silty clay loam, or loam. Some pedons have thin strata of fine sandy loam.

Fairpoint Series

The Fairpoint series consists of deep, well drained soils on reclaimed surface mined areas on uplands. These soils formed in medium acid to neutral unconsolidated regolith from coal surface mine operations. Permeability is moderately slow. Slopes range from 0 to 20 percent.

Fairpoint soils are similar to Farmerstown soils and commonly are adjacent to Canfield, Coshocton, Westmoreland, and Wooster soils. Canfield, Coshocton, Westmoreland, and Wooster soils have an argillic horizon and are in unmined areas. Farmerstown soils are more acid in the substratum than the Fairpoint soils. In some areas Farmerstown soils have a thicker layer of topsoil from reconstructed natural soil material over the unconsolidated regolith from surface mine operations.

Typical pedon of Fairpoint silt loam, 8 to 20 percent slopes, about 4.0 miles east-southeast of Walnut Creek, in Walnut Creek Township, about 1,055 feet south and 1,715 feet west of the northeast corner of sec. 24, T. 9 N., R. 4 W. (Pedon 158):

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) (70 percent) and yellowish brown (10YR 5/4) (30 percent) silt loam, very pale brown (10YR 6/4) dry; weak medium granular structure; firm; common fine and medium roots; few rock fragments; strongly acid; abrupt wavy boundary.

C1—8 to 12 inches; very dark grayish brown (10YR 3/2) extremely channery silty clay loam; massive; firm; few fine roots; about 70 percent shale fragments; strongly acid; clear wavy boundary.

C2—12 to 24 inches; variegated dark gray (10YR 4/1) (90 percent) and dark yellowish brown (10YR 4/4) (10 percent) very channery silty clay loam; massive; firm; about 50 percent shale fragments; neutral; clear wavy boundary.

C3—24 to 80 inches; variegated yellowish brown (10YR 5/4) (80 percent) and gray (10YR 5/1) (20 percent) very channery silty clay loam; massive; firm; about 40 percent shale fragments; neutral.

The reconstructed soil ranges in thickness from 4 to 18 inches. The depth to bedrock is more than 60 inches. Rock fragments make up 35 to 80 percent of the volume except for the Ap horizon and the upper part of the C horizon in some pedons. They are dominantly less than 10 inches in diameter, but they include some stones and boulders. These fragments include shale, sandstone, siltstone, and coal.

The reclaimed Ap horizon (from reconstructed natural soil material) has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is dominantly silt loam and layers of loam, clay loam, and silty clay loam in some pedons. It is 4 to 12 inches thick. The C horizon has hue of 7.5YR to 5Y, or is neutral; value of 3 to 6 and chroma of 0 to 8. It commonly is very channery or extremely channery silty clay loam, clay loam, silt loam, or loam; but in some pedons in the upper part it is loam, silt loam, clay loam, or silty clay loam.

Farmerstown Series

The Farmerstown series consists of deep, well drained soils on reclaimed surfaced mined areas on uplands. These soils formed in a blanket of natural soil material 20 to 40 inches thick that had been excavated prior to surface mine operations, stockpiled, and later reconstructed over acid, unconsolidated regolith from coal surface mine operations. Permeability is moderately slow or slow. Slopes range from 0 to 20 percent.

Farmerstown soils are similar to Fairpoint soils and commonly are adjacent to Coshocton, Gilpin, Rigley, and Westmoreland soils. In reclaimed areas Fairpoint soils have only 4 to 20 inches of reconstructed natural soil material over unconsolidated regolith from surface mine operations. Farmerstown soils have 20 to 40 inches of reconstructed natural soil material. Also, Fairpoint soils are less acid in the substratum than Farmerstown soils. Coshocton, Gilpin, Rigley, and Westmoreland soils have an argillic horizon and are in unmined areas.

Typical pedon of Farmerstown silt loam, 8 to 20 percent slopes, about 0.9 miles north-northwest of Farmerstown, in Clark Township, about 2,245 feet south and 290 feet west of the northeast corner of sec. 9, T. 8 N., R. 5 W. (Pedon 155):

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure in the upper 4 inches and massive below; friable; many fine and medium roots; about 5 percent rock fragments; strongly acid; clear wavy boundary.

C1—9 to 14 inches; variegated yellowish brown (10YR 5/4 and 5/6) (90 percent) and grayish brown (10YR 5/2) (10 percent) loam; massive; firm; common fine and few medium roots; about 12 percent rock fragments; very strongly acid; gradual wavy boundary.

C2—14 to 23 inches; variegated yellowish brown (10YR 5/4 and 5/6) (90 percent) and grayish brown (10YR 5/2) (10 percent) loam; massive; very firm, compacted; about 10 percent rock fragments; very strongly acid; abrupt wavy boundary.

2C3—23 to 32 inches; variegated dark gray (10YR 4/1) (80 percent) dark yellowish brown (10YR 4/4) (15 percent) and yellowish brown (10YR 5/6) (5 percent) very channery silt loam; massive; very firm, compacted; about 40 percent rock fragments (35 percent shale and 5 percent sandstone); extremely acid; gradual wavy boundary.

2C4—32 to 48 inches; variegated dark gray (10YR 4/1) (85 percent) and yellowish brown (10YR 5/6) (15 percent) very channery silt loam; massive; very firm; about 50 percent rock fragments (40 percent shale, 5 percent coal, 5 percent sandstone); very strongly acid; gradual wavy boundary.

2C5—48 to 80 inches; dark yellowish brown (10YR 4/4) very channery silt loam; massive; firm; about 45 percent rock fragments (shale); very strongly acid.

The reconstructed soil ranges in thickness from 20 to 40 inches. Rock fragments make up 0 to 25 percent of the volume of the C horizon and 15 to 80 percent in horizons of the 2C horizon. They are dominantly less than 10 inches in diameter, but they include some stones and boulders. These fragments include shale, sandstone, siltstone, and coal.

The reclaimed Ap horizon (in topsoil from reconstructed natural soil material) has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is dominantly silt loam, but includes loam, sandy loam, clay loam, or silty clay loam. The reclaimed C horizon (from reconstructed natural soil material) has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is silt loam, loam, sandy loam, clay loam, or silty clay loam. In some pedons the lower part of the C horizon contains a channery analog of various fine earth textures. The 2C horizon has hue of 7.5YR to 5Y, or is neutral, value of 4 to 6, and chroma of 0 to 6. It is channery, very channery, or extremely channery silt loam, loam, silty clay loam, or clay loam.

Fitchville Series

The Fitchville series consists of deep, somewhat poorly drained soils on terraces along streams and on lake plains. These soils formed in glacial meltwater deposits having a high content of silt. Permeability is moderately slow. Slopes range from 0 to 6 percent.

Fitchville soils are similar to Euclid soils and commonly are adjacent to Euclid, Glenford, and Sebring soils. Euclid soils have a cambic horizon and are in slightly lower landscape positions. Glenford soils are moderately well drained, and Sebring soils are poorly drained. Glenford soils are in slightly higher landscape positions. Sebring soils are in slightly lower landscape positions than Fitchville soils.

Typical pedon of Fitchville silt loam, 2 to 6 percent slopes, about 3.2 miles northeast of Walnut Creek, in

Walnut Creek Township, about 1,520 feet north and 1,255 feet west of the southeast corner of sec. 7, T. 9 N., R. 4 W. (Pedon 141):

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine and common medium roots; slightly acid; abrupt smooth boundary.

BE—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; common distinct pale brown (10YR 6/3) silt coatings on faces of peds; common medium distinct light brownish gray (10YR 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky and angular blocky structure; friable; common fine roots; medium acid; clear smooth boundary.

Bt1—13 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; many grayish brown (10YR 5/2) coatings on faces of peds; common medium prominent light brownish gray (10YR 6/2), common medium distinct yellowish brown (10YR 5/4), and few medium distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; common fine roots; many prominent grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—21 to 27 inches; yellowish brown (10YR 5/6) silty clay loam; many grayish brown (10YR 5/2) coatings on faces of peds; many medium prominent grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; common fine roots; many prominent grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—27 to 33 inches; yellowish brown (10YR 5/6) silty clay loam; many grayish brown (10YR 5/2) coatings on faces of peds; many medium prominent light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/4) mottles; weak medium and coarse subangular blocky structure; firm; few fine roots; many prominent grayish brown (10YR 5/2) clay films on faces of peds; medium acid; gradual smooth boundary.

BC—33 to 40 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; few fine roots; few distinct grayish brown (10YR 5/2) clay films on faces of peds; slightly acid; gradual smooth boundary.

Cg—40 to 55 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; neutral; gradual smooth boundary.

C—55 to 80 inches; yellowish brown (10YR 5/6) silt loam; many medium and coarse, prominent light brownish gray (10YR 6/2) mottles; massive; friable; neutral.

The solum ranges in thickness from 30 to 70 inches.

The Ap horizon has hue of 2.5Y or 10YR and value of 4 or 5. The Bt horizon has hue of 2.5Y to 7.5YR, value of 4 to 6, and chroma of 1 to 6. It is silty clay loam or silt loam. The C and Cg horizons have hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 2 to 6. They are dominantly silt loam or silty clay loam and some thin strata of loam, fine sandy loam, clay loam, silty clay, or lenses of very fine sand or fine sand.

Gilpin Series

The Gilpin series consists of moderately deep, well drained soils on unglaciated uplands. These soils formed in material weathered from siltstone or interbedded shale, siltstone, and fine grained sandstone. Permeability is moderate. Slopes range from 3 to 15 percent.

Gilpin soils are similar to Loudonville, Mechanicsburg, and Westmoreland soils, and commonly are adjacent to Brownsville, Coshocton, and Westmoreland soils. Coshocton soils are moderately well drained. Loudonville and Mechanicsburg soils have glacial till in the upper part of the solum. Brownsville, Coshocton, Mechanicsburg, and Westmoreland soils are deep. Coshocton soils are in landscape positions similar to those of the Gilpin soils. Brownsville and Westmoreland soils are on the lower side slopes.

Typical pedon of Gilpin silt loam, 8 to 15 percent slopes, about 4.1 miles southeast of Loudonville, in Knox Township, about 1,250 feet south and 500 feet west of the northeast corner of sec. 30, T. 19 N., R. 15 W. (Pedon 082):

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine and medium granular structure; friable; common fine and few coarse roots; about 10 percent rock fragments; strongly acid; abrupt smooth boundary.

Bt1—9 to 18 inches; yellowish brown (10YR 5/6) channery silt loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 20 percent rock fragments; very strongly acid; clear smooth boundary.

Bt2—18 to 22 inches; yellowish brown (10YR 5/4) very channery silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 35 percent rock fragments; strongly acid; clear smooth boundary.

Bt3—22 to 26 inches; yellowish brown (10YR 5/6) channery silt loam; moderate fine and medium subangular blocky structure; firm; few fine roots; few distinct reddish brown (5YR 4/4) clay films on faces of peds; about 20 percent rock fragments; strongly acid; clear smooth boundary.

C—26 to 34 inches; yellowish brown (10YR 5/6) extremely channery silt loam; massive; friable; few fine roots; about 75 percent rock fragments; very strongly acid; clear smooth boundary.

R—34 to 36 inches; yellowish brown (10YR 5/6) fractured siltstone bedrock.

The solum ranges in thickness from 18 to 36 inches. The depth to bedrock is 20 to 40 inches. Rock fragments range from 10 to 40 percent in the Bt horizon and 30 to 90 percent in the C horizon.

The Ap horizon has chroma of 2 to 4. It is dominantly silt loam, but it is channery silt loam in some pedons. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is loam, silt loam, silty clay loam, or their channery or very channery analogs. The C horizon, if it occurs, has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. It is channery, very channery, or extremely channery loam, silt loam, or silty clay loam.

Glenford Series

The Glenford series consists of deep, moderately well drained soils on terraces along streams and on lake plains. A few areas are on outwash plains. These soils formed in silty, glaciolacustrine deposits. Permeability is moderately slow. Slopes range from 0 to 12 percent.

Glenford soils commonly are adjacent to Fitchville, Luray, and Sebring soils. Fitchville soils are somewhat poorly drained and are in slightly lower areas. Luray soils are very poorly drained and are in low areas and depressions. Sebring soils are poorly drained and typically are on broad flats at lower elevations.

Typical pedon of Glenford silt loam, 2 to 6 percent slopes, about 3.5 miles northeast of Winesburg, in Paint Township, about 2,440 feet south and 1,190 feet west of the northeast corner of sec. 25, T. 15 N., R. 11 W. (Pedon 131):

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine and medium roots; medium acid; abrupt smooth boundary.

Bt1—8 to 13 inches; yellowish brown (10YR 5/6) silt loam; moderate coarse and medium subangular blocky structure; firm; common fine and few medium roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—13 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate coarse and medium angular blocky; firm; common fine roots; common distinct brown (10YR 5/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—21 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure; firm; few fine roots; many distinct light brownish gray (10YR 6/2) clay films on faces of peds; common medium and coarse black (10YR 2/1) stains (iron and manganese oxide); very strongly acid; gradual smooth boundary.

Bt4—28 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure; very firm; many distinct light brownish gray (10YR 6/2) clay films on faces of peds; common medium and coarse black (10YR 2/1) stains (iron and manganese oxide); medium acid; gradual smooth boundary.

BC—34 to 44 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure parting to weak thick platy; firm; common distinct light brownish gray (10YR 6/2) clay films on faces of peds; common medium and coarse black (10YR 2/1) stains (iron and manganese oxide); medium acid; gradual wavy boundary.

C1—44 to 58 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) mottles; massive; firm; common medium and coarse black (10YR 2/1) stains (iron and manganese oxide); neutral; gradual wavy boundary.

C2—58 to 80 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and few medium distinct grayish brown (10YR 5/2) mottles; massive; firm; neutral.

The solum ranges in thickness from 30 to 60 inches. Rock fragments, generally absent, range to as much as 3 percent in the BC horizon and to as much as 5 percent in the C horizon.

The Ap horizon has chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6; mottles with chroma of 2 or less are within the upper 10 inches of the Bt horizon. It is silty clay loam or silt loam. The C horizon has value of 4 or 5 and chroma of 3 to 6. It is dominantly stratified silt loam and silty clay loam, but includes thin strata of loam, fine sandy loam, silty clay, and lenses of very fine and fine sand.

Hazleton Series

The Hazleton series consists of deep, well drained soils on unglaciated uplands. These soils formed in colluvium and material weathered from acid gray and brown sandstone. Permeability is moderately rapid or rapid. Slopes range from 8 to 70 percent.

Hazleton soils are similar to Berks and Brownsville soils and commonly are adjacent to Gilpin, Rigley, and Westmoreland soils. Berks soils are moderately deep. Brownsville soils have a lower content of medium and coarse sand and a higher content of clay, fine sand, and silt. Gilpin, Rigley, and Westmoreland soils have an argillic horizon. Also, Gilpin soils are moderately deep. Gilpin, Rigley, and Westmoreland soils are on ridgetops and the upper side slopes above Hazleton soils. Berks and Brownsville soils are in landscape positions similar to Hazleton soils. In places Westmoreland soils also are in landscape positions similar to those of Hazleton soils.

Typical pedon of Hazleton loam, 25 to 70 percent slopes, very bouldery, about 2.1 miles southwest of Charm, in Mechanic Township, about 160 feet south and 820 feet east of the northwest corner of sec. 11, T. 8 N., R. 6 W. (Pedon 160):

Oi—2 inches to 1 inch; deciduous leaf litter.

Oa—1 inch to 0; very dark brown (10YR 2/2) decomposed deciduous leaf litter.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many fine and medium roots; about 10 percent rock fragments; very strongly acid; clear smooth boundary.

Bw1—3 to 6 inches; brown (10YR 4/3) channery loam; weak medium subangular blocky structure; friable; many fine and medium roots; about 30 percent rock fragments; very strongly acid; clear smooth boundary.

Bw2—6 to 12 inches; dark yellowish brown (10YR 4/4) very channery sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 45 percent rock fragments; very strongly acid; gradual smooth boundary.

Bw3—12 to 18 inches; yellowish brown (10YR 5/4) very channery sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 45 percent rock fragments; very strongly acid; gradual smooth boundary.

Bw4—18 to 30 inches; yellowish brown (10YR 5/4) very channery sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; about 40 percent rock fragments; very strongly acid; clear wavy boundary.

Bw5—30 to 35 inches; yellowish brown (10YR 5/4) very channery loam; weak medium subangular blocky structure; firm; few fine roots; about 40 percent rock fragments; very strongly acid; gradual smooth boundary.

C—35 to 50 inches; yellowish brown (10YR 5/4) very channery loam; massive; friable; about 40 percent rock fragments; very strongly acid; abrupt wavy boundary.

R—50 to 54 inches; yellowish brown (10YR 5/4) hard, fine grained sandstone.

The solum ranges in thickness from 25 to 50 inches. The depth to bedrock ranges from 40 to 72 inches or more. Rock fragments range from 15 to 70 percent in the individual horizons of the Bw horizon and from 35 to 80 percent in the C horizon.

The A horizon has value of 2 to 4 and chroma of 1 or 2. The A horizon is dominantly loam, but in some pedons it is fine sandy loam, sandy loam, channery loam, or channery sandy loam. Some pedons have an Ap or E horizon. The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. It is loam, fine sandy loam, or sandy loam in the fine earth fraction. The C horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 8. It ranges from loam to loamy sand in the fine-earth fraction.

Keene Series

The Keene series consists of deep, moderately well drained soils on unglaciated uplands. These soils formed in a mantle of silty material and in the underlying material weathered from shale and siltstone. Permeability is moderately slow or slow. Slopes range from 2 to 6 percent.

Keene soils are similar to Coshocton soils and commonly are adjacent to Coshocton and Westmoreland soils. Coshocton and Westmoreland soils contain more sand in the subsoil and are on the lower side slopes.

Typical pedon of Keene silt loam, 2 to 6 percent slopes, about 3 miles south of Millersburg, in Mechanic Township, about 2,565 feet north and 1,500 feet east of the southwest corner of sec. 10, T. 8 N., R. 7 W. (Pedon 115):

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine and few medium roots; few rock fragments; medium acid; abrupt smooth boundary.

Bt1—10 to 17 inches; yellowish brown (10YR 5/6) silt loam; common distinct yellowish brown (10YR 5/4) silt coatings on faces of peds; weak medium subangular blocky structure; friable; few fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few rock fragments; strongly acid; clear smooth boundary.

Bt2—17 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few rock fragments; very strongly acid; clear smooth boundary.

2Bt3—20 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct light brownish gray (10YR 6/2) clay films on faces of prisms; about 5 percent weathered siltstone and sandstone fragments; very strongly acid; clear wavy boundary.

2Bt4—26 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; common fine black (10YR 2/1) stains (iron and manganese oxide); about 10 percent weathered siltstone and sandstone fragments; very strongly acid; clear wavy boundary.

2BC1—37 to 51 inches; light olive brown (2.5Y 5/4) silty clay loam; common fine prominent gray (N 6/0) mottles; weak coarse subangular blocky structure; firm; common distinct gray (10YR 6/1) clay films on faces of peds; about 5 percent weathered siltstone and sandstone fragments; very strongly acid; clear smooth boundary.

2BC2—51 to 57 inches; yellowish brown (10YR 5/4) channery clay loam; weak coarse subangular blocky structure; firm; about 25 percent weathered siltstone and sandstone fragments; very strongly acid; clear smooth boundary.

2C—57 to 76 inches; light olive brown (2.5Y 5/4) channery silty clay loam; common medium prominent gray (10YR 6/1) mottles; massive; firm; about 15 percent rock fragments; very strongly acid; clear wavy boundary.

2R—76 to 78 inches; yellowish brown (10YR 5/6) fractured siltstone.

The solum ranges in thickness from 30 to 60 inches. The depth to bedrock ranges from 40 to 84 inches. Siltstone and sandstone fragments range from 0 to 5 percent in the Bt horizon, 5 to 15 percent in the 2Bt horizon, and 5 to 35 percent in the 2BC and 2C horizons.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an E horizon. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam or silt loam. The 2Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is silty clay loam or silty clay. The 2C horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 to 4. It is silty clay loam, silty clay, clay loam, or their channery analog.

Killbuck Series

The Killbuck series consists of deep, poorly drained soils on the lower and wetter parts of flood plains. These soils formed in recent alluvium overlying a buried soil that has a dark surface horizon. Permeability is moderately slow. Slopes range from 0 to 2 percent.

These soils have a darker colored surface layer than is definitive for the Killbuck series. This difference, however, does not affect the use or behavior of the soils.

Killbuck soils are similar to Melvin soils and commonly are adjacent to Luray and Melvin soils. Luray and Melvin soils do not have a buried soil and are in landscape positions similar to those of Killbuck soils.

Typical pedon of Killbuck silt loam, frequently flooded, about 0.3 miles west of Big Prairie, in Ripley Township, about 50 feet south and 1,585 feet east of the northwest corner of sec. 30, T. 18 N., R. 14 W. (Pedon 163):

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; many fine and medium roots; neutral; clear smooth boundary.

Bg—9 to 17 inches; dark gray (10YR 4/1) silt loam; common medium prominent dark red (2.5YR 3/4) mottles; moderate medium subangular blocky structure; friable; common fine and medium roots; neutral; abrupt wavy boundary.

2Ab—17 to 27 inches; black (N 2/0) silty clay loam; many very dark gray (N 3/0) coatings on faces of peds; common fine prominent dark red (2.5YR 3/4) mottles around roots; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; slightly acid; clear smooth boundary.

2Bgb1—27 to 38 inches; gray (10YR 5/1) silty clay loam; many gray (N 5/0) and few very dark gray (N 3/0) coatings on faces of peds; common medium and coarse prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; slightly acid; gradual smooth boundary.

2Bgb2—38 to 48 inches; gray (10YR 5/1) silty clay loam; common distinct gray (N 5/0) coatings on faces of peds; common medium prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; slightly acid; clear wavy boundary.

2Cg—48 to 80 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; massive; firm; slightly acid.

The silty alluvium overlying the 2Ab horizon of the buried soil is 15 to 30 inches thick. Coarse fragments are less than 2 percent in the Bg horizon and less than 10 percent in the 2Ab, 2Bgb, and 2Cg horizons.

The Ap horizon has value of 3 or 4 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or is neutral, value of 4 or 5, and chroma of 0 to 2. It is dominantly silt loam or silty clay loam but includes thin strata of fine sandy loam or very fine sandy loam. The 2Ab horizon has hue of 10YR or is neutral, value of 2 or 3, and chroma of 0 to 2. It is silt loam, silty clay loam, or silty clay. The 2Bgb and 2Cg horizons have hue of 10YR, 2.5Y, 5Y, or are neutral, value of 4 to 6, and chroma of 0 to 2. Textures are variable but commonly are silty clay loam or silt loam.

Lobdell Series

The Lobdell series consists of deep, moderately well drained soils on the higher parts of flood plains. These soils formed in loamy alluvium. Permeability is moderate. Slopes range from 0 to 2 percent.

Lobdell soils are similar to Tioga soils and commonly are adjacent to Melvin, Orrville, and Tioga soils. Melvin soils are poorly drained. Orrville soils are somewhat poorly drained. Tioga soils are well drained. Melvin and Orrville soils are in slightly lower positions on the flood plains. Tioga soils are in the slightly higher areas than Lobdell soils.

Typical pedon of Lobdell silt loam, occasionally flooded, about 1.7 miles west-southwest of Farmerstown, in Clark Township, about 600 feet south and 2,400 feet west of the northeast corner of sec. 18, T. 8 N., R. 5 W. (Pedon 151):

Ap—0 to 12 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; common distinct dark grayish brown (10YR 4/2) organic coatings on faces of peds; moderate medium granular structure; friable; few fine and medium roots; slightly acid; abrupt smooth boundary.

Bw1—12 to 18 inches; brown (10YR 4/3) silt loam; common fine distinct brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; few fine and medium roots; neutral; gradual smooth boundary.

Bw2—18 to 26 inches; brown (10YR 5/3) silt loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; few fine and medium roots; slightly acid; gradual smooth boundary.

Cg1—26 to 37 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/4), common fine prominent strong brown (7.5YR 5/6), and common fine prominent yellowish red (5YR 4/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; strongly acid; gradual smooth boundary.

Cg2—37 to 42 inches; light brownish gray (10YR 6/2) sandy loam; common fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; few fine roots; thin bands of dark brown (7.5YR 4/4) loamy sand; strongly acid; gradual smooth boundary.

Cg3—42 to 48 inches; light brownish gray (10YR 6/2) loam; common fine distinct dark yellowish brown (10YR 4/4) and strong brown (7.5YR 5/6) mottles; massive; friable; few fine roots; medium acid; gradual smooth boundary.

C1—48 to 58 inches; yellowish brown (10YR 5/6) silt loam; many medium prominent light brownish gray (10YR 6/2) mottles; massive; firm; common medium very dark brown (10YR 2/2) and red (2.5YR 4/6) stains (iron and manganese oxide); strongly acid; gradual smooth boundary.

C2—58 to 68 inches; yellowish brown (10YR 5/6) sandy clay loam; common medium prominent light brownish gray (10YR 6/2) mottles; massive; firm; common medium very dark brown (10YR 2/2) and red (2.5YR 4/6) stains (iron and manganese oxide); strongly acid; clear smooth boundary.

Cg—68 to 80 inches; gray (10YR 6/1) (60 percent), yellowish brown (10YR 5/4) (25 percent), and strong brown (7.5YR 5/6) (15 percent) sandy clay loam; massive; firm; strongly acid.

The solum ranges in thickness from 24 to 50 inches. Coarse fragments make up from 0 to 15 percent of the Bw and C horizons.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is dominantly silt loam but is loam in some pedons. The Bw horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is mainly silt loam or loam, but is sandy loam in some pedons. The C and Cg horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 to 6. They are stratified with textures of silt loam, loam, sandy loam, sandy clay loam, or clay loam.

Loudonville Series

The Loudonville series consists of moderately deep, well drained soils on glaciated uplands. These soils formed in glacial till and the underlying material weathered from sandstone, siltstone, or shale. Permeability is moderate. Slopes range from 2 to 25 percent.

Loudonville soils are similar to Gilpin, Mechanicsburg, and Westmoreland soils and commonly are adjacent to Canfield and Wooster soils. Gilpin and Westmoreland soils formed in residuum and do not have rounded rock fragments. Canfield, Mechanicsburg, and Wooster soils are deep. Canfield soils are moderately well drained. Canfield and Wooster soils have a fragipan. Canfield, Mechanicsburg, and Wooster soils are in landscape positions similar to those of the Loudonville soils.

Typical pedon of Loudonville silt loam, 6 to 12 percent slopes, about 3.4 miles northeast of Winesburg, in Paint Township, about 975 feet north and 1,545 feet west of the southeast corner of sec. 25, T. 15 N., R. 11 W. (Pedon 159):

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many fine and medium roots; about 5 percent rock fragments; medium acid; clear wavy boundary.

BA—8 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; few distinct dark brown (10YR 4/3) organic coatings on faces of peds; weak medium subangular blocky structure; friable; common fine and medium roots; few rock fragments; medium acid; gradual smooth boundary.

Bt1—12 to 18 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; few rock fragments; strongly acid; clear wavy boundary.

Bt2—18 to 24 inches; dark yellowish brown (10YR 4/4) loam; moderate fine and medium subangular blocky structure; firm; few fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; about 5 percent rock fragments; very strongly acid; clear wavy boundary.

2BC—24 to 33 inches; dark yellowish brown (10YR 4/4) very channery loam; weak medium subangular blocky structure; friable; few fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; about 55 percent rock fragments; very strongly acid; abrupt wavy boundary.

2R—33 to 36 inches; light gray (10YR 7/2) hard, massive, fine grained sandstone.

The solum ranges in thickness from 20 to 40 inches. The depth to bedrock ranges from 20 to 40 inches. Rock fragments typically increase with depth and range from 2 to 25 percent in the Bt horizon and 10 to 60 percent in the 2C horizon.

The Ap horizon has color chroma of 2 or 3. It is dominantly silt loam, but in some pedons it is loam. Some pedons have A and E horizons. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, silt loam, clay loam, silty clay loam, or their channery analog. Some pedons have a 2C horizon.

Luray Series

The Luray series consists of deep, very poorly drained soils on lake plains, outwash plains, and till plains. These soils formed in silty lacustrine material or slack water sediments. Permeability is moderately slow. Slopes range from 0 to 2 percent.

These soils have less clay movement in the subsoil than is definitive for the Luray series. This difference, however, does not alter the usefulness or behavior of the soils.

Luray soils commonly are adjacent to Carlisle, Fitchville, Killbuck, and Sebring soils. Carlisle soils have organic material in the solum and are in bogs and depressions. Fitchville and Sebring soils have a lighter colored surface layer and are on the higher and more convex parts of the landscape. Killbuck soils have recent alluvium over a buried soil and are on flood plains.

Typical pedon of Luray silty clay loam, about 2 miles northeast of Loudonville, in Washington Township, about 1,600 feet south and 400 feet west of the northeast corner of sec. 31, T. 20 N., R. 15 W. (Pedon 084):

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A—8 to 11 inches; black (10YR 2/1) silty clay loam, gray (10YR 5/1) dry; moderate medium subangular blocky structure; firm; few fine roots; slightly acid; clear wavy boundary.

BA—11 to 15 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to strong fine subangular blocky; firm; few fine roots; thin strata of very fine sandy loam; slightly acid; clear wavy boundary.

Bg1—15 to 20 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; few fine roots; few distinct very dark gray (N 3/0) organic stains on faces of peds; slightly acid; clear wavy boundary.

Bg2—20 to 27 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; thin strata of very fine sandy loam; slightly acid; clear wavy boundary.

BCg—27 to 34 inches; gray (10YR 5/1) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

C—34 to 51 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse distinct gray (10YR 5/1) and few fine prominent strong brown (7.5YR 5/8) mottles; massive; firm; slightly acid; clear wavy boundary.

Cg—51 to 62 inches; gray (10YR 5/1) stratified silt loam and very fine sandy loam; common fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; slightly acid.

The solum ranges in thickness from 30 to 48 inches. The mollic epipedon ranges in thickness from 10 to 18 inches. Rock fragments are only in the C horizon, where they make up 0 to 2 percent of the volume.

The Ap and A horizons have value of 2 or 3 and chroma of 1 or 2. They are dominantly silty clay loam, but include mucky silt loam and silt loam. The Bg horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 4 to 6, and chroma of 0 to 2. It is silty clay loam or silt loam. The C horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 4 to 6, and chroma of 0 to 6. It is mainly silt loam or silty clay loam and commonly has thin strata of loam, very fine sandy loam, fine sandy loam, or sandy loam.

Mechanicsburg Series

The Mechanicsburg series consists of deep, well drained soils on glaciated uplands. These soils formed in glacial till and in residuum of the underlying, fractured siltstone and fine grained sandstone. Permeability is moderate. Slopes range from 6 to 18 percent.

Mechanicsburg soils are similar to Gilpin, Loudonville, and Westmoreland soils and commonly are adjacent to Canfield and Wooster soils. Gilpin and Loudonville soils are moderately deep. Canfield soils are moderately well drained. Gilpin and Westmoreland soils formed in residuum and do not have rounded coarse fragments. Canfield and Wooster soils have a fragipan. Canfield and Wooster soils are in landscape positions similar to those of the Mechanicsburg soils.

Typical pedon of Mechanicsburg silt loam, 6 to 12 percent slopes, about 3.5 miles west of Nashville, in Washington Township, about 2,110 feet north and 210 feet west of the southeast corner of sec. 17, T. 19 N., R. 15 W. (Pedon 138):

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; moderate fine and medium granular structure; friable; common fine and medium roots; about 2 percent rock fragments; slightly acid; abrupt smooth boundary.

BA—9 to 13 inches; yellowish brown (10YR 5/4) silt loam; common distinct dark brown (10YR 4/3) organic coatings on faces of peds; moderate medium subangular blocky structure; friable; common fine and medium roots; about 2 percent rock fragments; slightly acid; clear smooth boundary.

Bt1—13 to 23 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; firm; few fine and medium roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 5 percent rock fragments; medium acid; gradual smooth boundary.

Bt2—23 to 30 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent rock fragments; medium acid; gradual smooth boundary.

Bt3—30 to 40 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; about 10 percent rock fragments; medium acid; gradual wavy boundary.

Bt4—40 to 48 inches; yellowish brown (10YR 5/4) loam; moderate coarse subangular blocky structure; friable; few fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 12 percent rock fragments; very strongly acid; gradual wavy boundary.

2BC—48 to 58 inches; light olive brown (2.5Y 5/4) channery loam; few fine distinct light brownish gray (10YR 6/2) mottles; massive with vertical seams; friable; few fine roots; common distinct light olive brown (2.5Y 5/4) clay films on vertical faces; about 15 percent rock fragments; very strongly acid; gradual wavy boundary.

2C—58 to 64 inches; light olive brown (2.5Y 5/4) extremely channery loam; common medium distinct grayish brown (2.5Y 5/2) and few fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine roots; about 65 percent rock fragments; very strongly acid; clear wavy boundary.

2R—64 to 66 inches; light olive brown (2.5Y 5/4) fractured, fine grained sandstone.

The solum ranges in thickness from 40 to 60 inches. The depth to material weathered from fractured bedrock is 30 to 50 inches. The depth to bedrock ranges from 40 to 72 inches. Rock fragments (rounded) range from 0 to 10 percent in the Ap horizon and from 1 to 20 percent in the Bt horizon. Thin, flat fragments of siltstone and fine grained sandstone make up from 2 to 50 percent in the 2BC horizon and from 60 to 90 percent in the 2C horizon.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The A and E horizons are present in some pedons. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, silt loam, clay loam, silty clay loam, or their gravelly analog. The 2C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is extremely channery loam or silt loam.

Melvin Series

The Melvin series consists of deep, poorly drained soils on the lowest and wettest parts of the flood plains. These soils formed in alluvium. Permeability is moderate. Slopes range from 0 to 2 percent.

Melvin soils are similar to Killbuck soils and commonly are adjacent to Carlisle, Euclid, Killbuck, Lobdell, and Orrville soils. Carlisle soils formed in organic materials and are in bogs and depressions. Euclid and Orrville soils are somewhat poorly drained and Lobdell soils are moderately well drained. These three soils are on higher and more convex parts of the landscape. Killbuck soils consist of alluvium over a dark buried soil and are in similar landscape positions.

Typical pedon of Melvin silt loam, frequently flooded, about 1.5 miles south of Holmesville, in Prairie Township, about 530 feet south and 1,320 feet west of the northeast corner of sec. 15, T. 13 N., R. 13 W. (Pedon 053):

Ap—0 to 8 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; few fine prominent dark brown (7.5YR 4/4) mottles; moderate medium granular structure; friable; many very fine and fine roots; neutral; abrupt smooth boundary.

Bg1—8 to 31 inches; dark gray (N 4/0) silt loam; few fine prominent olive brown (2.5Y 4/4) mottles in the upper part; weak coarse subangular blocky structure; friable; few fine roots; slightly acid; clear wavy boundary.

Bg2—31 to 44 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) and many medium prominent dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; firm; few fine roots; slightly acid; clear wavy boundary.

Cg1—44 to 58 inches; dark grayish brown (2.5Y 4/2) very fine sandy loam; common medium distinct light olive brown (2.5Y 5/4) and common medium prominent greenish gray (5B 6/1) mottles; massive; friable; slightly acid; clear wavy boundary.

Cg2—58 to 76 inches; dark gray (N 4/0) loamy very fine sand; massive; very friable; slightly acid.

The solum ranges in thickness from 30 to 48 inches. The content of coarse fragments ranges from 0 to 5 percent above a depth of 40 inches and from 0 to 20 percent below that depth.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 to 3. The Bg horizon has hue of 10YR, 2.5Y, 5Y, or is neutral, value of 4 to 7, and chroma of 0 to 2. It is silt loam or silty clay loam. The Cg horizon has colors similar to those of the Bg horizon. It is silt loam or silty clay loam, except below a depth of 40 inches it is stratified with very fine sandy loam, loamy very fine sand, sandy loam, loam, or their gravelly analog.

Orrville Series

The Orrville series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in loamy alluvium. Permeability is moderate. Slopes range from 0 to 2 percent.

Orrville soils commonly are adjacent to Lobdell, Melvin, and Tioga soils. Melvin soils are poorly drained and are in slightly lower areas. Lobdell soils are moderately well drained; Tioga soils are well drained. Lobdell and Tioga soils are in slightly higher areas on flood plains.

Typical pedon of Orrville silt loam, occasionally flooded, about 0.75 miles northwest of Millersburg, in Hardy Township, about 265 feet south and 165 feet east of the northwest corner of sec. 12, T. 9 N., R. 7 W. (Pedon 043):

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; few fine faint dark brown (10YR 4/3) mottles; weak medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bw—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; common dark grayish brown (10YR 4/2) coatings on faces of peds; common fine distinct dark grayish brown (10YR 4/2) and few fine prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; medium acid; clear wavy boundary.

Bg1—13 to 21 inches; grayish brown (10YR 5/2) silt loam; common dark grayish brown (10YR 4/2) coatings on faces of peds; few fine prominent strong brown

(7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; medium acid; gradual wavy boundary.

Bg2—21 to 26 inches; light brownish gray (10YR 6/2) loam; common fine prominent strong brown (7.5YR 5/6) and common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; strongly acid; gradual wavy boundary.

Cg1—26 to 37 inches; light brownish gray (10YR 6/2) loam; many coarse distinct yellowish brown (10YR 5/4) and common fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; thin strata of fine sandy loam; strongly acid; clear wavy boundary.

Cg2—37 to 42 inches; light brownish gray (10YR 6/2) loam; common medium distinct yellowish brown (10YR 5/4) and few fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; strongly acid; gradual smooth boundary.

Cg3—42 to 80 inches; grayish brown (10YR 5/2) loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; strongly acid.

The solum ranges in thickness from 24 to 50 inches. Gravel content ranges from 0 to 15 percent in the B horizon and 0 to 25 percent in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2. It is dominantly silt loam, but in some pedons it is loam, fine sandy loam, or sandy loam. The B horizon has hue of 10YR, 2.5Y, 5Y, or is neutral, value of 4 to 6, and chroma of 0 to 6. It has common or many mottles. The B horizon commonly is silt loam or loam and less commonly silty clay loam or clay loam. The C horizon has hue of 10YR, 2.5Y, 5Y or is neutral, value of 4 to 7, and chroma of 0 to 6. It has common or many mottles. It is dominantly silt loam, loam, or sandy loam, but below a depth of 40 inches it includes loamy sand or its gravelly analog and thin layers of silty clay loam or clay loam.

Ravenna Series

The Ravenna series consists of deep, somewhat poorly drained soils on glaciated uplands. These soils formed mainly in low-lime glacial till, but some areas have a thin loess mantle. Ravenna soils have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 0 to 6 percent.

Ravenna soils commonly are adjacent to Canfield and Wooster soils. Canfield soils are moderately well drained and are on slight rises. Wooster soils are well drained and are on higher and more convex parts of the landscape.

Typical pedon of Ravenna silt loam, 2 to 6 percent slopes, about 1.0 mile east of Mt. Hope, in Paint Township, about 800 feet south and 475 feet east of the northwest corner of sec. 7, T. 14 N., R. 11 W. (Pedon 116):

Oi—1 inch to 0; deciduous leaf litter.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine and few medium roots; few coarse fragments; very strongly acid; clear smooth boundary.

E—3 to 7 inches; brown (10YR 5/3) loam; common faint grayish brown (10YR 5/2) silt coatings on faces of peds; common medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; common fine and few medium roots; about 10 percent coarse fragments; very strongly acid; clear smooth boundary.

BE—7 to 18 inches; brown (10YR 5/3) loam; many distinct grayish brown (10YR 5/2) silt coatings on faces of peds; common medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; common fine roots; about 10 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt—18 to 22 inches; brown (10YR 5/3) gravelly loam; many faint grayish brown (10YR 5/2) silt coatings on faces of peds; common fine prominent strong brown (7.5YR 5/6) and many fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; common faint brown (10YR 4/3) clay films on faces of peds; about 20 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx—22 to 45 inches; yellowish brown (10YR 5/4) gravelly loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate coarse platy; very firm, brittle; few fine roots along prism faces; many distinct gray (10YR 5/1) clay films on vertical faces of prisms; common fine very dark brown (10YR 2/2) stains (iron and manganese oxide); about 15 percent coarse fragments; very strongly acid; clear smooth boundary.

BC—45 to 55 inches; yellowish brown (10YR 5/4) sandy loam; few fine distinct gray (10YR 6/1) mottles; weak coarse subangular blocky structure; friable; about 10 percent coarse fragments; medium acid; clear smooth boundary.

C—55 to 80 inches; light olive brown (2.5Y 5/4) loam; few medium prominent grayish brown (10YR 5/2) mottles; massive; friable; about 10 percent coarse fragments; medium acid.

The solum ranges in thickness from 40 to 80 inches. The depth to the top of the fragipan ranges from 14 to 30 inches. The content of coarse fragments ranges from 2 to 25 percent throughout the soil below the A horizon.

The A or Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 3. It is dominantly silt loam, but in some pedons it is loam. The Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is loam, silt loam, or their gravelly analog. The Btx and C horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. They are loam, silt loam, sandy loam, or their gravelly analog.

Rigley Series

The Rigley series consists of deep, well drained soils on unglaciated uplands. These soils formed in residuum or in colluvium and residuum primarily from sandstone and siltstone with small amounts of shale. Permeability is moderately rapid. Slopes range from 3 to 25 percent.

Rigley soils commonly are adjacent to Coshocton, Gilpin, Hazleton, and Westmoreland soils. Coshocton, Gilpin, and Westmoreland soils contain more clay in the subsoil and commonly are below the Rigley soils on the landscape. Hazleton soils have a cambic horizon and a higher content of rock fragments in the lower part of the subsoil and are in landscape positions similar to those of Rigley soils.

Typical pedon of Rigley sandy loam, 15 to 25 percent slopes, about 2.6 miles south-southeast of Charm, in Clark Township, about 2,205 feet south and 1,410 feet west of the northeast corner of sec. 17, T. 8 N., R. 5 W. (Pedon 166):

Oi—1 inch to 0; deciduous leaf litter.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; very friable; many fine and medium roots; about 10 percent sandstone fragments; very strongly acid; abrupt smooth boundary.

E—3 to 8 inches; yellowish brown (10YR 5/4) sandy loam; weak thick platy structure parting to weak medium subangular blocky; friable; many fine and medium roots; about 10 percent sandstone fragments; very strongly acid; clear smooth boundary.

Bt1—8 to 15 inches; brown (7.5YR 4/4) sandy loam; common faint yellowish brown (10YR 5/4) silt coatings on faces of peds; moderate coarse subangular blocky structure; friable; many fine and medium roots; few distinct brown (7.5YR 4/2) clay films on faces of peds; about 10 percent sandstone fragments; extremely acid; clear wavy boundary.

Bt2—15 to 24 inches; brown (7.5YR 4/4) channery sandy loam; few faint yellowish brown (10YR 5/4) silt coatings on faces of peds; moderate medium subangular blocky structure; firm; common fine and medium roots; common distinct brown (7.5YR 4/2) clay films on faces of peds; about 25 percent sandstone fragments; extremely acid; clear wavy boundary.

Bt3—24 to 33 inches; brown (7.5YR 4/4) channery sandy loam; moderate medium subangular blocky structure; firm; common fine and medium roots; common distinct brown (7.5YR 4/2) clay films on faces of peds; about 25 percent sandstone fragments; extremely acid; clear wavy boundary.

Bt4—33 to 45 inches; brown (7.5YR 4/4) channery sandy loam; moderate medium subangular blocky structure; firm; few fine and medium roots; common distinct brown (7.5YR 4/2) clay films on faces of peds; common, extremely coarse, irregularly shaped, very hard concretions of iron and manganese oxide; about 25 percent sandstone fragments; very strongly acid; clear wavy boundary.

BC—45 to 56 inches; strong brown (7.5YR 5/6) channery sandy loam; weak coarse subangular blocky structure; firm; few fine and medium roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 15 percent sandstone fragments; very strongly acid; clear wavy boundary.

C—56 to 78 inches; yellowish brown (10YR 5/6) channery sandy loam; massive; friable; about 20 percent sandstone fragments; extremely acid; abrupt wavy boundary.

2Cr—78 to 84 inches; gray (10YR 5/1) thin-bedded shale.

The solum ranges in thickness from 40 to 60 inches. The depth to bedrock is more than 60 inches. Rock fragments range from 5 to 35 percent by volume in the Bt horizon and from 20 to 70 percent in the C horizon.

The A horizon has value of 3 to 5 and chroma of 2 or 3. It commonly is sandy loam, but includes fine sandy loam, loam, or their channery analog. Some pedons have an Ap horizon. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is sandy loam, loam, or their channery analog. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It is channery, very channery, extremely channery, flaggy, very flaggy, or extremely flaggy sandy loam, loam, or sandy clay loam.

Schaffenaker Series

The Schaffenaker series consists of moderately deep, well drained soils on unglaciated uplands. These soils formed in material weathered from sandstone. Permeability is rapid or very rapid. Slopes range from 12 to 25 percent.

Schaffenaker soils commonly are adjacent to Brownsville, Coshocton, and Rigley soils. Coshocton and

Rigley soils are deep and have more clay and less sand in the subsoil and commonly are above the Schaffenaker soils on the landscape. Brownsville soils are deep, have more clay in the subsoil, have a cambic horizon, have a higher content of rock fragments in the lower part of the subsoil, and are in lower landscape positions than the Schaffenaker soils.

Typical pedon of Schaffenaker loamy sand, 12 to 25 percent slopes, about 3.6 miles west of Glenmont, in Richland Township, about 1,850 feet north and 1,520 feet west of the southeast corner of sec. 5, T. 8 N., R. 9 W. (Pedon 139):

Oi—1 inch to 0; deciduous leaf litter.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; moderate medium granular structure; very friable; many fine and medium roots; about 5 percent sandstone fragments; very strongly acid; abrupt smooth boundary.

Bw1—3 to 7 inches; brown (10YR 4/3) loamy sand; weak medium subangular blocky structure; very friable; common fine and medium roots; about 10 percent sandstone fragments; strongly acid; clear smooth boundary.

Bw2—7 to 16 inches; light yellowish brown (10YR 6/4) loamy sand; few distinct dark brown (10YR 4/3) silt coatings on faces of peds; weak coarse subangular blocky structure; very friable; few fine roots; about 10 percent sandstone fragments; strongly acid; gradual smooth boundary.

Bw3—16 to 21 inches; yellowish brown (10YR 5/4) channery loamy sand; weak medium subangular blocky structure; very friable; few fine roots; about 20 percent sandstone fragments; strongly acid; clear smooth boundary.

C—21 to 33 inches; brown (7.5YR 4/4) channery loamy sand; single grained; loose; few fine roots; many soft fragments of sandstone; about 20 percent sandstone fragments; strongly acid; abrupt wavy boundary.

R—33 to 38 inches; yellowish brown (10YR 5/4) sandstone that is soft and fractured in the upper few inches and hard below.

The solum ranges in thickness from 15 to 30 inches. The depth to bedrock ranges from 20 to 40 inches. Rock fragments range from 0 to 30 percent by volume in the Bw horizon and from 0 to 50 percent in the C horizon.

The A horizon has value of 2 to 4 and chroma of 1 or 2. The E horizon has value of 4 to 6 and chroma of 3 or 4. The A and E horizons commonly are loamy sand but include loamy fine sand and sand. The Bw horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is sand, loamy sand, or their channery analog. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is sand, loamy sand, or their channery analog.

Sebring Series

The Sebring series consists of deep, poorly drained soils on small, local lake basins and in a few areas in depressions on stream terraces. These soils formed in silty lacustrine deposits. Permeability is moderately slow. Slopes range from 0 to 2 percent.

Sebring soils commonly are adjacent to Fitchville, Glenford, and Luray soils. Fitchville soils are somewhat poorly drained, and Glenford soils are moderately well drained. Fitchville and Glenford soils are on slightly higher parts of lake plains. Luray soils are very poorly drained and are in bogs and depressions.

Typical pedon of Sebring silt loam, about 1.2 miles west-southwest of Nashville, in Knox Township, about 660 feet south and 1,585 feet east of the northwest corner of sec. 23, T. 19 N., R. 15 W. (Pedon 109):

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; strongly acid; abrupt smooth boundary.

BEg—12 to 18 inches; gray (10YR 5/1) silt loam; common faint gray (10YR 5/1) silt coatings on faces of peds; few medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; strongly acid; clear smooth boundary.

Btg1—18 to 27 inches; dark gray (10YR 4/1) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and common medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct gray (10YR 5/1) clay films on faces of peds; strongly acid; clear smooth boundary.

Btg2—27 to 35 inches; dark gray (N 4/0) silty clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure parting to moderate fine subangular blocky; firm; few fine roots; common distinct grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; clear smooth boundary.

BCg—35 to 48 inches; gray (10YR 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak very coarse subangular blocky structure; firm; few fine roots; strongly acid; clear smooth boundary.

Cg—48 to 55 inches; gray (10YR 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; very firm; few fine concretions (iron and manganese oxide); strongly acid; clear smooth boundary.

C—55 to 80 inches; yellowish brown (10YR 5/4) silty clay loam that has gray (10YR 5/1) vertical seams; common medium distinct yellowish brown (10YR 5/6) and many medium distinct grayish brown (10YR 5/2) mottles; massive; firm; strongly acid.

The solum ranges in thickness from 30 to 55 inches.

The Ap horizon has value of 4 or 5 and chroma of 1 or 2. It commonly is silt loam, but is silty clay loam in some pedons. The Bt horizon has hue of 10YR to 5Y, or is neutral, value of 4 to 6, and chroma of 0 to 2 above a depth of 30 inches and chroma of 0 to 6 below that depth. It is silty clay loam or silt loam and has thin strata of loam or clay loam in some pedons. The C horizon has hue of 10YR to 5Y, or is neutral, value of 4 or 5, and chroma of 0 to 6. It is commonly silty clay loam, but in some pedons it is silt loam, clay loam, or sandy loam.

Tioga Series

The Tioga series consists of deep, well drained soils on the highest parts of flood plains. These soils formed in alluvium. Permeability is moderate or moderately rapid. Slopes range from 0 to 2 percent.

Tioga soils are similar to Lobdell soils and commonly are adjacent to Chili, Lobdell, and Orrville soils. Chili soils have an argillic horizon and are on terraces. Lobdell soils are moderately well drained and Orrville soils are somewhat poorly drained. Lobdell and Orrville soils are in the slightly lower areas on flood plains.

Typical pedon of Tioga loam, occasionally flooded, about 4.4 miles west-southwest of Glenmont, in Richland Township, about 1,520 feet south and 105 feet east of the northwest corner of sec. 6, T. 8 N., R. 9 W. (Pedon 122):

Ap—0 to 8 inches; brown (10YR 4/3) loam, light gray (10YR 7/2) dry; weak fine subangular blocky structure; friable; few fine roots; few rock fragments; slightly acid; abrupt smooth boundary.

Bw1—8 to 14 inches; brown (10YR 4/3) loam; weak thin platy structure parting to weak fine subangular blocky; friable; few fine roots; few rock fragments; slightly acid; clear smooth boundary.

Bw2—14 to 18 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; few fine roots; common faint brown (10YR 4/3) and yellowish brown (10YR 5/4) organic stains on faces of peds; few rock fragments; medium acid; clear smooth boundary.

Bw3—18 to 26 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; few fine roots; common faint brown (10YR 4/3) and yellowish brown (10YR 5/4) organic stains on faces of peds; few rock fragments; medium acid; clear smooth boundary.

Bw4—26 to 36 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine roots; few rock fragments; medium acid; clear smooth boundary.

C—36 to 80 inches; dark yellowish brown (10YR 4/4) stratified silt loam and loam; massive; friable; few thin sand lenses between 36 and 64 inches; few rock fragments; medium acid.

The solum ranges in thickness from 18 to 40 inches. Rock fragments, mainly gravel, range from 0 to 30 percent in the Bw horizon and from 0 to 60 percent in the C horizon.

The Ap horizon has value of 3 to 5 and chroma of 2 to 4. Typically, it is loam but in some pedons it is silt loam, fine sandy loam, or gravelly loam. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly loam or silt loam, but includes subhorizons of sandy loam, fine sandy loam, or their gravelly analog. The C horizon is stratified and has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam, loam, sandy loam, fine sandy loam, or their gravelly or very gravelly analogs.

Westmoreland Series

The Westmoreland series consists of deep, well drained soils on unglaciated uplands. These soils formed in colluvium and material weathered from weathered, interbedded siltstone and sandstone. Permeability is moderate. Slopes range from 8 to 40 percent.

Westmoreland soils are similar to Gilpin, Loudonville, and Mechanicsburg soils, and commonly are adjacent to Coshocton, Gilpin, Hazleton, and Rigley soils. Gilpin and Loudonville soils are moderately deep. Coshocton soils are moderately well drained. Loudonville and Mechanicsburg soils formed partly in glacial till and contain rounded, coarse fragments. Hazleton and Rigley soils contain more sand and less clay in the solum than Westmoreland soils. Hazleton soils have a cambic horizon and a higher content of coarse fragments in the solum. Except Hazleton soils, these soils are in landscape positions similar to those of the Westmoreland soils. Hazleton soils are on steeper slopes below the Westmoreland soils.

Typical pedon of Westmoreland silt loam, 8 to 15 percent slopes, eroded, about 1.7 miles west-southwest of Farmerstown, in Clark Township, about 100 feet north and 2,060 feet east of the southwest corner of sec. 13, T. 8 N., R. 5 W. (Pedon 144):

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown

(10YR 6/3) dry; mixed with some streaks and pockets of yellowish brown (10YR 5/4) subsoil material; moderate medium granular structure; friable; common fine and medium roots; few rock fragments; neutral; abrupt smooth boundary.

Bt1—7 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 5 percent rock fragments; slightly acid; gradual smooth boundary.

Bt2—14 to 19 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent rock fragments; strongly acid; gradual smooth boundary.

Bt3—19 to 27 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and coarse subangular blocky structure; firm; common fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent rock fragments; very strongly acid; gradual smooth boundary.

Bt4—27 to 32 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent rock fragments; very strongly acid; gradual smooth boundary.

Bt5—32 to 39 inches; yellowish brown (10YR 5/4) channery silt loam; moderate medium subangular blocky structure; firm; few fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 15 percent rock fragments; very strongly acid; gradual smooth boundary.

BC—39 to 54 inches; yellowish brown (10YR 5/4) channery silt loam; moderate medium subangular blocky structure; firm; about 20 percent rock fragments; very strongly acid; abrupt wavy boundary.

Cr—54 to 70 inches; light olive brown (2.5Y 5/4) soft siltstone; abrupt wavy boundary.

R—70 to 72 inches; light olive brown (2.5Y 5/4) thin-bedded, fractured siltstone.

The solum ranges in thickness from 30 to 56 inches. The depth to bedrock ranges from 40 to 72 inches. Fragments of shale, siltstone, or sandstone range from 2 to 30 percent in the Bt horizon, 5 to 40 percent in the BC horizon, and 45 to 75 percent in the C horizon, where present.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. It is dominantly silt loam, but in some pedons it is loam. Some pedons have A and E horizons. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam, clay loam, silt loam, loam, or their channery analog. Some pedons have a C horizon that is very channery or extremely channery loam, silt loam, clay loam, or silty clay loam.

Wooster Series

The Wooster series consists of deep, well drained soils on glaciated uplands. These soils formed in low lime, glacial till and, in most areas, a thin mantle of loess. Wooster soils have a fragipan. Permeability is moderately slow. Slopes range from 2 to 18 percent.

Wooster soils are similar to Canfield soils and commonly are adjacent to Canfield, Chili, Loudonville, Mechanicsburg, and Ravenna soils. Canfield soils are moderately well drained and are on concave or less convex parts of the landscape. Chili, Loudonville, and Mechanicsburg soils do not have a fragipan. Chili soils are adjacent to Wooster soils on kames and nearby outwash plains and stream terraces. Loudonville and Mechanicsburg soils are in landscape positions similar to those of the Wooster soils but have bedrock between depths of 20 and 40 inches and 40 and 72 inches respectively. Ravenna soils are somewhat poorly drained and are in lower areas and slight depressions.

Typical pedon of Wooster silt loam, 2 to 6 percent slopes, about 1.95 miles south-southeast of Lakeville, in Washington Township, about 1,490 feet north and 1,810 feet east of the southwest corner of sec. 1, T. 19 N., R. 15 W. (Pedon 106):

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; weak fine granular structure; friable; common fine and few medium roots; about 5 percent rock fragments; medium acid; abrupt smooth boundary.

Bt1—9 to 16 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine and few medium roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; few rock fragments; strongly acid; diffuse wavy boundary.

Bt2—16 to 23 inches; yellowish brown (10YR 5/6) loam; moderate fine subangular blocky structure; firm; few fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; 5 percent coarse rock fragments; very strongly acid; clear wavy boundary.

Btx—23 to 40 inches; yellowish brown (10YR 5/4) loam; many coarse prominent strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to moderate thick platy; very firm, brittle; few fine roots along prism faces; common distinct grayish brown (10YR 5/2) clay films on faces of peds; common medium very dark brown (10YR 2/2) stains (iron and manganese oxide); about 10 percent rock fragments; very strongly acid; clear wavy boundary.

BC—40 to 57 inches; yellowish brown (10YR 5/4) loam; weak very coarse subangular blocky structure; firm; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; thin lenses of fine sandy loam and silt loam in the upper part; about 10 percent rock fragments; strongly acid; gradual wavy boundary.

C—57 to 80 inches; yellowish brown (10YR 5/4) gravelly loam; massive; friable; about 15 percent rock fragments; slightly acid in the upper part and neutral in the lower part.

The solum ranges in thickness from 34 to 60 inches and the depth to the top of the fragipan ranges from 20 to 36 inches. Rock fragments range from 2 to 20 percent in the Bt horizon above the fragipan, 5 to 25 percent in the Btx and BC horizons, and 5 to 30 percent in the C horizon.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is dominantly silt loam, but includes loam or gravelly loam in some pedons. Some pedons have A and E horizons. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly silt loam, loam, or their gravelly analog and subhorizons of clay loam. The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is commonly loam, silt loam, or their gravelly analog, but includes subhorizons of clay loam in some pedons. The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 3 to 6. It is typically loam or gravelly loam, but the range includes silt loam, sandy loam, or their gravelly analog.

Formation of the Soils

This section discusses the factors of soil formation, relates them to the formation of soils in Holmes County, and explains the processes of soil formation.

Factors of Soil Formation

The soil is a three-dimensional, natural body capable of supporting plant growth. The nature of the soil at any given site is the result of the interaction of many factors. The major factors of soil formation are parent material, plants and animals, climate, relief, and time. Differences among these factors cause the formation of different kinds of soils.

Climate and living organisms, particularly plants, are active forces in soil formation. Their effect on parent material is modified by relief and by the length of time that the parent material has been acted upon. The relative importance of each factor differs from place to place. The interaction of all five factors generally determines the kind of soil that forms, but in some areas one dominant factor determines most of the soil properties.

Parent Material

Parent material is the raw material acted upon by the other soil forming factors. It mainly determines the soil texture, which in turn controls permeability and the available water capacity. The soils of Holmes County formed in different kinds of parent material. Soils in the northern part of the county formed in material deposited by glaciers that covered the area thousands of years ago or in material deposited by water from melting glaciers. The soils in the southern part of the county formed in material that weathered from rock in place. Other soils formed in material recently deposited by streams or in material that formed in decaying plants. Of lesser extent are those soils that formed in surface mine spoils.

Glacial till is material deposited by glacial ice. The glacial ice contained a variety of soil materials that it left behind upon melting. Glacial till typically contains particles that range widely in size from fine clay to large stones. The smaller stones and pebbles have sharp angles, indicating that they have not been rounded by water action. The composition of the till depends upon the nature of the area over which the ice passed before it reached the area where it deposited the till. Some boulders were carried for long distances, but the origin of most of the till material is in what is now Ohio. Amanda, Canfield, Centerburg, and Wooster soils mainly formed in glacial till.

Soils that formed in glacial till are generally compact in the lower part. They generally make good foundation material because of the wide range in particle sizes.

Meltwater deposits were laid down by melting glaciers. They are of two general kinds: lacustrine deposits laid down in stillwater and outwash deposits laid down by moving water. The size of particles that can be carried while suspended in water depends on the speed at which the water is moving. When water slows to a given speed, all particles larger than a given size that are suspended in the water will drop out. The speed of a stream slows where the stream flows into a still lake. The coarser sand and gravel particles are dropped immediately near the mouth of the stream; the fine clay particles are carried far into the lake where they settle out slowly from stillwater.

Outwash deposits are not extensive in Holmes County. These deposits were laid down as meltwater from the glaciers flowed down the valleys between the hills. Because of the speed of the water, the smaller silt and clay particles were washed away and the sand and gravel were left behind. Chili soils formed in these outwash deposits. They are gravelly and porous in the lower part of the subsoil and in the substratum.

Of lesser extent in the county are soils that formed in lacustrine deposits. Fitchville, Glenford, and Luray soils formed in deposits laid down in lakes that existed after the glaciers melted.

The speed of water at many points did not remain constant during the period of deposition. Because of changes in the speed of water, thin layers of material were deposited in which the dominant particle size is different from that in the layers above and below. This type of deposition, known as stratification, consists of individual layers called strata. For example, many areas of Fitchville and Luray soils have alternating thin strata of silt loam and silty clay loam.

The soils in the unglaciated southern part of the county formed in residuum, residuum and loess, colluvium, and residuum and colluvium. The moderately deep Berks soils formed in residuum of interbedded siltstone, shale, and fine grained sandstone (fig. 23). Schaffenaker soils formed in sandstone residuum.

In some areas the upper part of the soil formed in loess (*17*). Loess is windblown and deposited soil material. Soils that formed in loess are of minor extent. In places the loess cap is as much as 36 inches deep over residuum in Holmes County. Keene soils formed partly in loess and in the underlying residuum.

Most of the soils on side slopes formed in residuum and colluvium. Colluvium is weathered bedrock and soil material that has been moved downhill by gravity. Colluvium and residuum derived from sandstone bedrock are coarse textured or moderately coarse textured. The soils that formed in this parent material dominantly are moderately coarse textured to medium textured in the subsoil. Rigley soils, for example, formed in residuum and colluvium.

Soils that formed in residuum and colluvium derived from clayey shale, siltstone, and limestone are dominantly moderately fine textured in the subsoil. Coshocton soils are an example.

Soils that formed in residuum and colluvium derived from siltstone and fine grained sandstone are dominantly medium textured or moderately fine textured in the subsoil. Brownsville soils are an example.

Alluvium is soil material deposited by flowing streams. Texture is extremely variable because the speed and duration of floodwater varies considerably within small areas. Soil horizons are poorly expressed because the soil-forming process starts over again with each new deposit of material. Some areas have a buried surface layer; generally, the soils are highly stratified. The source of most alluvium is other soils farther upstream in the watershed. Lobdell, Melvin, Orrville, and Tioga soils formed in alluvium.

Carlisle soils formed in the residue of decomposed plant material. These soils are in naturally wet, low areas that supported plant growth. When the plants died, wet conditions prevented oxidation and slowed decomposition; thus, the residue accumulated. Carlisle soils are very dark in color because of organic parent material.

Some soils formed in regolith from surface mine operations. Soil horizons do not have structure and soil textures are extremely variable. Vegetation is sparse in some areas. Bethesda and Fairpoint soils formed in this material, which consists of shale, siltstone, sandstone, and limestone mixed with some partly weathered fine earth. Farmerstown soils formed in a blanket of loamy natural soil material 20 to 40 inches thick that has been excavated prior to surface mine operations, stockpiled, and later reconstructed over acid, unconsolidated regolith from surface mining for coal.

Plants and Animals

The type of vegetation in which a soil developed has an influence on the color, structure, and organic matter content of the soil. Because grass is more effective than trees in returning organic matter to the soil, soils that developed under forest vegetation generally are lighter in color than those that developed under grass vegetation. Grass vegetation also promotes granular structure in the surface soil.

Most of the soils in Holmes County developed under hardwood forest vegetation. Canfield and Wooster soils developed under a forest consisting mainly of hardwood species, such as red oak, white oak, and black oak. Most of the poorly drained and very poorly drained soils, such as Sebring and Luray soils, formed under swamp forest vegetation. The soils that formed in these forested areas are subject to acid leaching. As a result, the subsoil generally is lower in exchangeable bases than the substratum.

The soil contains many micro-organisms, such as bacteria and fungi, that help to breakdown plant residue returned to the soil. The type of organic residue that is left depends to some extent on the type of organism involved in the breakdown. Generally, fungi are more active in acid soils and bacteria, in alkaline soils.

Earthworms, burrowing insects, and small animals constantly mix the soil. Because of their burrowing, the soil is more porous and water passes more rapidly through the soil. Earthworms help to incorporate the organic matter into the soil. Leaf fall on a soil well populated with earthworms is usually incorporated into the soil by early next spring. On some soils in which the earthworm population is low, part of the 2- or 3-year-old leaf fall remain on the surface.

Man has accelerated erosion by cultivating and clearing the land. Cultivation also influences soil structure and tends to lower the organic matter content. Large areas of soils, such as Luray soils, have been artificially drained. Future soil development in such areas will take place under drier conditions than those under which the present soils developed. The change from native forest vegetation to cultivated crops also can be expected to influence future soil development. The addition of such soil nutrients as lime and fertilizer tends to change the chemical regime of the soil (*14*).

Climate

The climate in Holmes County is uniform enough that it has not greatly contributed to differences among the soils.

It has favored physical change and chemical weathering of the parent material and the activity of living organisms.

Rainfall has been adequate to leach from the upper part of the subsoil any carbonates in the parent material of some of the soils on uplands and terraces. All the soils, except those formed in recent alluvium and surface mine spoil, have a lower base saturation in the lower part of the subsoil than in the substratum. Wetting and drying cycles have resulted in the translocation of clay minerals and in the formation of soil structure.

The range in temperature has favored both physical change and chemical weathering of the parent material. Freezing and thawing aided the formation of soil structure. Warm temperatures in summer favored chemical reactions in the weathering of primary minerals. Rainfall and temperature have been conducive to plant growth and the accumulation of organic matter in all the soils.

More information about the climate is available in the section "General Nature of the Survey Area."

Relief

Relief affects the natural drainage of soils through its effect on the amount of runoff and the depth to a seasonal high water table. Water that runs off the more sloping soils collects in depressions or is removed through a drainage system. From an equal amount of rainfall, the more sloping soils receive less water than depressional or nearly level soils. Gently sloping soils generally show the most evidence of profile development because they are neither saturated or droughty. Soil formation on steep slopes tends to be inhibited by erosion and by reduced amounts of water entering the soil.

Relief can result in the formation of different soils from

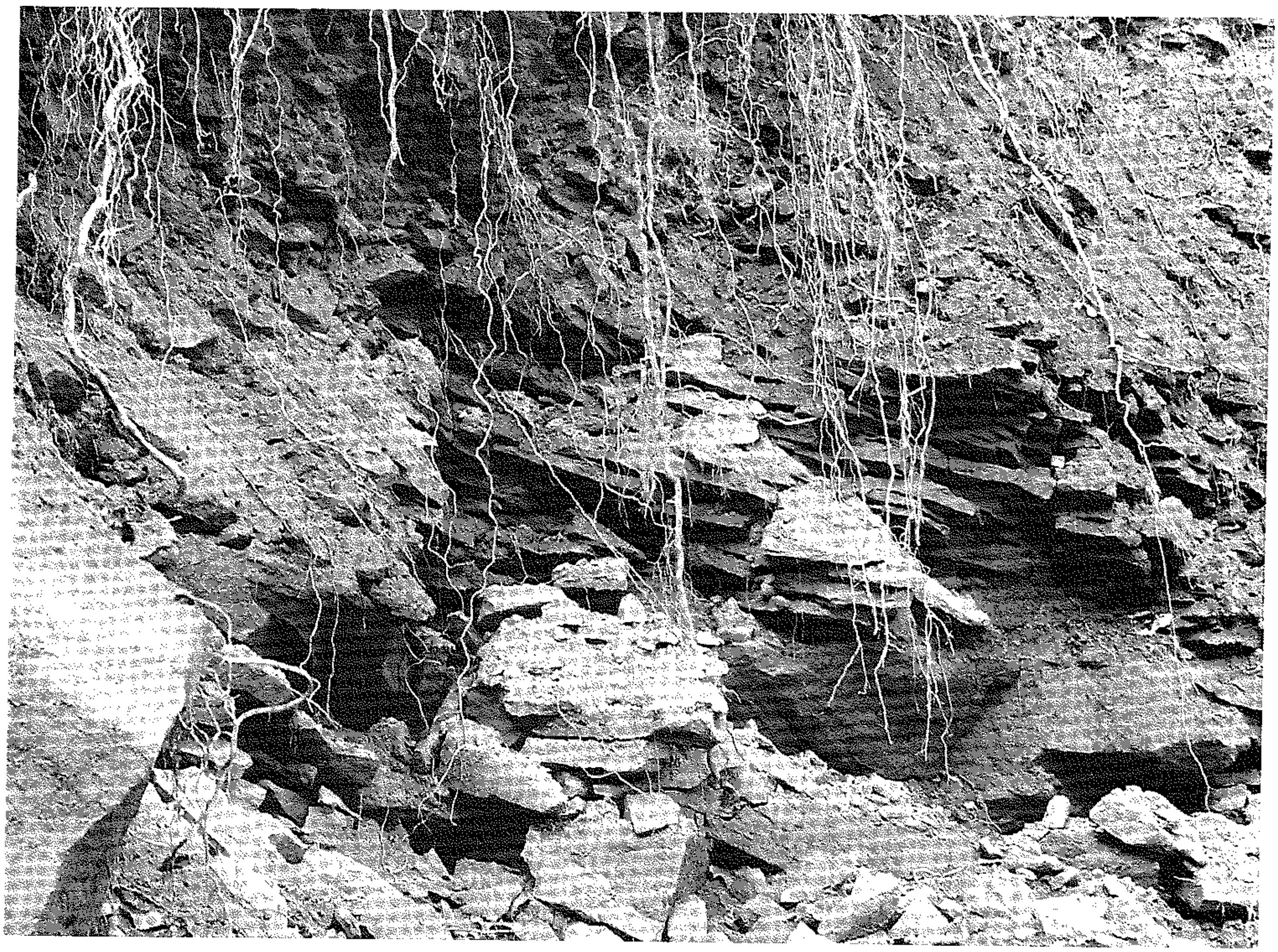

Figure 23.—Berks soils formed in residuum of siltstone, fine grained sandstone, and shale.

the same kind of parent material. Glenford and Luray soils, for example, both formed in lacustrine sediments. The moderately well drained Glenford soils are on the higher, more sloping parts of terraces. Their seasonal high water table generally is not close to the surface. The very poorly drained Luray soils are in lower, nearly level areas. Their seasonal high water table is near or above the surface.

Relief varies considerably in Holmes County. The northern, glaciated part of the county is nearly level to hilly. The southern part of the county was not covered by glaciers; it retains the rough bedrock relief of southeastern Ohio.

Time

Time is needed for the other factors of soil formation to produce their effects. The age of a soil is indicated, to some extent, by the degree of profile development. If the parent material weathers slowly, the profile forms slowly. In many areas, however, factors other than time have been responsible for most of the differences in the kind and distinctness of layers in the different soils.

Most of the soils in Holmes County are old and have a strongly expressed profile. The youngest soils formed in surface mine spoil, namely Bethesda, Fairpoint, and Farmerstown soils. On flood plains, deposits of fresh sediments periodically interrupt soil formation. As a result, Melvin and Orrville soils do not have a strongly expressed profile.

Processes of Soil Formation

Most soils in Holmes County have a strongly expressed profile because the processes of soil formation have distinctly changed the parent material. These are upland soils on ridgetops and side slopes and soils on terraces along the major streams. In contrast, the parent material on flood plains and in surface mined areas is only slightly modified.

All the factors of soil formation act in unison to control the processes that form different layers in the soil. These processes are additions, removals, transfers, and transformations (*22*). Some processes result in differences among the surface layer, subsoil, and substratum.

In Holmes County, the most important addition to the soil is organic matter to the surface layer. A thin layer of organic matter accumulates under forest vegetation. If the soil is cleared and cultivated, this organic matter is mixed with the underlying mineral material. In some severely eroded areas, all evidence of this addition has been removed.

Leaching of carbonates from calcareous parent material is one of the most significant removals. It precedes many other chemical changes in the soil. The limestone, calcareous shale, or calcareous glacial till underlying undisturbed soils and combinations of these materials underlying surface mined soils have a high content of carbonates when first exposed to leaching. Most of the soils on uplands and terraces do not have carbonates within 5 feet of the surface and are very strongly acid or medium acid in the subsoil. Other minerals in the soil are subject to the chemical weathering that results from leaching, but their resistance is higher and their removal is slower.

Seasonal wetting and drying of the soil are largely responsible for the transfer of clay from the surface layer to the faces of peds in the subsoil. The fine clay particles are suspended in the percolating water moving through the surface layer and then are deposited in the subsoil. This transfer of fine clay accounts for the clay films on the faces of peds in the subsoil of most of the soils on uplands and terraces (*15*).

Transformations of mineral compounds occur in most soils. The results are most apparent if the formation of layers is not affected by rapid erosion or by accumulation of material at the surface. When the primary silicate minerals are weathered chemically, secondary minerals, mainly layer lattice silicate clays, are produced. Most of the layer lattice clays remain in the subsoil.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

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.

Air drainage. The condition of having proper slope and relief at the growing site so as to provide air outlets and convection currents that reduce "dead" air and frozen "pockets."

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

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 material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas 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 or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

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. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

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 and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Deep soils are more than 40 inches deep over bedrock; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches.

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 wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a 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 resulting from erosion or faulting. Synonym: scarp.

Esker. A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

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.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

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.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

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 as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

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.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grains and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

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 uppercase letter represents the major horizons. Numbers or lowercase 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.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

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 overlying soil material. 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, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it 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 potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. An irregular, short ridge or hill of stratified glacial drift.

Kettle. A steep-sided, bowl-shaped depression without surface drainage in glacial drift deposits and believed to have been formed by the melting of a large, detached block of stagnant ice buried in the glacial drift.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

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-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

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. 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).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

North aspect. North- and east-facing slopes of from 355 to 95 degrees azimuth.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

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.

Perimeter drain. Artificial drain placed around the perimeter of a septic tank absorption field to lower the water table; also called curtain drain.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Very slow	0.0 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities 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.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of 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 degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

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 generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

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.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

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. Seepage 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. 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 (in tables). 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.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

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.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 2 percent
Nearly level and gently sloping	0 to 8 percent
Gently sloping	2 to 8 percent
Moderately sloping	6 to 12 percent
Strongly sloping	6 to 18 percent
Moderately steep	12 to 25 percent
Steep	25 to 40 percent
Very steep	35 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

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, in millimeters, of separates recognized in the United States are as follows:

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 material below the solum. The living roots and plant and animal activities are largely confined to the solum.

South aspect. South- and west-facing slopes of 96 to 354 degrees azimuth.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion 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.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

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. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

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 that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

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.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.